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10 CFR 50.4

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Duke Energy Carolina, LLC (Duke Energy)
Oconee Nuclear Station, Units 1, 2 and 3
Docket Numbers 50-269, 50-270 and 50-287
Renewed License Numbers DPR-38, DPR-47 and DPR-55

Subject: Completion of Required Action by NRC Order EA-12-051 with Regard to Reliable Spent Fuel Pool Instrumentation

References:

1. NRC Order Number EA-12-051, Order Modifying Licenses With Regard To Reliable Spent Fuel Pool Instrumentation, dated March 12, 2012, ADAMS Accession No. ML12054A679.

Ladies and Gentlemen

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued Order EA-12-051, "Order Modifying Licenses With Regard To Reliable Spent Fuel Pool Instrumentation" (Reference 1). This Order was effective immediately and directed Oconee Nuclear Station to install reliable spent fuel pool instrumentation as outlined in Attachment 2 of the Order. This letter, along with its enclosures, provides the notification required by Section IV.C.3 of the Order that compliance with the requirements described in Attachment 2 of the Order has been achieved for Oconee Nuclear Station (ONS), Units 1, 2 and 3.

Enclosure 1 provides a summary of compliance elements that support the final compliance status for Spent Fuel Pool Instrumentation (SFPI) requirement of Order EA-12-051.

Enclosure 2 is included at the request of the NRC and provides the Request for Additional Information (RAI) answers as previously reviewed and accepted by the NRC Audit process. It also addresses the closure of the one open Item identified in the Audit report.

Enclosure 3 is also included at the request of the NRC and provides a bridging document that provides a comparison of vendor technical information and ONS specific considerations in the SFPI implementation.

This letter contains no new or revised Regulatory Commitments.

Should you have any questions regarding this submittal, please contact David Haile with Oconee Regulatory Affairs, at (864) 873-4742.

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I declare under penalty of perjury that the foregoing is true and correct. Executed on February 29, 2016.

Sincerely,

Scott L. Batson
Vice President
Oconee Nuclear Station

Enclosures:

1. Summary of Compliance for NRC Order EA-12-051 Oconee Nuclear Station, Units 1, 2 and 3
2. Oconee Nuclear Station Units 1, 2 and 3 ISE RAI Responses and NRC Audit Report Open Items
3. Bridging Document Between Vendor Technical Information and ONS Specific Considerations For Spent Fuel Pool Instrumentation

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ENCLOSURE 1

Summary of Compliance for NRC Order EA-12-051
Oconee Nuclear Station, Units 1, 2 and 3

BACKGROUND

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued Order EA-12-051, "Order Modifying Licenses With Regard To Reliable Spent Fuel Pool Instrumentation." (Reference E1) This Order was effective immediately and directed Oconee Nuclear Station (ONS) to install reliable spent fuel pool instrumentation (SPFI) as outlined in Attachment 2 of the Order. ONS submitted by letter dated February 28, 2013 (Reference E2), an Overall Integrated Plan (OIP) documenting how the requirements of Order EA-12-051 would be achieved. By letter dated November 1, 2013, the NRC provided its Interim Staff Evaluation which included 15 questions as a Request for Additional Information (RAI) regarding Order EA-12-051 implementation (Reference E11). Also, in accordance with Order EA-12-051, the OIP was supplemented by Six-Month Status Reports (References E3, E4, E5, E6 and E7). A compliance report for Oconee Units 1 and 2 was submitted to the NRC by letter dated 1/20/16 (Reference E13) The information provided herein documents final compliance of Order EA-12-051 for all three units at Oconee Nuclear Station.

COMPLIANCE SUMMARY FOR UNITS 1, 2 AND 3

NRC RAI, ISE, and Audit Items - Complete

All Requests for Additional Information, ISE Open Items. ISE Confirmatory Items, and Audit Questions/Open Items have been addressed and are considered complete.

Identification of Levels of Required Monitoring - Complete

The three required level indications for monitoring SFP level have been established in compliance with Order EA-12-051 for ONS, Units 1, 2 and 3. These levels are integrated into the site processes for monitoring SFP during Beyond Design Basis events, including response to loss of SFP inventory.

Instrument Design Features - Complete

The modifications to install the Spent Fuel Pool Level Instrumentation have been fully implemented on ONS Units 1, 2 and 3 in accordance with the station design control process (Note: Units 1 and 2 share a single pool). The design complies with the requirements specified in the order and as described in NEI 12-02, Revision 1, "Industry Guidance for Compliance with NRC Order EA-12-051" (Reference E10).

The instruments are arranged to provide reasonable protection against missiles. The instruments are mounted to retain design configuration during and following the maximum expected ground motion. The instruments are designed to be reliable at expected environmental and radiological conditions including extended periods when the SFP is at saturation. The instruments are independent of each other and have separate and diverse power supplies. The instruments are designed to maintain their designed accuracy following a power interruption and to allow routine testing and calibration.

The instrument display is readily accessible during postulated events and allows level information to be promptly available to decision makers.

Program Features - Complete

Operating and maintenance procedures for the Spent Fuel Pool Instruments for ONS Units 1, 2 and 3 have been developed, and integrated with existing procedures. These procedures have been verified and are available for use in accordance with the site procedure control program.

Site processes have been established to ensure the Spent Fuel Pool Instruments are maintained at their design accuracy.

Training for ONS, Units 1, 2 and 3 has been completed using the ONS Systematic Approach to Training (SAT) as recommended in NEI 12-02, Revision 1, Section 4.1.

ENCLOSURE 1

Summary of Compliance for NRC Order EA-12-051
Oconee Nuclear Station, Units 1, 2 and 3

REFERENCES

E1. NRC Order Number EA-12-051, Order Modifying Licenses With Regard To Reliable Spent Fuel Pool Instrumentation, dated March 12, 2012, (Accession No. ML12054A679).

E2. Oconee Nuclear Station's Overall Integrated Plans in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), dated February 28, 2013 (Accession No. ML13086A095).

E3. Oconee Nuclear Station First Six Month Status Report in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), dated August 29, 2013 (Accession No. ML13242A009).

E4. Oconee Nuclear Station Second Six Month Status Report in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), dated February 28, 2014 (Accession No. ML14064A197).

E5. Oconee Nuclear Station Third Six Month Status Report in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), dated August 27, 2014 (Accession No. ML14245A019).

E6. Oconee Nuclear Station Fourth Six Month Status Report in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), dated February 27, 2015 (Accession No. ML15063A028).

E7. Oconee Nuclear Station Fifth Six Month Status Report in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), dated August 26, 2015 (Accession No. ML15247A069).

E8. Nuclear Regulatory Commission Audits of Licensee Responses to Reliable Spent Fuel Pool Instrumentation Order EA-12-051, dated March 26, 2014 (Accession No. ML14083A620).

E9. 10CFR50.54(f), "Request for Information Pursuant to Title 10 of the Code of Federal Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force review of Insights from the Fukushima Dai-ichi Accident", Recommendation 9.3, dated March 12, 2012, (Accession No. ML12053A340).

E10. 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."

E11. Oconee Nuclear Station, Units 1, 2, and 3, Interim Staff Evaluation and Request for Additional Information Regarding Overall Integrated Plan for Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), dated November 1, 2013 (Accession No. ML13298A696).

E12. Oconee Nuclear Station, Units 1, 2, and 3 - Report For The Onsite Audit Regarding Implementation Of Mitigating Strategies And Reliable Spent Fuel Instrumentation Related To Orders EA-12-049 and EA-12-051 (TAC NOS. MF0782, MF0783, MF0784, MF0785, MF0786, AND MF0787), dated October 6 2015 (Accession No. ML 15259A387).

E13. Notification of Compliance with Order EA-12-051, "Order to Modify Licenses With Regard To Reliable Spent Fuel Pool Instrumentation" for Oconee Nuclear Station, Units 1 and 2, dated January 20, 2016 (Accession No. ML 16028A193).

ENCLOSURE 2
Oconee Nuclear Station Units 1, 2 and 3,
ISE RAI responses and NRC Audit Report Open Items

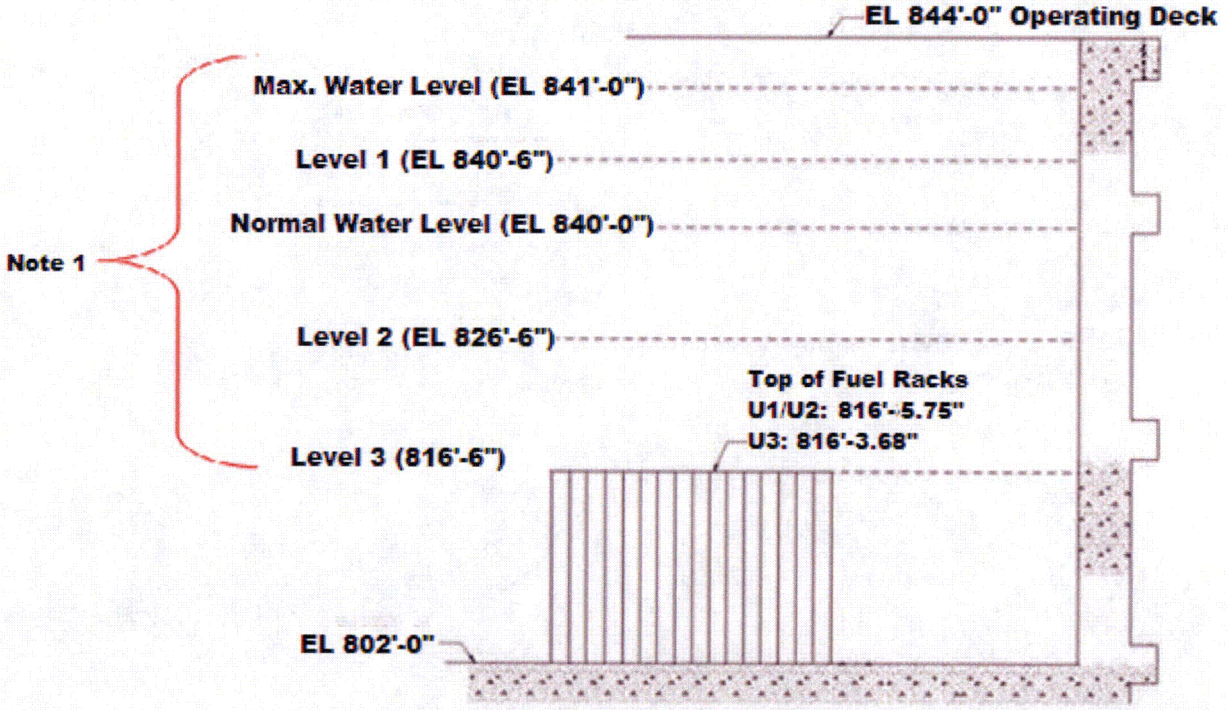
ONS Units 1, 2 and 3 are in final compliance with Order EA-12-051 as demonstrated by the docketed correspondence and the results of the NRC's Audit concerning this Order.

The responses to the Request for Additional Information (RAI) items for ONS Units 1, 2 and 3 listed in the Spent Fuel Pool Level Instrumentation (SFPLI) ISE were addressed by means of the NRC Audit process and are complete. A summary characterization of the associated responses as reviewed by the NRC Audit is provided below as information only.

RAI #1
Please provide a sketch showing the approximate location of the SFP level instrumentation sensors and the elevations identified as Levels 1, 2 and 3 for the Unit 3 SFP.

RAI #1 Response:
Reference revision 20G of general arrangement drawing O-912-A for the location of the two sensors for the Unit 1&2 SFP and reference revision 29B of general arrangement drawing O-2912 for the location of the two sensors for the Unit 3 SFP. Refer to Figure 1 for the elevations representing Level 1, Level 2 and Level 3, the top of the fuel and the level monitoring range. Note that the elevation of the top of the fuel racks is 2.07" higher on the Unit 1&2 SFP than the Unit 3 SFP. Given this difference is small and well within the criteria specified in NEI 12-02 for Level 3 monitoring (+/- 12 inches from the top of the fuel racks), Level 3 is defined as 816'-6" for both the Unit 1&2 and Unit 3 SFPs for convenience.

FIGURE 1
Level Range EL. 816' - 6" to EL. 841' - 0"



Note 1: *Level 1, Level 2 and Level 3 are applicable to both the Unit 1&2 SFP and the Unit 3 SFP. The range of the level indication will meet or exceed elevations defined by the maximum pool level (841'-0") and Level 3 (816'-6").*

RAI #2

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

RAI #2 Response:

Reference highlighted general arrangement drawing O-308-C for Unit 1&2 SFP dimensions and approximate locations of the radar horn antennas and waveguide piping for each channel. Reference revision 20G of general arrangement drawing O-912-A for the location of the two sensors for the Unit 1&2 SFP and the associated electronics for each channel. Reference highlighted general arrangement drawing O-2308-C for Unit 3 SFP dimensions and approximate locations of the radar horn antennas and waveguide piping for each channel. Reference revision 29B of general arrangement drawing O-2912 for the location of the two sensors for the Unit 3 SFP and the associated electronics for each channel.

Physical layout drawings that provide a useable view of cable routing are not readily available as cable routes are normally identified on cable tray sectional drawings and cable cards. Alternately, a written description of the instrumentation system and associated cable routing is provided. Each level channel consists of a guided wave radar horn assembly and waveguide piping located at opposite ends of each SFP. The waveguide piping for each channel is routed slightly above the SFP operating deck and through a wall penetration to the sensor electronics located in separate rooms on the 838' elevation of the Auxiliary Building east of each SFP. Each channel contains a level sensor or transmitter, a power control panel that includes battery back-up capability and a local display all located on the 838' elevation of the Auxiliary Building in separate rooms as shown on O-912-A and O-2912. The primary SFP level channel is provided non-safety related AC power from a 120 VAC panel board located within the room containing the primary channel electronics. Similarly, the back-up SFP level channel is provided non-safety related AC power from a 120 VAC panel board located within the room containing the back-up channel electronics. The primary and back-up channel 120 VAC panel boards are fed from different transformers. For each channel, one field routed cable connects the sensor/transmitter to the power control panel and a second field routed cable connects the local display to the power control panel. For each channel, a level signal cable is routed from the power control panel through a cable shaft to the Cable Spreading Rooms and then to separate independent displays on Control Room Auxiliary Bench Board 2AB3 (Unit 1&2 SFP level channels) and Control Room Auxiliary Bench Board 3AB3A (Unit 3 SFP level channels). The level signal cables for the primary and back-up channels will be separated consistent with plant standards for routing redundant safety-related cabling. All electronics and cabling (power and signal) are located in the Seismic Category 1 Auxiliary Building and/or Control Rooms.

RAI #3

Please provide additional information describing how the final arrangement of the SFP instrumentation and routing of the cabling between the level instruments, the electronics and the displays, meets the Order requirement to arrange the SFP level instrument channels in a manner that provides reasonable protection of the level indication function against missiles that may result from damage to the structure over the SFP. If applicable, please describe what precautions will be taken to ensure the back-up instrument's sensing line do not become susceptible to freezing during cold outside temperatures.

RAI #3 Response:

The two channels of the AREVA Through Air Radar Spent Fuel Pool 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 radar horn antenna for each level instrument will be installed on opposite ends of the Spent Fuel Pool near the southwest and northeast corners of each pool as shown on highlighted general arrangement drawings O-

308-C (Unit 1&2 SFP) and O-2308-C (Unit 3 SFP). The waveguide piping will be routed toward the extreme southeast and northeast corners of the SFP rooms near the Reactor Building walls which provides maximum separation of the two channels in the SFP area and reasonable protection against any missiles that may result from damage to the structure over the SFP. The electronics for each channel containing a level sensor or transmitter, a power control panel that includes battery back-up capability and a local display; will be located on the 838' elevation of the Auxiliary Building in separate rooms remote from the SFP area as shown on O-912-A (Unit 1&2) and O-2912 (Unit 3). For each channel, one field routed cable connects the sensor/transmitter to the power control panel and a second field routed cable connects the local display to the power control panel. For each channel, a level signal cable is routed from the power control panel through a cable shaft to the Cable Spreading Rooms and then to separate independent displays on Control Room Auxiliary Bench Board 2AB3 (Unit 1&2 SFP level channels) and Control Room Auxiliary Bench Board 3AB3A (Unit 3 SFP level channels). The level signal cables for the primary and back-up channels will be separated consistent with plant standards for routing redundant safety-related cabling. All electronics and cabling are located in the Seismic Category 1 Auxiliary Building and/or Control Rooms remote from the SFP area. All points of mounting will be to seismically qualified structures.

The design of the primary and back-up SFP level channels are not susceptible to freezing.

RAI #4 a)
Please provide the following:

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

RAI #4 a) Response:
The primary channel, which consists of the electronic sensor/transmitter, radar horn, and waveguide piping, is mounted seismically. The mounting designs for the electronic sensor support, radar horn support, and intermediate supports were qualified considering the total weight of the waveguide piping and its components and the seismic accelerations for the building structure. To meet the design criteria for a BDB Event, the loading for the mounting supports were generated using a minimum of 4 X SSE accelerations. The mounting designs for these supports are qualified by calculations using the Manual For Steel Construction AISC 9th Edition, Hilti Product Technical Guides, and site specific specifications.

The electronic sensor mounting support is qualified by a generic calculation using a simple C-channel steel section that is welded centrally on a ½ " thick steel base plate on the Auxiliary Building concrete wall. This Auxiliary Building wall is Seismic Category 1. The base plate is anchored to the wall with four (4) concrete anchor bolts. The generic sensor mounting support was designed for generic enveloping SSE ZPA seismic accelerations of 2g (horizontal) and 1g (vertical). The calculation further assumed an enveloping sensor cantilevered length.

The radar horn cantilever mounting support for the Unit 1&2 channels consists of a C8"X18.75" channel, HSS 3" X 3" X ¼" and a ½ " baseplate of dimensions 10" X 12". The base plate is designed to be anchored to the floor with four (4) concrete anchor bolts. A visual representation of the Unit 1&2 pool edge mounting configuration for the radar horn is shown in OM-201-3514. The radar horn cantilever mounting support for the Unit 3 channels consists of a C8"X18.75" channel and a ½ " baseplate of dimensions 8" X 12". The base plate is designed to be anchored to the floor with four (4) concrete anchor bolts. A visual representation of the Unit 3 pool edge mounting configuration for the radar horn is shown in OM-201-3515.

Both radar horn support designs are qualified to withstand deadweight, seismic and sloshing loads, as well as the loads acting on them from the horn end assembly. Both radar horn mounting supports are designed for generic enveloping SSE ZPA seismic accelerations of 2g (horizontal) and 1g (vertical). A hydrodynamic loading analysis has been completed which indicates hydrodynamic interaction of SFP inventory with the radar horn assembly does not occur during a seismic event characterized by the ONS GMRS. The installation design for the instruments provides more than enough clearance to preclude any hydrodynamic interaction during the event (Reference OSC-11320).

The intermediate mounting supports are qualified by a site specific calculation. Standard Oconee conduit supports are used to support the waveguide system. These supports are qualified up to a current maximum loading, however they have been re-qualified as needed to show they can be used to support the loading from the waveguide pipe using the 4 X SSE accelerations. All intermediate supports used are intended to be 2-way supports and allow free movement in the axial direction (along the pipe). The waveguide pipe has been qualified using increased seismic requirements with a maximum allowable span between pipe supports of 9'-0".

All of the mounting supports for the waveguide piping will be attached to either the concrete wall or concrete floor. These are Seismic Category 1 concrete structures with a minimum concrete strength of 3000 psi.

The mounting design for the Power Control Panels (PCP) and the local digital displays are qualified considering the total weight of the enclosures and their associated components and the seismic accelerations for the building structure. The Power Control Panels (PCP) and the local digital displays are to be installed on the concrete wall or floor of the Purge Exhaust Equipment Rooms in the Auxiliary Building, above floor elevation 838'-0". A floor response spectrum for a higher floor elevation of 848' is used, which bounds lower elevation accelerations. The elevated 4 X SSE accelerations are also applied. In the original seismic test for the PCP and digital display assembly, Grade 5 and Grade 8 fasteners were used to connect the PCP and digital display to a back plate, which in turn was connected to the shake table via unistruts. The assembly was tested to a minimum Required Response Spectrum (RRS) of 14g for SSE. However, for the ONS installations, the back plates are not used. The PCP and digital display are mounted to the wall or steel stanchion directly via Unistruts. In this mounting configuration with the back plate removed and the PCP mounted directly to the Unistrut, the mounting configuration (and load path) continues to be rigid and the PCP configuration unchanged. Therefore, the test results remain valid without the back plate. Additionally, the equipment was tested to accelerations that bound U.S. seismic demand; the test curves are significantly higher than Oconee response spectra where the equipment is being mounted (at least 7 times peak SSE), demonstrating additional margin in the design. For PCPs or digital displays that are to be installed on a concrete wall, the electrical components are bolted to two horizontal unistruts which are then anchored to the wall by two (2) concrete anchor bolts. For PCPs or digital displays that are installed on the floor a supporting steel stanchion is used. The stanchion consists of a HSS 7" X 7" X 3/8" welded to a 1" base plate of dimensions 16" X 16". The base plate is anchored to the floor by four (4) concrete anchor bolts. Two horizontal unistruts are welded to the HSS and the electrical components are bolted to the unistruts.

Installation and mounting of all field run electray/cable tray is done per OSS-0218.00-00-0025 which is applicable to QA-1 safety-related installations.

The remote indicators will be seismically mounted in the QA-1 safety-related auxiliary bench boards located in the Unit 2 and Unit 3 Main Control Rooms.

RAI #4 b) & c)
Please provide the following:

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

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

RAI #4 b) & c) Response:
The waveguide piping assembly, horn, and electronic sensor are designed to attach to the SFP concrete floor and the Auxiliary Building concrete wall by means of mounting supports. These mounting supports consist of a horn support, sensor support, and intermediate supports. Spacing of the mounting supports is to comply with site specific specifications and standards and qualification restrictions for the waveguide assembly. An isometric drawing of each level channel is included in the level system instruction manual (OM-201-3506).

RAI #5
For RAI 4(a) above, please provide the analyses used to verify the design criteria and methodology for seismic testing of the SFP instrumentation and the electronics units, including, design basis maximum seismic loads and the hydrodynamic loads that could result from pool sloshing or other effects that could accompany such seismic forces.

RAI #5 Response:
The Required Response Spectra (RRS) used for seismic testing of the SFP level instrumentation and the electronics units envelop the ONS design basis seismic spectra for the locations where the equipment will be installed. The seismic testing and analysis performed is in accordance with IEEE 344-2004 methodology per site procedures. A hydrodynamic loading analysis has been completed which indicates hydrodynamic interaction of SFP inventory with the radar horn assembly does not occur during a seismic event characterized by the ONS GMRS. The installation design for the instruments provides more than enough clearance to preclude any hydrodynamic interaction during the event (Reference OSC-11320). The waveguide and horn end assembly are evaluated for deadweight and seismic loads.

The various analyses documenting the seismic qualification of the SFP level instrumentation including the radar horn assembly mounting, waveguide piping supports, level sensors, power control panels and displays are listed below.

- OM-201-3515 (Areva Report 32-9221237-002): Qualification for a Waveguide Type A Support and Horn End Assembly for Areva SFP Level Monitoring Instrumentation (Applicable to the Unit 3 SFP Level channels)
- OM-201-3514 (Areva Report 32-9221238-000): Qualification for a Waveguide Type B Support and Horn End Assembly for Areva SFP Level Monitoring Instrumentation (Applicable to the Unit 1&2 SFP Level channels)
- OM-201-3521 (Areva Report 66-00846-002): Test Report for VEGAPULS 62ER
- OM-201-3518 (Areva Report 32-9221347-001):VEGA Waveguide Span Criteria, Standard Pipe Support Design, and Anchorage Verification for VEGA Waveguide Supports.
- OM-201-3516 (Areva Report 32-9218496-002): Qualification for a Standard Orthogonal Sensor Support for the Areva SFP Level Monitoring System.

- OM-201-3517 (Areva Report 32-9220141-001): Areva Power Control Panel and Digital Display Mounting and Anchorage Design for Units 1, 2, 3.
- OM-201-3520 (Areva Report 51-9202556-005): Qualification Analysis of VEGAPULS 62ER Through Air Radar.
- OM-201-3536 (Contains Areva Report 51-9221032-000): Qualification Analysis for VEGA Waveguide Horn Cover
- OM-201-3536 (Contains Areva Report 174-9213558-006): Seismic Test Report for VEGAPULS.
- OSC-2509-ICC-001: Seismic Qualification of Safety Devices on the Oconee Units 1, 2, & 3 Main Control Boards
- DPM-1393.01-0009-001: Qualification Test Report of Weschler Meters
- OSS-0218.00-00-0025 "Installation of Field Run Cable Support Systems"

RAI #6
For each of the mounting attachments required to attach SFP Level equipment to plant structures, please describe the design inputs, and the methodology that was used to qualify the structural integrity of the affected structures/equipment.

RAI #6 Response:
The SFP rooms (Unit 1&2 and Unit 3) are seismic category 1 structures. All waveguide piping supports are attached to the SFP deck or wall. The concrete walls in the Purge Exhaust Equipment rooms where the Power Control Panels, level sensor and local digital display for each channel are mounted are seismic category 1 structures. The remote indicators are located on seismically qualified auxiliary bench boards located in the Unit 1/2 and Unit 3 main control rooms.

RAI #7 a)
Please provide the following:
A description of the specific method or combination of methods you intend to apply to demonstrate the reliability of the permanently installed equipment under BOB ambient temperature, humidity, shock, vibration, and radiation conditions.

RAI #7 a) Response:
The SFP level channel instrumentation reliability will be established based on a combination of analyses, testing, and operating experience, as described below. Refer to the response for RAI #8 for test report references.

Temperature
The postulated temperature in the spent fuel pool area that results from a boiling pool is 100°C (212°F). No temperature sensitive components will be located in the SFP area. The radar sensor electronics (sensor, PCP and local digital display) will be located outside of the spent fuel pool room in an area where the temperature will not exceed the rated design temperature. The most limiting maximum ambient temperature for the electronics is 149 degrees F for the PCP components which includes a 9 degree F heat rise allowance within the panel (Reference OM-201-3520). The maximum expected temperature for a BDBEE resulting in an ELAP and loss of ventilation at the location of the system electronics does not exceed 149 degrees F with no cooling mitigating actions employed (Reference OSC-11253). Draft FLEX guide FG/0/A/1900/005 "Initial Assessment and FLEX Equipment Staging" contains actions to open various doors within Auxiliary Building for natural circulation before T=12 hours which reduces the maximum temperature at the location of the system electronics to 134 degrees F

(Reference OSC-11253 Table 73). The maximum ambient temperature limit for the remote displays located in the control rooms exceeds the maximum expected temperature for a BDBEE resulting in an ELAP and loss of ventilation based on planned cooling mitigating actions for FLEX (Reference OSC-11203, OSC-11253 and Draft FG/0/A/1900/005).

Humidity

The maximum humidity postulated for the spent fuel pool area is 100% relative humidity, saturated steam. The radar horn assembly over the SFP will have a sealed glass cover to prevent steam or high humidity air from entering the waveguide piping. The radar sensor electronics will be located outside of the spent fuel pool room in an area away from the steam atmosphere. The sensor has been tested in accordance with IEC 60068-2-30, which varies the room temperature from normal room temperature to elevated temperature at high humidity conditions, to verify that the test item withstands condensation that can occur due to the changing conditions. The sensor is rated IP66/IP68, which signifies totally dust tight housing, protection against string water jets and waves, and protection against the prolonged effects of immersion under 0.2 bar pressure. The sensor has also been tested to EN 60529:2000. The PCP enclosure is rated NEMA 4X and provides protection to the internal components from the effects of high humidity. The ambient humidity in the Auxiliary Building at the location of the sensor electronics would be expected to be below 100% RH during a postulated ELAP.

Steam

The ability of the radar wave to propagate through steam has been demonstrated by vendor testing. In addition through air radar has been used in numerous applications that involve measuring the level of boiling liquids. Therefore, successful operating experience has demonstrated that the through air radar functions at high levels of steam saturation.

Shock and Vibration

Shock:

The VEGAPULS 66 Through Air Radar sensor and PLICSCOM indicating and adjustment module mounted to the sensor were shock tested in accordance with MIL-STD-901 D. The test results are considered also applicable to the VEGAPULS 62 ER and PLICSCOM indicating and adjustment module. Differences in construction between the VEGAPULS 66 and VEGAPULS 62 ER are mainly in the smaller size of the VEGAPULS 62 ER. The shape of the housing, its material construction (precision cast stainless steel), the mass and form factor for the electronics modules, the materials and method for mounting the electronics into the sensor housing are the same between the VEGAPULS 66 and the VEGAPULS 62 ER.

The MIL-STD-901 D test consisted of a total of nine (9) shock blows, three (3) through each of the three (3) principal axes of the sensor, delivered to the anvil plate of the shock machine. The heights of hammer drop for the shock blows in each axis were one (1) foot, three (3) feet and five (5) feet.

The VEGAPULS 62 ER Through Air Radar sensor has also been shock tested in accordance with EN60068-2-27 (100g, 6ms), ten (10) shock blows applied along a radial line through the support flange.

The foregoing testing demonstrates the sensor is reliable under severe shock conditions.

Vibration:

A VEGAPULS 66 Though Air Radar sensor and PLICSCOM indicating and adjustment module mounted to the sensor were successfully vibration tested in accordance with MILSTD-167-1. The test results are considered also applicable to the VEGAPULS 62 ER and PLICSCOM indicating and adjustment module. Differences in construction between the VEGAPULS 66 and VEGAPULS 62 ER are mainly in the smaller size of the VEGAPULS 62 ER. The shape of the housing, its material construction (precision cast stainless steel), the mass and form factor for the electronics modules, the materials and method for

mounting the electronics into the sensor housing are the same between the VEGAPULS 66 and the VEGAPULS 62 ER.

The vibration test procedure described above applies to equipment found on Navy ships with conventional shafted propeller propulsion. The test frequencies ranged from 4 Hz to 50 Hz with amplitudes ranging from 0.048" at the low frequencies to 0.006" at the higher frequencies. This procedure is not applicable to high-speed or surface effect ships that are subject to vibrations for high-speed wave slap, which produce vibration amplitudes and frequencies in excess of the levels on conventional Navy ships.

The potential vibration environment around the SFP and surrounding building structure might contain higher frequencies than were achieved in the testing discussed above. Additional testing of the VEGA PULS 62 ER sensor was performed in accordance with EN 60068-2-6 Method 204 (except 4g, 200 Hz). This additional testing is considered to provide a stand-alone demonstration of the resistance to vibration of the VEGAPULS 62 ER sensor and further substantiates the results of the MIL-STD-167-1 testing.

The components used in the power control panel are listed in the Table 1-1 below, which provides the shock and vibration test and/or analysis for each component.

Table 1-1: Power Control Panel Shock and Vibration Test and Analysis

Component Name	Test Standard Used	Test Levels Per Manufacturer Description
Selector switch	Vibration resistance per IEC 60068-2-6. Shock per IEC 60068-2-27.	5 gn (f = 2 to 500Hz) 30 gn for 18 ms half sine wave acceleration 50 gn for 11 ms half sine wave acceleration
Terminal blocks	Not tested, these are considered suitable for use in the shock and vibration environments based on their previous use in the manufacturer's mobile remote display.	N/A
Power supply	Vibration resistance per IEC 60068-2-6. Shock per IEC 60068-2-27	(Mounting by rail: Random wave, 10-500Hz, 2G, ea. Along X, Y, Z axes 10 min/cycle, 60 mi) Half sine wave, 4G, 22 ms, 3axes, 6 faces, 3 times for each face
Fuse	Vibration tested per MIL-STD-202 Shock tested per MIL-STD-202	Method 204, Test Condition C (Except 5g, 500 Hz) Method 207 (HI Shock)
Indicating light	Not tested for shock or vibration resistance. Failure of light will not impact instrument operability.	N/A
Control relay	Not tested, mounted on dampener (See Note 2 Below)	N/A
Battery	Not tested, mounted on dampener (See Note 2 Below)	N/A
Current isolator	Not tested, mounted on dampener (See Note 2 Below)	N/A
Readout (See Note 1 Below)	Test standards as described in the above response.	Test standards as described in the above response.

Notes:

1) *The VEGA displays will be mounted separately from the power control panel. These displays have the same housing, the same material construction and method for mounting the electronics into the sensor housing as the VEGAPULS 62 ER that has been shock and vibration tested as discussed in the responses above.*

2) *Three components that were not shock or vibration tested by the manufacturers were included in a power control panel that was successfully seismically tested in accordance with the requirements of the Institute of IEEE Standard 344-2004. The seismic test levels reached peaks of 19g in the x direction, 20g in the y direction, and 21g in the z direction. The test response spectra exceeded 10g at all upper frequencies up to 100 Hz beyond which they were not recorded. Also, these components are mounted to vibration dampeners to further minimize the transfer of external vibration to these components. There are no known reasons that would cause vibration to increase in an ELAP event.*

The test parameter values provided in IEC Standards, IEC 60068-2-6 (vibration) and IEC 60068-2-27 (shock), tables are recommendations and not mandatory testing levels. The test parameter values were selected to be consistent with previous shock and vibration testing performed on the VEGA supplied equipment. The test parameter values specified envelope the expected levels for the equipment installed location, due to the fact that the equipment is mounted to seismic structures within the plant. This approach is consistent with similar technology used in the same application at other installations.

The vibration testing deviated from the IEC 60068-2-6 recommended frequency range and displacement magnitude for large power plant equipment (TABLE C.2). In-lieu of the 10-55 Hz and minimum displacement of 0.15 mm recommended in TABLE C.2, the power and control panel vibration testing utilized a narrower frequency band (5-25 Hz) and a more limiting displacement magnitude (1.6 mm). These values were deemed to be acceptable and enveloping for equipment rigidly mounted to a Seismic Category I structure, based on engineering judgment.

The shock testing deviated from the IEC 60068-2-27 recommended peak acceleration and duration for land-based permanently installed equipment. In-lieu of the 15 g's peak acceleration and duration of 11 m-sec recommended in TABLE A.1, the power and control panel vibration testing utilized and acceleration of 10g with a 6 m-sec duration. These values were deemed to be acceptable and enveloping for equipment rigidly mounted to a seismic Category I structure, based on engineering judgment.

The shock and vibration testing performed for the SFP level instrumentation adequately demonstrates the sensor and power control panel will be reliable in the installed design location. The instrumentation is rigidly mounted to the Seismic Category I Auxiliary Building wall and would not be subjected to any significant shock or vibration during a postulated beyond design bases event, or during normal operation. The instrumentation is located within the Seismic Category I Auxiliary Building and is protected from external wind borne missile threats. The instrumentation installed design location is not susceptible to vibration from surrounding rotating equipment. The radar sensor and power control panel design location provides spatial separation from surrounding SSCs, such that potential seismic interaction with surrounding SSCs is also not a concern.

The testing bounds the expected component shock environment and accelerations for the power control panel design mounting location (i.e., concrete walls or rigid metal building structures).

Radiation:

The area above and around the pool will be subject to large amounts of radiation in the event water level decreases near the top of the fuel racks. The only parts of the measurement channel in the pool radiation environment are the metallic waveguide and horn and the glass horn cover. The metallic waveguide and radar horn are not susceptible to the expected levels of radiation. The horn cover is made of fused silica glass, which is inorganic and not sensitive to radiation. Test data for the Dow Corning Sylgard 170 silicone elastomer which attaches the glass horn cover to the metallic horn shows test data for exposures up to 7.13×10^8 rads. At 1.64×10^8 rads the elastomer still showed some flexibility, but continued to become more brittle with higher exposure. Change in brittleness is not considered to be a significant factor as this level of exposure is not anticipated during a boiling

pool scenario. In addition, Draft FG/_/A/1900/0011 "Alternative SFP Cooling" includes actions to maintain SFP water level greater than -12 ft, or 11.5 ft above the top of the fuel racks, as indicated on the WR SFP level indicator in the main control rooms which should prevent excessive radiation dose in the SFP area.

A specific radiation dose calculation was performed for the Auxiliary Building locations where the sensor electronics will be located. The calculated dose is applicable for a normal refueling quantity of freshly discharged (100 hour decayed) fuel with the SFP water level at the top of the fuel racks for 7 days as specified by NEI 12-02 and is bounding for both the Unit 1 & 2 and Unit 3 SFPs. The calculated total integrated dose does not exceed the $1x10^3$ rad design limit for the required operating time (Reference OSC-11286).

RAI #7 b)
Please provide the following:

A description of the testing and/or analyses that will be conducted to provide assurance that the equipment will perform reliably under the worst-case credible design basis loading at the location where the equipment will be mounted. Include a discussion of this seismic reliability demonstration as it applies to a) the level sensor mounted in the SFP area, and b) any control boxes, electronics, or read-out and re-transmitting devices that will be employed to convey the level information from the level sensor to the plant operators or emergency responders.

RAI #7 b) Response:

A seismic shake test was performed to the requirements of IEEE 344-2004 for elements of the VEGAPULS 62ER Through Air Radar to levels anticipated to envelope most if not all plants in the United States. The equipment tested included the sensor, readout and power control panel, horn end of the waveguide, pool end and sensor end mounting brackets, and waveguide piping. The items were tested to the Required Response Spectra (RRS) contained in EPRI TR-107330 to account for the potentially high seismic motion that could occur to the cabinet-mounted readout and the power control panel. This RRS also envelops the seismic ground motion for items mounted to the building structure, pool edge, etc.

The main control room display/indicator will be seismically mounted, and is seismically qualified based on similarity to other control board indicators.

RAI #7 c)
Please provide the following:

A description of the specific method or combination of methods that will be used to confirm the reliability of the permanently installed equipment such that following a seismic event the instrument will maintain its required accuracy.

RAI #7 c) Response:

The seismic testing described in RAI #5 includes testing the VEGAPULS 62ER for functionality prior to and post seismic testing, which includes verification of the instrument's accuracy.

RAI #8

For RAI #7 above, please provide the results for the selected methods, tests and analyses used to demonstrate the qualification and reliability of the installed equipment in accordance with the Order requirements.

RAI #8 Response:

The level sensor, PCP and local display were qualified to environmental levels (temperature, humidity and radiation) that bound those expected for their location during a BDBEE/ELAP. The test results are

documented in OM-201-3520, OM-201-3521 and OM-201-3536. The expected environmental levels for the installation location of these devices for a BDBEE/ELAP are documented in OSC-11253 and OSC-11286. Environmental qualification of the remote displays to be installed in the main control rooms is documented in DPM-1393.01-0009-001. The remote displays were tested to 122 degrees F which bounds the expected maximum temperature for the main control rooms considering planned cooling mitigating actions for FLEX.

The level sensor, PCP, local display, horn end of the waveguide, standard pool end, sensor end mounting brackets and waveguide piping were successfully seismically tested in accordance with the requirements of IEEE Standard 344-2004. The system was monitored for operability before and after the resonance search and seismic tests. The required response spectra used for the five Operating Basis Earthquakes (OBE) and one Safe Shutdown Earthquake (SSE) in the test were taken from EPRI TR-107330. This test level exceeds the building response spectra where equipment will be located. The applicable seismic test reports are listed in the response to RAI #5.

Seismic qualification of the remote display to be installed in the main control room was performed in accordance with IEE 344-1987 and is documented in DPM-1393.01-0009-001. The display (Weschler VX-252) is qualified to envelope the RRS with 20g peak and 6.6 g ZPA at 5% damping which envelopes the ONS main control board in-cabinet spectra.

The level sensor, PCP and local display are shock and vibration resistant based on the various testing as noted in the response to RIA #7. The results of these tests are documented in OM-201-3520 and OM-201-3536.

The mounting designs for the electronic sensor support, radar horn support, and intermediate supports were qualified by calculation considering the total weight of the waveguide piping and its components and the seismic accelerations for the building structure. To meet the design criteria for a BDB Event, the loading for the mounting supports were generated using a minimum of 4 X SSE accelerations.

The mounting design for the Power Control Panels (PCP) and the local digital displays are qualified by calculation considering the total weight of the enclosures and their associated components and the seismic accelerations for the building structure.

The intermediate mounting supports are qualified by a site specific calculation. Standard Oconee conduit supports are used to support the waveguide system. These supports are qualified up to a current maximum loading, however they have been re-qualified as needed to show they can be used to support the loading from the waveguide pipe using 4 X SSE accelerations.

Refer to the response to RIA #4 and the reference documents listed in response to RIA #5 for additional details on the qualification of mounting supports.

RAI #9 a)
Please provide the following:

A description of how the two channels of the proposed level measurement system meet this requirement so that the potential for a common cause event to adversely affect both channels is minimized to the extent practicable.

RAI #9 a) Response:

The radar horn antenna for each level instrument channel will be installed on opposite ends of the Spent Fuel Pool near the southwest and northeast corners of each pool as shown on highlighted general arrangement drawings O-308-C (Unit 1&2 SFP) and O-2308-C (Unit 3 SFP). The waveguide piping will be routed toward the extreme southeast and northeast corners of the SFP rooms near the Reactor Building walls which provides maximum separation of the two channels in the SFP area. The electronics for each channel (level sensor, PCP and local display) will be located on the 838' elevation of the Auxiliary Building in separate rooms as shown on O-912-A and O-2912.

RAI #9 b)
Please provide the following:

Further information on how each level measurement system, consisting of level sensor electronics, cabling, and readout devices will be designed and installed to address independence through the application and selection of independent power sources, the use of physical and spatial separation, independence of signals sent to the location(s) of the readout devices, and the independence of the displays.

RAI #9 b) Response:
The primary SFP level channel is provided non-safety related AC power from a 120 VAC panel board located within the room containing the primary channel electronics. Similarly, the back-up SFP level channel is provided non-safety related AC power from a 120 VAC panel board located within the room containing the back-up channel electronics. The primary and back-up channel 120 VAC panel boards are fed from different transformers. For each channel, located in separate rooms, one field routed cable connects the sensor/transmitter to the power control panel and a second field routed cable connects the local display to the power control panel. For each channel, a level signal cable is routed from the power control panel through a cable shaft to the Cable Spreading Rooms and then to separate independent displays on Control Room Auxiliary Bench Board 2AB3 (Unit 1&2 SFP level channels) and Control Room Auxiliary Bench Board 3AB3A (Unit 3 SFP level channels). The level signal cables for the primary and back-up channels will be separated consistent with plant standards for routing redundant safety-related cabling. All electronics and cabling (power and signal) are located in the Seismic Category 1 Auxiliary Building and/or Control Rooms.

RAI #10 a)
Please provide the following:

A description of the electrical AC power sources and capabilities for the primary and backup channels.

RAI #10 a) Response:
The PCP for each channel (primary and backup) normally operates on 120 VAC which is provided from a non-safety related 120 VAC power panel board located in same room with the channel electronics. The power path and sources for each channel are listed below:

Unit 1&2 SFP Channel A - Lighting Panel board 2L11 fed from 208 VAC MCC 2XR
Unit 1&2 SFP Channel B - Lighting Panel board 1L11 fed from 208 VAC MCC 1XR
Unit 3 SFP Channel A - Lighting Panel board 3L11 fed from 208 VAC MCC 3XT
Unit 3 SFP Channel B - Lighting Panel board 3L15 fed from 208 VAC MCC 3XR

Each PCP contains a 120VAC to 24 VDC power supply that provides normal DC power to the sensor. Each PCP contains eight (8) lithium batteries that provide the required DC voltage automatically upon loss of the normal 120 VAC source. An indicating light is provided on the PCP which illuminates with 120 VAC normal power provided to the unit. Loss of normal 120 VAC power is alarmed on the Operator Aid Computer (OAC) via a digital input from a relay in the PCP to indicate a loss of normal power to the unit.

RAI #10 b)
Please provide the following:

Please provide the results of the calculation depicting the battery backup duty cycle requirements demonstrating that its capacity is sufficient to maintain the level indication function until offsite resource availability is reasonably assured.

RAI #10 b) Response:
Analysis of the battery life in relation to operating temperature is documented in OM-201-3520. The batteries can support operation at full voltage at 20 madc for approximately 130 hours at -22 degrees F and approximately 230 hours at 32 degrees F. Battery life expectancy increases with increasing temperature. This demonstrates the batteries have sufficient capacity to support reliable instrument channel operation until offsite resource availability is reasonably assured. Per OM-201-3520, battery life expectancy is 330 hours (13.75 days) at 77 degrees F and 349 hours (14.5 days) at 131 degrees F. Therefore, actions will be added to FG/1-2,3/A/1900/011 "Alternate SFP Cooling" to replace the batteries on each channel as needed to ensure long term availability of the WR SFPL indication during an ELAP.

RAI #11 a)
Please provide the following:

An estimate of the expected instrument channel accuracy performance under both (a) normal SFP level conditions (approximately Level 1 or higher) and (b) at the BOB conditions (i.e., radiation, temperature, humidity, post-seismic and post-shock conditions) that would be present if the SFP level were at the Level 2 and Level 3 datum points.

RAI #11 a) Response:
The manufacturer reference accuracy for each radar level channel is no greater than ± 1 inch based on tests performed by Areva (Reference OM-201-3506). This is the design accuracy value that will be specified for each level instrument channel but is subject to change depending on the actual performance with the installed waveguide and potential uncertainties associated with the calibration method. The ± 1 inch accuracy is applicable to the radar measurement system and does not include other components in the overall instrument loop.

The uncertainty of the radar level channels are minimally affected by postulated BDB conditions (i.e., radiation, temperature, humidity, post-seismic and post shock conditions). The stainless steel horn antenna and waveguide pipe that is exposed to BDB conditions is unaffected by radiation, temperature and humidity. The horn cover prevents formation of condensation inside the waveguide. A minor effect on the measurement uncertainty is the length of the overall measurement path which can change due to temperature related expansion of the waveguide pipe. The waveguide pipe permits the sensor electronics to be located in a mild environment so that the effect of elevated temperature on accuracy is also limited. Based on VEGA operating instructions for the VEGAPULS 62ER, a small correction factor is applied to account for the impact of saturated steam at atmospheric pressure on the radar beam velocity. Testing performed by AREVA using saturated steam and saturated steam combined with smoke indicate that the overall effect on the instrument uncertainty is minimal. The overall uncertainty due to BDB conditions described above is estimated to not exceed ± 3 inches for the radar measurement system (Reference OM-201-3506 and Areva Report 174-9213558-006 contained in OM-201-3536).

The uncertainty of the SFP level channels is documented in OSC-11203. The bounding uncertainty at the control room indicator is ± 9 inches for normal plant operating conditions and +12/-11 inches for BDBEE conditions. These bounding uncertainty values include the uncertainty of the analog indicators.

NEI 12-02 does not specify a quantitative limit on the uncertainty of the SFPLI. Only two requirements are specified:

1) The instruments shall maintain their designed accuracy following a power interruption without re-calibration.
2) The instrument accuracy shall be sufficient to allow trained personnel to determine when actual level exceeds the specified lower level of Levels 1, 2 and 3 without conflicting or ambiguous indication.

The uncertainties determined are adequate for these purposes.

RAI #11 b)
Please provide the following:

A description of the methodology that will be used for determining the maximum allowed deviation from the instrument channel design accuracy that will be employed under normal operating conditions as an acceptance criterion for a calibration procedure to flag to operators and to technicians that the channel requires adjustment to within the normal condition design accuracy.

RAI #11 b) Response:
Calibration of the level instrumentation will follow vendor recommendations. Calibration tolerances will be established for the radar system local indication in accordance with vendor specifications (i.e., ± 1 inch or as limited by the actual performance with the installed waveguide and potential uncertainties associated with the calibration method). Calibration tolerances for the loop to the remote indicator will be established using a SRSS (square root sum of the squares) methodology considering resolution of the analog indicator.

RAI #12 a)
Please provide the following:

A description of the capability and provisions the proposed level sensing equipment will have to enable periodic testing and calibration, including how this capability enables the equipment to be tested in-situ.

RAI #12 a) Response:
Based on the extensive operating experience of VEGAPULS sensors, the expected calibration drift is negligible. The functional check described in response #12 c) below is all that is required to verify that the system is functioning correctly. The functional check includes calibration testing of the analog indicators located in the main control rooms. Initial system calibration, and subsequent calibration (if required), will be performed per vendor recommendations which requires the calibration check to be performed using at least two distance measurements at least 2 inches apart. The preferred method is to lower SFP water level or place a metal target between the horn and water level in the measurement range to achieve a minimum level change of at least two inches. If neither one of the above approaches are practical, the radar horn can be rotated by slightly loosening the three bolts on the lap joint flange holding the horn antenna and waveguide elbow to the seismic mount. Calibration can then be performed using a test target placed perpendicularly to the radar beam path. Reference OM-201-3506 for additional details.

RAI #12 b)
Please provide the following:

A description of how such testing and calibration will enable the conduct of regular channel checks of each independent channel against the other, and against any other permanently-installed SFP level instrumentation.

RAI #12 b) Response:
Channel checks will be performed as specified in the Selected Licensee Commitment discussed in the RAI #15 response. Channel checks will compare the new wide range level indications to each other and to existing independent narrow range level indications available in the main control room.

RAI #12 c)
Please provide the following:

A description of how functional checks will be performed, and the frequency at which they will be conducted. Describe how calibration tests will be performed, and the frequency at which they will be conducted. Provide a discussion as to how these surveillances will be incorporated into the plant surveillance program.

RAI #12 c) Response:
Functional checks will be performed per vendor recommendations as outlined below.

- Verify that the indication is within the expected calibration tolerance for the loop, including the readout device, as compared to actual level.
- Verify the measurement reliability of the target echo is acceptable.
- Place a target at a different distance than the water level and verify the indication changes in the correct direction.
- Verify proper operation of the battery backup capability.

The functional check will be performed within 60 days prior to each planned refueling outage (approximately 24 months). The surveillance interval will be controlled by the Selected Licensee Commitment discussed in the RAI #15 response. Calibration will be performed as described in response #12 a) if required. A calibration procedure will be completed to provide instructions for the required functional and calibration methods. Model work orders will be created to ensure performance of the functional check on the required frequency.

RAI #12 d)
Please provide the following:

A description of what preventive maintenance tasks are required to be performed during normal operation, and the planned maximum surveillance interval that is necessary to ensure that the channels are fully conditioned to accurately and reliably perform their functions when needed.

RAI #12 d) Response:
Functional checks will be performed as described in response #12 c). Based on vendor recommendations, the lithium batteries will be replaced during each functional surveillance. During this surveillance the capability to swap from 120 VAC normal power to DC power from the batteries will be tested prior to and after the battery replacement.

RAI #13 a)
Please provide the following:
The specific location for the primary and backup instrument channel display.

RAI #13 a) Response:
The primary and backup channel displays for the Unit 1&2 SFPL channels will be located on Auxiliary Bench Board 2AB3 in the Unit 2 Main Control Room. The primary and backup channel displays for the Unit 3 SFPL channels will be located on Auxiliary Bench Board 3AB3A in the Unit 3 Main Control Room.

RAI #13 b)
For the SFP level instrumentation backup display located outside the MCR, please describe the evaluation used to validate that the display location can be accessed without unreasonable delay following a BOB event. Include the time available for personnel to access the display as credited in the evaluation, as well as the actual time (e.g., based on walk-throughs) that it will take for personnel to access the display. Additionally, please include a description of the radiological and environmental conditions on the paths personnel might take. Describe whether the display location remains habitable for radiological, heat and humidity, and other environmental conditions following a BOB event. Describe whether personnel are continuously stationed at the display or monitor the display periodically.

RAI #13 b) Response:
Part b) of this RAI does not apply to Oconee.

RAI #14
Please provide a list of the procedures addressing operation (both normal and abnormal response), calibration, test, maintenance, and inspection procedures that will be developed for use of the spent SFP instrumentation. The licensee is requested to include a brief description of the specific technical objectives to be achieved within each procedure.

RAI #14 Response:
Procedures applicable to the SFPL primary and back-up channels include the following:

- EP/1,2,3/A/1800/001B: Loss of All AC Power (Station Blackout)
- EP/1,2,3/A/1800/001N: Enclosure 5.44, Parallel Actions for SBO
- AP/1-2,3/A/1700/035: Loss of SFP Cooling and/or Level
- FG/1-2,3/A/1900/011: Alternative SFP Cooling
- FG/0/A/1900/005: Initial Assessment and FLEX Equipment Staging
- PT/1,2,3/A/0600/001: Periodic Instrument Surveillance Procedure
- IP/1-2/B/0220/001G3: Unit 1&2 Wide Range SFP Level Instrument Calibration Procedure
- IP/3/B/0220/001G3: Unit 3 Wide Range SFP Level Instrument Calibration Procedure

Existing steps within the Emergency and Abnormal Procedures identified above will be modified as needed to allow monitoring of SFP level via the primary and/or backup SFP level channels.

The Operations Periodic Instrument Surveillance Procedure will be modified to require the performance of channel checks on the new wide range SFP level primary and backup channels. The surveillance interval will be controlled by the Selected Licensee Commitment discussed in the RAI #15 response.

A Maintenance Calibration Procedure will be created to perform periodic functional checks and calibration (if required) of the primary and back-up SFP level instrumentation including a functional check of the battery backup capability for each channel. The procedure will verify proper operation of the level

instrumentation and provide instruction for equipment calibration adjustment within design accuracy requirements. The surveillance interval will be controlled by the Selected Licensee Commitment discussed in the RAI #15 response.

RAI #15 a)
Please provide the following:
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.

RAI #15 a) Response:
Programmatic controls will be established to ensure the performance of periodic channel checks, functional tests, calibration, and maintenance for the instrument channels. The programmatic controls will be established, in part, by a new Selected Licensee Commitment (SLC). The new SLC will be established for the primary and backup SFP level channels. The new SLC will specify the required frequency of performance for periodic channel checks and functional tests, as appropriate. The SLC will outline allowed out of service time frames consistent with NEI 12-02 requirements. The SLC will specify required remedial actions, in the event one or more channels cannot be restored within the allowed out of service time-frame. The remedial actions will be consistent with NEI 12-02 requirements.

The SLC will further require the functional testing be performed to verify proper channel operation within 60 days of a planned refueling outage, as required by NEI 12-02. The scope of the functional test is described in the response to RIA #12 c). The channel out of service durations required remedial actions and required action timeframes will be formally controlled similar to that for Technical Specifications. The calibration frequency will be controlled by the plant preventive maintenance program and will be based on manufacturer recommendations and/or operating experience.

RAI #15 b)
Please provide the following:
Information describing compensatory actions when both channels are out-of-order, and the implementation procedures.

RAI #15 b) Response:
Compensatory actions for a single primary or back-up level channel out of service beyond 90 days could include one or more of the following:

- Increased surveillance (channel check) to verify functionality of the remaining level channel
- Implementation of equipment protection measures
- Increased operator visual surveillance of the SFP level and area
- Maintain elevated SFP level
- Reduce SFP temperature
- Supplemental operations staffing

Compensatory actions for both the primary and back-up level channels out of service could include one or more of the following:

- Increased operator visual surveillance of the SFP level and area
- Maintain elevated SFP level
- Reduce SFP temperature

- Supplemental operations staffing
- Pre-stage FLEX support equipment (nozzles, hoses, etc.) which are relied upon for SFP make-up. Pre-staged equipment would be located within Seismic Category I structures.

The listed compensatory actions are intended as examples of potential actions which could be considered (one or more), and are not intended to be a comprehensive listing.

RAI #15 c)
Please provide the following:
Additional information describing expedited and compensatory actions in the maintenance procedure to address when one of the instrument channels cannot be restored to functional status within 90 days.

RAI #15 c) Response:
The Maintenance procedures will not explicitly address any expedited or compensatory actions for a channel that is not restored to functional status within 90 days. As required by NEI 12-02, compensatory actions must be implemented if one channel is not expected to be restored to functional within 90 days. The corrective action program will evaluate and establish appropriate compensatory actions for a channel that cannot be restored to functional within 90 days.

Audit Report Open Items

The open item below has been addressed and found to be satisfactory by the NRC Audit Team.

Item	Description	Summary Response
SFPI RAI-8-D	Please provide the results for the selected methods, tests and analyses used to demonstrate the qualification and reliability of the installed equipment in accordance with the order requirements.	The SAT report was uploaded to the e-portal on 10/1/15 and the NRC has reviewed the report and found it satisfactory and closed item SRAI-8-D. See copy of email below. Sent: Tue 10/13/2015 11:40 AM From: Boska, John <John.Boska@nrc.gov> To: Jones, Dana Chandler; Haile, David Guill, Paul F Dana, We have reviewed the SFPI SAT report. We found it satisfactory and closed item SRAI-8-D in the SE Tracker file. John Boska Mitigation Strategies & SFP Instrumentation Project Manager, NRR/JLD/JOMB U.S. Nuclear Regulatory Commission

ENCLOSURE 3

Bridging Document Between Vendor Technical Information and ONS Specific Considerations For Spent Fuel Pool Instrumentation

#	Topic	Parameter Summary	Vendor Design Reference Document #	Additional Comments	Test or Analysis Results	Licensee Evaluation
1	Design Specification	Customer technical requirements specification for SFPLI	Duke Technical Requirements Document DPR-1336.04-00-0001 Rev. 02 , Duke PO 171968 Rev. 003	EA-12-051, NEI 12-02	N/A	The vendor instrumentation design was reviewed and determined to adequately meet the specification requirements.
2	Test Strategy	Qualification is based on a combination of tests and analyses or similarity as described below. Qualification tests and analyses are summarized in qualification analyses report 51-9202556-005.	Qualification analyses Doc. 51-9202556-005	EA-12-051, 1.4 NEI 12-02, 3.4	Test and analyses results meet requirements of EA 12-051, JLD-ISG-2012-03, and NEI 12-02 Rev. 1	The vendor qualification documentation was reviewed and concluded to adequately demonstrate the instrumentation could reliably function in its installed environment(s) during a postulated Beyond Design Bases External Event (BDBEE).
3	Environmental qualification for electronics enclosure with display	Temperature and humidity	Qualification Analyses Doc. 51-9202556-005, Section 2.3	NEI 12-02, 3.4	Temperature rating of Power Control Panel -13 to149°F allowing for 9°F rise above ambient. NEMA 4X enclosure prevents moisture intrusion. Radiation withstand analyzed to 1 x10^3 Rads	The instrumentation electronics are located outside the SFP area. The vendor instrumentation design temperature, humidity, and dose limits bound the expected environmental conditions during a postulated BDBEE. Refer to RAIs #7 and #8 responses in Enclosure 2.

ENCLOSURE 3

Bridging Document Between Vendor Technical Information and ONS Specific Considerations For Spent Fuel Pool Instrumentation

#	Topic	Parameter Summary	Vendor Design Reference Document #	Additional Comments	Test or Analysis Results	Licensee Evaluation
4	Environmental testing for level sensor *components* in SFP area – Saturated steam & Radiation	Measurement capability through saturated steam and smoke. Testing performed to demonstrate the radar horn cover was effective at preventing moisture intrusion within the horn and wave guide pipe. Radar horn cover (fused silica glass), metal waveguide pipe and horn are not susceptible to radiation degradation. Manufacturer test data supports acceptable radiation degradation resistance for the radar horn cover adhesive.	Qualification Analyses Doc. 51-9202556-005, Section 2.3, 2.4, 2.5, 2.7, Appendix B and supporting references 66-9200846-002 51-9220845-001 51-9221032-000 66-9225632-000	EA-12-051, 1.4 NEI 12-02, 3.4	Initial testing (without horn cover) demonstrated successful measurement capability through steam and smoke. Subsequent testing of the radar horn and cover demonstrated adequate operation during sustained simulated SFP boiling conditions, and that the horn cover was effective in preventing moisture intrusion within the horn and wave guide pipe. The horn cover adhesive is a silicone elastomer manufactured by Down Corning (Sylgard 170). The adhesive manufacturer radiation test data adequately demonstrates the adhesive would not experience unacceptable degradation for exposures up to 1.64 x10^8 Rads.	The radar horn cover qualification testing adequately demonstrated acceptable operation during exposure to simulated SFP boiling conditions. The horn cover adhesive manufacturer radiation test data adequately demonstrated the adhesive would not experience unacceptable degradation for radiation exposure in excess of that expected for the postulated beyond design bases event over the required mission time. Refer to RAIs #7 and #8 responses in Enclosure 2.

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5	Environmental testing for level sensor electronics housing – outside SFP	Temperature and humidity testing and analysis of sensor and indication	Qualification Analyses Doc. 51-9202556-005, Sections 2.3, 2.5, Appendix A and supporting references IEC 60068-2-30, 38-9218218-000, EN 60529:2000, 38-9218214-000, USNRC Bulletin 79-01B Table C-1, NUREG-1793, Vol.1, Section 3.11.3.2.1, Reg. Guide 1.209	NEI 12-02, 3.4	Sensor and indication are demonstrated to withstand the manufacturer ratings 80°C (sensor) and 70°C (indication), 100% RH. Radiation withstand analyzed to 1 x10^3 Rads.	The channel instrumentation electronics are located outside the SFP area. The vendor instrumentation design temperature, humidity, and dose limits bound the expected environmental conditions during a postulated BDBEE. Refer to RAIs #7 and #8 responses in Enclosure 2.
6	Thermal & Radiation Aging – organic components in SFP area	Radar horn cover (fused silica glass), metal waveguide pipe and horn are not susceptible to radiation degradation. Horn cover adhesive manufacturer radiation test data and temperature withstand specifications.	Qualification analyses Doc. 51-9202556-005, Section 2.5 51-9221032-000 66-9225632-000	EA-12-051, 1.4 NEI 12-02, 3.4	Thermal and radiation aging not applicable to metal waveguide in SFP area. The horn cover adhesive is a silicone elastomer manufactured by Down Corning (Sylgard 170). The adhesive manufacturer radiation test data adequately demonstrates the adhesive would not experience unacceptable degradation for exposures up to 1.64 x10^8 Rads. The silicone adhesive is rated to withstand temperatures extremes of -45 to 200°C, which adequately bound the postulated temperatures for sustained SFP boiling conditions.	The glass and metallic instrumentation components located within the SFP area are not susceptible to aging due to thermal and/or radiation effects. The horn cover adhesive manufacturer radiation test data adequately demonstrated the adhesive would not experience unacceptable degradation for radiation exposure in excess of that expected for the postulated beyond design bases event over the required mission time. The horn cover adhesive temperature ratings are acceptable and readily bound the expected conditions for the postulated beyond design bases event.

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7	Basis for Dose Requirement	SFPLI remote transmitter and power control panel qualified to $1x10^3$ Rads based on industry operating experience. Based on engineering judgment, the expected total integrated dose for the radar horn cover adhesive would not exceed $1 x10^8$ over the required mission time for the instrumentation.	AREVA Document No. 51-9202556-005, Qualification Analysis of VEGAPULS 62 ER Through Air Radar 51-9221032-000 66-9225632-000	NEI 12-02, 3.4	Analyses based on operating experience concludes the electronics are not susceptible to degraded performance up to this dose threshold. The adhesive manufacturer radiation test data adequately demonstrates the adhesive would not experience unacceptable degradation for exposures up to $1.64 x10^8$ Rads.	A location specific dose calculation was performed for the remote electronics, which demonstrated the sensor total integrated dose (TID) over its required mission time is enveloped by the vendor instrumentation design limit of $1x10^3$ Rads. The horn cover adhesive manufacturer radiation test data adequately demonstrated the adhesive would not experience unacceptable degradation for radiation exposure in excess of that expected for the postulated beyond design bases event over the required mission time. Refer to RAIs #7 and #8 responses in Enclosure 2.
8	Seismic Qualification	Seismic withstand capability of VEGAPULS 62 ER sensor , indicators, power control panel, mounting brackets, waveguide pipe	Qualification analyses Doc. 51-9202556-005, Section 2.1, Appendix D and supporting references 11-9203036-002, IEEE STD 344-2004, EPRI TR-107330, 174-9213558-006	NEI 12-02, 3.4	VEGAPULS 62 ER sensor , indicators, power control panel, mounting brackets, waveguide pipe are seismically qualified to RRS levels from EPRI TR-107330	The vendor instrumentation seismic testing adequately demonstrates the equipment is capable of reliably operating during a seismic event. Refer to RAIs #5, #7 an #8 responses in Enclosure 2.
9	Sloshing	NRC RAIs indicated a SFP seismic induced sloshing analyses is required. If wave impact is predicted, then the hydrodynamic forces should be included in the mounting design loading combinations.	Sloshing analyses was performed by an alternate vendor than the vendor of the radar level instrumentation (Reference Oconee calculation OSC-11320).	N/A	Seismic induced sloshing analyses concluded that the available SFP free-board readily enveloped the maximum predicted wave height. The analyses determined wave impact on the radar horn would not occur.	Sloshing analyses determined seismic induced wave would not impact radar horn.

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10	Spent Fuel Pool instrumentation system functionality test procedure	Functionality testing was performed during the factory acceptance test. Factory acceptance testing was performed on the Power Control Panel and the complete integrated level system. See #16	VEGA Test Procedures AREVA Doc. 63-9224206-000 (Power Control Panel) and 63-9223821-000 (System), Factory Acceptance Test Reports AREVA Doc. 66-9227346-001 (Power Control Panel) and 66-9231244-000 (System)	N/A	Testing demonstrated that the SFPLI met the specification functional requirements.	The vendor factory acceptance test demonstrated reliable operation of the SFP level instrumentation under normal conditions and under various simulated test conditions (e.g., steam exposure). The testing demonstrated the instrumentation met design accuracy and repeatability specifications.
11	Boron Build-Up	N/A	Sloshing analyses was performed by an alternate vendor than the vendor of the radar level instrumentation (Reference Oconee calculation OSC-11320).	N/A	Waveguide radar horn is not immersed in SFP water and therefore not susceptible to boron accumulation. During postulated SFP boiling, boron is not transported by rising steam/vapor. Seismic induced sloshing analyses concluded that the available SFP free-board readily enveloped the maximum predicted wave height. The analyses determined that a seismic induced wave would not impact the radar horn.	Licensee concurs that the wave guided radar instrumentation located in the SFP area is not susceptible to degradation due to postulated boron build-up. The wave guided radar horn is elevated above the SFP process and would not be susceptible to boron build-up on the horn during postulated SFP boiling conditions, nor is it credible that boron crystal accumulation on the perimeter of the SFP walls would impede the radar signal strength.

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12	Pool-side Bracket Seismic Analysis	Test and analyses were performed for the horn cover and adhesive to demonstrate adequate seismic withstand capability. Perform seismic induced sloshing analyses to assess hydrodynamic wave force on the radar horn.	Qualification analyses Doc. 51-9202556-005 and supporting reference 174-9213558-006, Calculations and Qualification Analyses 32-9221238-000, 32-9221237-002 51-9221032-000 66-9225632-000 66-9225469-000 Sloshing analyses was performed by an alternate vendor than the vendor of the radar level instrumentation (Reference Oconee calculation OSC-11320).	NEI 12-02, 3.4	Sensor brackets and electronic enclosure mounting are seismically qualified to EPRI TR-107330 or site-specific RRS. Testing and analyses horn cover and adhesive support the components can tolerate horizontal and vertical accelerations up to 100g and SFP sloshing loads up to 3.37 psi. Seismic induced sloshing analyses concluded that the available SFP free-board readily enveloped the maximum predicted wave height. The analyses determined wave impact on the radar horn would not occur.	The test and analyses of the horn cover and adhesive demonstrate adequate seismic withstand capability. The stress analyses does not need to consider hydrodynamic sloshing forces in the design of the mounting brackets. The sloshing analyses determined seismic induced wave impact on the radar horn would not occur. Refer to RAIs #4, #5, #6, #7 and #8 responses in Enclosure 2.
13	Additional Brackets (Sensor Electronics and Electronic Enclosure)	Seismic withstanding of sensor brackets and electronic enclosure mounting	Qualification analyses Doc. 51-9202556-005, Section 2.1, Appendix D and supporting references 11-9203036-002, EPRI TR-107330, 174-9213558-006, Calculations 32-9221238-000, 32-9221237-002	NEI 12-02, 3.4	Sensor brackets and electronic enclosure mounting are seismically qualified to EPRI TR-107330 or site-specific RRS.	Refer to RAIs #4, #5, #6, #7 and #8 responses in Enclosure 2.

#	Topic	Parameter Summary	Vendor Design Reference Document #	Additional Comments	Test or Analysis Results	Licensee Evaluation
14	Shock & Vibration	Shock and vibration withstand testing and analyses for sensor, displays, power control panel Test and analyses were performed for the horn cover and adhesive to demonstrate adequate shock withstand. Additional testing was performed for the power control panel assembly.	Qualification Analysis Doc. 51-9202556-005, Sections 2.2 and supporting references MIL-S-901D, MIL-STD-167-1 38-9193058-000, EN 60068-2-27, 38-9218022-000, EN 60068-2-6, 38-9218023-000, MIL-STD-202 51-9221032-000 66-9225632-000 32-9221237-002 32-9221238-000 66-9225469-000 38-9228047-000	NEI 12-02, 3.4	Sensor, displays, and power control panel have been tested and/or analyzed for shock and vibration. The test parameter values provided in IEC Standards, IEC 60068-2-6 (vibration) and IEC 60068-2-27 (shock), tables are recommendations and not mandatory testing levels. The test parameter values were selected to be consistent with previous shock and vibration testing performed on the VEGA supplied equipment. The test parameter values specified envelope the expected levels for the equipment installed location, due to the fact that the equipment is mounted to seismic structures within the plant. This approach is consistent with similar technology used in the same application at other installations. The vibration testing deviated from the IEC 60068-2-6 recommended frequency range and displacement magnitude for large power plant equipment (TABLE C.2). In lieu of the 10-55 Hz and minimum displacement of 0.15 mm recommended in TABLE C.2, the power and control panel vibration testing utilized a narrower frequency band (5-25 Hz) and a more limiting displacement magnitude (1.6 mm). These values were deemed to be acceptable and enveloping for equipment rigidly mounted to a Seismic Category I structure, based on engineering judgment. The shock testing deviated from the IEC 60068-2-27 recommended peak acceleration and duration for land-based permanently installed equipment. In lieu of the 15 g's peak acceleration and duration of 11 m-sec recommended in TABLE A.1, the power and control panel vibration testing utilized and acceleration of 10g with a 6 m-sec duration. These values were deemed to be acceptable and enveloping for equipment rigidly mounted to a seismic Category I structure, based on engineering judgment. Testing and analyses of the horn cover and adhesive support the components can tolerate horizontal and vertical accelerations up to 100g and SFP sloshing loads up to 3.37 psi.	The shock and vibration testing performed for the SFP level instrumentation adequately demonstrates the sensor and power control panel will be reliable in the installed design location. The instrumentation is rigidly mounted to the Seismic Category I Auxiliary Building wall and would not be subjected to any significant shock or vibration during a postulated beyond design bases event, or during normal operation. The instrumentation is located within the Seismic Category I Auxiliary Building and is protected from external wind borne missile threats. The instrumentation installed design location is not susceptible to vibration from surrounding rotating equipment. The radar sensor and power control panel design location provides spatial separation from surrounding SSCs, such that potential seismic interaction with surrounding SSCs is also not a concern. The post modification testing will demonstrate reliable operation of the instrumentation, which confirms no damage occurred during shipping, handling and installation. Similarly, the performance of monthly channel functional comparisons will serve to confirm proper operation of the instrumentation, or provide a means of early detection of potential instrument degradation. The test and analyses of the horn cover and adhesive demonstrate adequate shock withstand capability. Refer to RAIs #7, #8 and #12 responses in Enclosure 2.

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15	Requirements Traceability	Not required by order	N/A	N/A	N/A	N/A
16	Factory Acceptance Test	Inspection of waveguide, test of functionality of power transfer to battery, sensor measurement accuracy and effects of steam and water in waveguide	VEGA Test Procedures AREVA Doc. 63-9224206-000 (Power Control Panel) and 63-9223821-000 (System) Factory Acceptance Test Reports AREVA Doc. 66-9227346-001 (Power Control Panel) and 66-9231244-000 (System)	N/A	Test demonstrates that specification requirements were met.	The vendor factory acceptance tests demonstrated reliable operation of the SFP level instrumentation under normal conditions and under various simulated test conditions (e.g., steam exposure). The testing demonstrated the instrumentation met design accuracy and repeatability specifications.
17	Channel Accuracy	Normal and accident conditions SFP level measurement accuracy	AREVA Instruction manual Doc. 01-9222210-001, Section 12.6	EA-12-051, 1.7 NEI 12-02, 3.7	Normal conditions accuracy ±1 inch, error due to all effects including 212°F saturated steam ±3 inches. Accuracy verified during factory acceptance testing.	The vendor factory acceptance test demonstrated reliable operation of the SFP level instrumentation under normal conditions and under various simulated test conditions (e.g., steam exposure). The testing demonstrated the instrumentation met design accuracy and repeatability specifications. Refer to RAI #11 response in Enclosure 2.
18	Power Consumption	Lifetime of battery backup at full load	Qualification Analysis Doc. 51-9202556-005, Section 2.9, Instruction Manual 01-9222210-001, Section 12.7	EA-12-051, 1.6, NEI 12-02, 3.6	Battery capacity at full load is expected to readily exceed 7 days.	Based on vendor analyses the battery capacity is deemed sufficient to support reliable instrument channel operation until off-site resources can be deployed by the mitigating strategies in response to Order EA-12-049. Refer to RAI #10 response in Enclosure 2.
19	Technical Manual	Application-specific information on the installation, operation, and maintenance of the SFPLI	AREVA Doc. 01-9222210-001	N/A	N/A	The vendor technical manual has been reviewed, accepted and incorporated in the engineering change package.

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20	Calibration	Periodic indication checks, calibration checks, calibration	EA-12-051, 1.8 AREVA Doc. 01-9222210-001, Sections 7.0 and 9.1	EA-12-051, 1.8 NEI 12-02, 3.8 Based on negligible drift rate of VEGA electronics experienced over large user base, periodic calibration is not needed. Functional verification can be achieved using cross channel checks and functional checks per vendor manual.	N/A	Calibration and functional checks will be performed per vendor recommendations. Calibration checks will be performed using at least two distance measurements at least 2 inches apart as specified in the vendor manual. Refer to RAIs #11, #12, #14, and #15 responses in Enclosure 2.
21	Failure Modes and Effects Analysis (FMEA)	N/A	N/A	N/A	N/A	The instrumentation is required to function to provide SFP level indication for a beyond design bases event. Performance of a FMEA is not warranted for this type of an application. Reasonable assurance that both channels are not susceptible to a common mode failure is provided by satisfying the NEI 12-02 guidance.

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22	EMI Testing	Emissions and susceptibility testing for VEGAPULS 62 ER	Qualification Analysis Doc. 51-9202556-005, Section 2.6 and supporting references EN-61000-4 MIL-STD-461E, 58-9214362-000, 38-9218962-000, 38-9218963-000, 38-9218964-000, 38-9218965-000, 38-9218966-000, 38-9218967-000, 38-9218968-000, 38-9218969-000, 38-9218970-000	N/A	VEGAPULS 62 ER has been tested for emissions to both MIL and IEC standards and for susceptibility to IEC standards	The EMI/RFI susceptibility and emissions testing performed for the waveguide radar transmitter provides adequate assurance the instrumentation will be compatible in the design location. The testing was conservatively performed with unshielded interconnecting wiring. The design of the Oconee level channels includes shielded signal cabling, and grounding of the power control panel. Post-modification testing further demonstrates acceptable operation in the installed location.. During a postulated BDBEE, it is possible that intermittent UHF radio operation could occur in the vicinity of the radar transmitter. Successful long term SFP monitoring capability during a postulated BDBEE would not be inhibited by potential intermittent radio transmission interference.