July 16, 2013

MEMORANDUM TO: Veronica M. Rodriguez, Acting Branch Chief
Plant Licensing Branch I - 2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

FROM: Greg A. Casto, Branch Chief ***/RA/***
Balance of Plant Branch
Division of Safety Systems
Office of Nuclear Reactor Regulation

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION-SEABROOK STATION REGARDING OVERALL INTEGRATED PLAN FOR RELIABLE SPENT FUEL POOL INSTRUMENTATION (ORDER NUMBER EA-12-051) (TAC NO. MF0837)

By letter dated February 26, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13063A439), NextEra Energy Seabrook, LLC submitted an Overall Integrated Plan (OIP) in response to the March 12, 2012, Commission Order to modify licenses with regard to requirements for Reliable Spent Fuel Pool (SFP) Instrumentation (Order EA-12-051) for Seabrook Station. The Balance of Plant Branch (SBPB) and the Instrumentation and Controls Branch (EICB) staff have identified areas in which additional information is needed to complete the Technical Review. The staff's Request for Additional Information (RAI) is enclosed.

Docket No.: 50-443

Enclosure:
Request for Additional Information

CONTACT: Carla P. Roque-Cruz, NRR/DSS/SBPB
301-415-1455

Subinoy Mazumdar, NRR/DE/EICB
301-415-2904

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DISTRIBUTION: JLamb DRahn BPurnell JEvans MMitchell
SBPB/RF RidsNrrPMSeabrook CRoque-Cruz

Accession: ML13193A074 NRR-106

OFFICE	NRR/DE/EICB	NRR/DDSS/SBPB	NRR/DE/EICB:BC	NRR/DSS/SBPB:BC
NAME	SMazumdar	CRoque-Cruz	JThorp	GCasto
DATE	07/ 15 /2013	07/ 12/2013	07/15/2013	07/16 /2013

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REQUEST FOR ADDITIONAL INFORMATION

OVERALL INTEGRATED PLAN IN RESPONSE TO

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

NEXTERA ENERGY SEABROOK, LLC

SEABROOK STATION

DOCKET NO. 50-443

1.0 INTRODUCTION

By letter dated February 26, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13063A439), NextEra Energy Seabrook, LLC submitted an Overall Integrated Plan (OIP) in response to the March 12, 2012, Commission Order modifying licenses with regard to requirements for Reliable Spent Fuel Pool (SFP) Instrumentation (Order Number EA-12-051; ADAMS Accession No. ML12054A679) for Seabrook Station. The U.S. Nuclear Regulatory Commission (NRC) staff endorsed Nuclear Energy Institute (NEI) 12-02 "Industry Guidance for Compliance with NRC Order EA-12-051, to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," Revision 1, dated August 2012 (ADAMS Accession No. ML12240A307), with exceptions, as documented in Interim Staff Guidance (ISG) 2012-03 "Compliance with Order EA-12-051, Reliable Spent Fuel Pool Instrumentation," Revision 0, dated August 29, 2012 (ADAMS Accession No. ML12221A339).

The NRC staff has reviewed the February 26, 2013, response by the licensee and determined that the following Request for Additional Information (RAI) is needed to complete its Technical Review. If any part of this information is not available within the 30-day response date for this RAI, please provide the date this information will be submitted.

2.0 LEVELS OF REQUIRED MONITORING

The OIP states, in part, that

> Level 1is the level adequate to support operation of the normal fuel pool cooling system - Based on preliminary calculation, the low level limit for reliable SFP cooling system operation corresponds to an elevation of approximately 22 ft., 6 in. This level is based on a preliminary calculation that assumes mitigating effects by the installed suction strainer on vortexing. The actual effect of the strainer on this level will be determined during the engineering and design phase of the project. For the purposes of this submittal the minimum level that will be adequate to support normal fuel pool cooling system operation, as indicated on either the primary or backup instrument channel, is assumed to correspond to a plant elevation of 22 ft., 6 in.
>
> Level 2 is adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck - Indicated level on either the primary or backup instrument channel of greater than an elevation of 10 ft., 9.5 in

will provide substantial radiation shielding for a person standing on the SFP operating deck. This elevation is approximately 13 feet above the top of the spent fuel positioned in the pool (Nominal Elev. (-) 1 ft., 5-3/4 in.). With 13 feet of water above the highest fuel element position, the calculated dose rate at the surface of the SFP is less than 2.5 mrem/hr (Reference 10, Section 12.3.2.1.c). This monitoring level ensures there is adequate water level to provide substantial radiation shielding for personnel to respond to Beyond-Design-Basis External Events including the initiation of SFP makeup strategies that would require access to the Fuel Storage Building (FSB).

Level 3 is where fuel remains covered - Indicated level on either the primary or backup instrument channel of greater than Elevation (-)1 foot. This is the nominal water level approximately 6 in. above the top of the fuel racks. This monitoring level will assure the maximum range of level information is available to the plant Operators and emergency response personnel. This level is also assumed to be the minimum level that assures that adequate water level remains above the top of the stored fuel seated in the SFP (nominal elevation of (-)2 ft., 2.5 in.).

RAI-1

Please provide the following:

a) For level 1, specify how the identified elevation represents the HIGHER of the two points described in the NEI 12-02 guidance for this level.

b) A clearly labeled sketch depicting the elevation view of the proposed typical mounting arrangement for the portions of instrument channel consisting of permanent measurement channel equipment (e.g., fixed level sensors and/or stilling wells, and mounting brackets). Indicate on this sketch the datum values representing Level 1, Level 2, and Level 3 as well as the top of the fuel racks. Indicate on this sketch the portion of the level sensor measurement range that is sensitive to measurement of the fuel pool level, with respect to the Level 1, Level 2, and Level 3 datum points.

3.0 INSTRUMENTATION DESIGN FEATURES

3.2 Arrangement

The OIP states, in part, that

The Spent Fuel Pool Level (SFP) Instrumentation for each channel will consist of a level sensing probe suspended in the SFP, a signal conditioning processor module, level indicator and a backup battery system. Redundant Train A and Train B cables will be routed from the Fuel Storage Building (FSB) through the Containment Enclosure Building (CEB) and into the Primary Auxiliary Building (PAB) to connect each probe to a signal conditioning processor module. The signal processor module is a panel-mounted instrument that has a display screen showing a numerical read out of SFP level as a continuous indication (i.e.,

> remote Indication). The signal conditioning processor module for each channel will be mounted in a separate stainless steel enclosure located in the PAB so that the instruments will not be subject to the radiation, high temperature and high humidity conditions that could result from postulated loss of water inventory in the SFP. The primary operator indication and backup battery systems will be provided in the Train A and Train B Essential Switchgear Rooms (Elev. 21 ft., 6 in.) located in the Control Building.

RAI-2

Please modify the sketch in Figure 1 or provide a 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 sensors, and the proposed routing of the cables that will extend from the sensors toward the location of the local electronics cabinets and read-out/display devices in the main control room or alternate accessible location.

3.3 Mounting

The OIP states, in part, that

> Equipment mounting will be Seismic Category I in accordance with guidelines of Regulatory Guide 1.29. Installed equipment will be seismically qualified to withstand the maximum seismic ground motion considered in the design of the plant area in which it will be installed.
>
> Where the collapse of components would adversely affect the performance of the SFP level instrumentation, the components will be supported to withstand seismic loading or isolated from the systems or components by Seismic Category I boundary restraints.

RAI-3

Please provide the following:

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

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

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

3.4 Qualification

The OIP states, in part, that

> Components of the instrument channels will be qualified for shock and vibration using one or more of the following methods…
>
> The effects of postulated seismic events on installed instrument channel components (with the exception of battery chargers and replaceable batteries), will be verified to ensure that the equipment design and installation is robust. Applicable components of the instrument channels will be qualified by the manufacturer (or otherwise tested) for seismic effects at response levels commensurate with the equipment mounting location. Instrument channel qualification will be based on the guidance provided in Sections 7, 8, 9, and 10 of IEEE Standard 344-2004, *IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations,* or a substantially similar industrial standard.
>
> In addition, any of the below may also be used to provide additional assurance that the equipment will perform as designed during and following a seismic event:
>
> - Review of operating history for component used in environments with significant vibration, such as for portable hand-held devices or devices used in transportation applications. The effects of low frequency, high acceleration will be included in the qualification as discussed above. Vibration qualification will be inclusive of methods that demonstrate the effects of seismic motion imparted to the components at the location of installation;
> - Demonstration that devices are substantially similar in design to equipment that has been previously tested for seismic effects in accordance with the plant design basis at the location where the instrument is to be installed (g-levels and frequency ranges).
>
> In addition, pool mounted equipment will be qualified for submergence, providing protection from wave and seismic related disturbances during and after a seismic event.

RAI-4

Please provide the following:

a) A description of the specific method or combination of methods you intend to apply to demonstrate the reliability of the permanently installed equipment under Beyond-Design-Basis (BDB) ambient temperature, humidity, shock, vibration, and radiation conditions.

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

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

3.5 Independence

The OIP states, in part, that

> The backup instrument channel will be redundant to, and independent of, the primary instrument channel. Independence will be obtained through separation of the sensors, indication, backup battery power supplies, associated cabling and channel power feeds. Power sources to each channel will be from a different Class 1E plant bus (Train A and Train B).

RAI-5

Please provide the following:

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

b) Further information describing the design and installation of each level measurement system, consisting of level sensor electronics, cabling, and readout devices. Please address how independence of these components of the primary and back-up channels is achieved through the application of independent power sources, physical and spatial separation, independence of signals sent to the location(s) of the readout devices, and the independence of the displays.

3.6 Power Supplies

The OIP states, in part, that

> The primary and backup instrument channels will be powered from redundant dedicated batteries and local battery chargers. The battery chargers will normally be supplied 120 V AC power from redundant Class 1E distribution panels (Train A and Train B) that are sequenced and powered by the Emergency Diesel Generators or the Supplemental Emergency Power System (SEPS) on loss of off-site power (LOOP) events. If the normal Class 1E power supply to a channel is not available, the dedicated battery supply will automatically power the

instrument channel. A minimum battery life of 72 hours will be provided for each channel.

The design will include the capability to isolate the normal Class 1E power supply to each channel by opening the feeder breaker within the Class 1E distribution panel. The Class 1E distribution panels that will be used for this application are located in the Essential Train A and Train B Switchgear Rooms.

The minimum battery life of 72 hours will be sufficient to assure that the SFP level instrumentation will provide reliable level indication until off-site resources can be deployed by the mitigating strategies resulting from Order EA-12-049. As part of the mitigating strategies for Order EA-12-049 (Reference 2), it is assumed that one channel of the SFP level instrumentation will be repowered by the SEPS approximately 10 minutes into the event if the emergency diesel generators are not available. Off-site resources (personnel, equipment, etc.) will begin to arriving at the station approximately hour 6 into the event and full staffing is expected within 24 hours. Requested portable equipment that will be connected to repower the redundant vital plant bus, including the power feed to the redundant SFP level monitoring instrument channel, is assumed to arrive at the site from the Regional Response Center (RRC) approximately 24 hours into the event.

Long term coping strategies will include repowering of the redundant SFP level monitoring instrument channel and SFP cooling equipment approximately 36 hours into the event.

RAI-6

Please provide the following:

a) A description of the electrical AC power sources and capacities for the primary and backup channels.

b) If the level measurement channels are to be powered through a battery system (either directly or through an Uninterruptible Power Supply (UPS)), please provide the design criteria that will be applied to size the battery in a manner that ensures, with margin, that the channel will be available to run reliably and continuously following the onset of the BDB event for the minimum duration needed, consistent with the plant mitigation strategies for BDB external events (Order EA-12-049).

3.7 Accuracy

The OIP states, in part, that

> The instrument channels will be designed such that they will maintain their design accuracy following a power interruption or change in power source without recalibration. Channel accuracy will consider SFP conditions, e.g., saturated water, steam environment, or concentrated borated water.

> Additionally, instrument channel accuracy will be sufficient to allow trained personnel to determine when the actual level exceeds the key spent fuel pool water levels (Levels 1, 2 and 3) without conflicting or ambiguous indication. The accuracy will be within the resolution requirements of Figure 1 of NEI 12-02.

RAI-7

Please provide the following:

a) An estimate of the expected instrument channel accuracy performance (e.g., in % of span) under both a) normal SFP level conditions (approximately Level 1 or higher) and b) at the BDB 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.

b) 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.

3.8 Testing

The OIP states, in part, that

> Instrument channel design will provide for routine testing and calibration consistent with Order EA-12-051 and the guidance in NEI 12-02. Instrument channel testing and calibration will be performed using existing plant work control processes. Details for testing and calibration will be determined during the engineering and design phase of the project.

RAI- 8

Please provide the following:

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

b) A description of 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.

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

d) A description of what preventative 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.

3.9 Display

The OIP states, in part, that

> The location for primary and backup SFP level indication will be accessible during and following an event. The Operator indication (Primary and Backup indication) will be provided in the Train A and Train B Essential Switchgear Rooms (Elev. 21 ft., 6 in.) which are located in the Seismic Category I Control Building. The Train A and Train B Essential Switchgear Rooms are in close proximity to the main Control Room and Emergency Planning Technical Support Center located on elevation 75 ft of the Control Building. The location of the primary and backup indication is:
>
> - Promptly accessible to the appropriate plant staff giving appropriate consideration to various drain down scenarios,
> - Outside of the FSB, e.g., an appropriate distance from the radiological sources resulting from an event impacting the SFP,
> - Inside a seismic category I structure providing protection against adverse weather and
> - outside of any high radiation areas during normal operation.

RAI-9

Please provide the following:

a) Since the backup display location is not in the main control room, provide a description of the display location that addresses 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.

b) The reasons justifying why the locations selected will enable the information from these instruments to be considered “promptly accessible”. Include consideration of various drain-down scenarios.

4.0 PROGRAM FEATURES

4.2 Procedures

The OIP 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.
>
> Procedures will address a strategy to ensure SFP water level addition is initiated at an appropriate time consistent with implementation of NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide and EA-12-049, Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events.

RAI-10

Please provide the following:

a) A list of the operating (both normal and abnormal response) procedures, calibration/test procedures, maintenance procedures, and inspection procedures that will be developed for use of the SFP instrumentation in a manner that addresses the order requirements.

b) A brief description of the specific technical objectives to be achieved within each procedure. If your plan incorporates the use of portable spent fuel level monitoring components, please include a description of the objectives to be achieved with regard to the storage location and provisions for installation of the portable components when needed.

4.3 Testing and Calibration

The OIP sates, in part, that

> Processes will 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. Testing and calibration of the instrumentation will be consistent with vendor recommendations and any other documented basis. Calibration will be specific to the mounted instruments and indicators.

RAI-11

Please provide the following:

a) Further information describing the maintenance and testing program the licensee will establish and implement to ensure that regular testing and calibration is performed and verified by inspection and audit to demonstrate conformance with design and system readiness requirements. Include a description of your plans for ensuring that necessary channel checks, functional tests, periodic calibration, and maintenance will be conducted for the level measurement system and its supporting equipment.

b) A description of how the guidance in NEI 12-02 Section 4.3 regarding compensatory actions for one or both non-functioning channels will be addressed.

c) A description of the compensatory actions to be taken in the event that one of the instrument channels cannot be restored to functional status within 90 days.