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July 19, 2013

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U. S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

Duke Energy Carolinas, LLC (Duke Energy)

Oconee Nuclear Station, Units 1, 2, and 3  
Docket Numbers 50-269, 50-270, 50-287  
Renewed Operating Licenses DPR-38, DPR-47, and DPR-55

**Subject: Response to Requests for Additional Information Concerning Oconee Nuclear Station's Overall Integrated Plan With Regard To Requirements for Spent Fuel Pool Instrumentation**

References:

1. Duke Energy Letter to the NRC, dated February 28, 2013, 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) (ADAMS Accession No. ML12054A679)
2. NRC Letter to Duke Energy, dated June 21, 2013, Oconee Nuclear Station, Units 1, 2, and 3, Request For Additional Information Regarding Overall Integrated Plan For Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051) (TAC Nos. MF0785, MF0786, and MF0787) (ADAMS Accession No. ML13171A301)

In Reference 1, Duke Energy submitted an Overall Integrated Plan (OIP) to the U. S. Nuclear Regulatory Commission (NRC) in response to the NRC's March 12, 2012, Order modifying licenses with regard to requirements for Reliable Spent Fuel Pool (SFP) Instrumentation for Oconee Nuclear Station(ONS), Units 1, 2, and 3. During the NRC's review of the ONS OIP, the NRC determined a need for further information and provided Duke Energy with eleven (11) requests for additional information (RAIs) in Reference 2. The Enclosure to this letter provides Duke Energy's response to the subject RAI items for ONS. It should be noted that Duke Energy is unable to respond to RAI-2 through RAI-11 from Reference 2 at this time since the design work associated with SFP instrumentation at ONS is still in the early stages. However, Duke Energy anticipates submitting responses to RAI-2 through RAI-11 for ONS in the February 2014, Six-Month Status Report for the Implementation of Order EA-12-051.

There are no new regulatory commitments.

If you have any questions with regard to this letter, please contact Mr. David C. Haile from the ONS Regulatory Affairs Group at (864) 873-4742.

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U. S. Nuclear Regulatory Commission  
July 19, 2013  
Page 2

I declare under penalty of perjury that the foregoing is true and correct. Executed on  
July 19, 2013.

Sincerely,

 TP GILLESPIE FOR

Scott L. Batson  
Site Vice President  
Oconee Nuclear Station

Enclosure: Response to NRC RAIs Regarding the ONS Overall Integrated Plan for  
Reliable Spent Fuel Pool Instrumentation

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**Enclosure**

**Response to NRC RAIs Regarding the  
ONS Overall Integrated Plan for Reliable Spent Fuel Pool Instrumentation**

Duke Energy's response to the eleven (11) requests for additional information (RAIs) from NRC letter dated June 21, 2013, regarding the Oconee Nuclear Station's (ONS's) Overall Integrated Plan (OIP) for Reliable Spent Fuel Pool (SFP) Instrumentation, are as specified in this enclosure. Please note that information requested in NRC RAI-2 through RAI-11 is currently not available, and thus, a response cannot be submitted at this time. However, as provided for in the RAI letter, Duke Energy is providing the anticipated date for submitting those RAI responses.

#### Instrument Channel Preliminary Design Overview

The new Oconee Nuclear Station (ONS) Wide Range (WR) Spent Fuel Pool (SFP) Level instrumentation will consist of a "primary" channel and a "backup" channel for each SFP (i.e., Unit 1/2 SFP and Unit 3 SFP). Both the primary and backup channels will be permanently installed. Per NEI 12-02 guidance, neither of these channels requires access to the SFP area during a Beyond Design Bases (BDB) event.

The primary and backup channels will both utilize wave guided radar technology, which only requires a wave guided pipe and a receiving horn to be located in the SFP area. The wave guided pipe and receiving horn contain no organic materials and are not susceptible to degradation due to exposure to radiation, heat, or steam. The electronics associated with all channels will be remotely located from the SFP inside the Seismic Category 1 Auxiliary Building. The primary channels will provide remote indication of SFP level in the associated Main Control Room. The backup channels will provide SFP level in locations remote from the SFP and the Main Control Rooms, but promptly accessible in the plant, as described in NEI 12-02. Each channel will have independent battery back-up capability.

Below is the ONS response to RAI-1 and the anticipated date(s) for responses to RAI-2 through RAI- 11.

#### NRC RAI-1:

The OIP states, in part, that

Indication of SFP level will be provided from one foot above normal pool water level (El. 841'-0") down to approximately the top of the fuel storage racks (El. 816'-6" for Unit 1 & 2 and El. 816'-4" for Unit 3).

In accordance with the guidance in NEI 12-02, the system will be capable of monitoring SFP level at three distinct water levels:

- Level 1 - Level that is adequate to support operation of the normal fuel pool cooling system - indicated level greater than the point at which pump suction is presumed to be lost (El. 837'-6").
- Level 2 - Level adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck - indicated level greater than 10' above the highest point of any fuel storage racks (approximately El. 826'-6" for Units 1 & 2 and El. 826'-4" for Unit 3).
- Level 3 - Level where fuel remains covered but actions to implement make-up water addition should no longer be deferred - indicated level at the highest point of any fuel storage racks (approximately El. 816'-6" for Units 1 & 2 and El. 816'-4" for Unit 3).

Please provide the following:

- a) For Level 1, specify how the identified location represents the HIGHER of the two points described in the [Nuclear Energy Institute] 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. 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.

**ONS Response:**

- a) Level 1 as defined in NEI 12-02 is the higher of two points defined by :
  - A - The level at which reliable suction loss occurs due to uncovering of the coolant inlet pipe, weir or vacuum breaker (depending on the design), or
  - B - The level at which the water height, assuming saturated conditions, above the centerline of the cooling pump suction provides the required net positive suction head specified by the pump manufacturer or engineering analysis.

The normal SFP water level is Elevation (El.) 840'-0".

The SFP cooling pump suction piping submergence is lost when water level decreases below El. 836'-0" (Point A).

During normal operation, SFP cooling pumps are automatically tripped at El. 837'-6" to protect against NPSH and vortex concerns. However, as the SFP temperatures increase above normal, including temperatures that approach saturation conditions, the SFP cooling pump flow rates are procedurally controlled to prevent operation with potentially inadequate net positive suction head (NPSH) or vortex conditions based on engineering analysis. Under these high temperature and reduced flow conditions, the limiting level which provides protection against inadequate NPSH or vortex conditions is El. 840'-6", which is 6 inches above the normal SFP water level. Due to the design of the SFP suction piping, pump operation cannot be supported at all during saturation conditions in the pool. Thus, Point B for ONS can only be approximated by the point at which NPSH protection is provided, which varies dependent on SFP conditions. Under normal conditions, Point B relates to El. 837'-6", as provided in the overall integrated plan submitted February 28, 2013. But as SFP temperatures approach saturation, Point B relates to El. 840'-6". Therefore, ONS will consider El. 840'-6" as its "Level 1" datum due to it being higher than Point A and higher than El. 837'-6". Each channel will be capable of indicating any of these levels, as well as the other level datum required by NEI 12-02 (See Answer b below for explanation of the expected range of the level instruments).

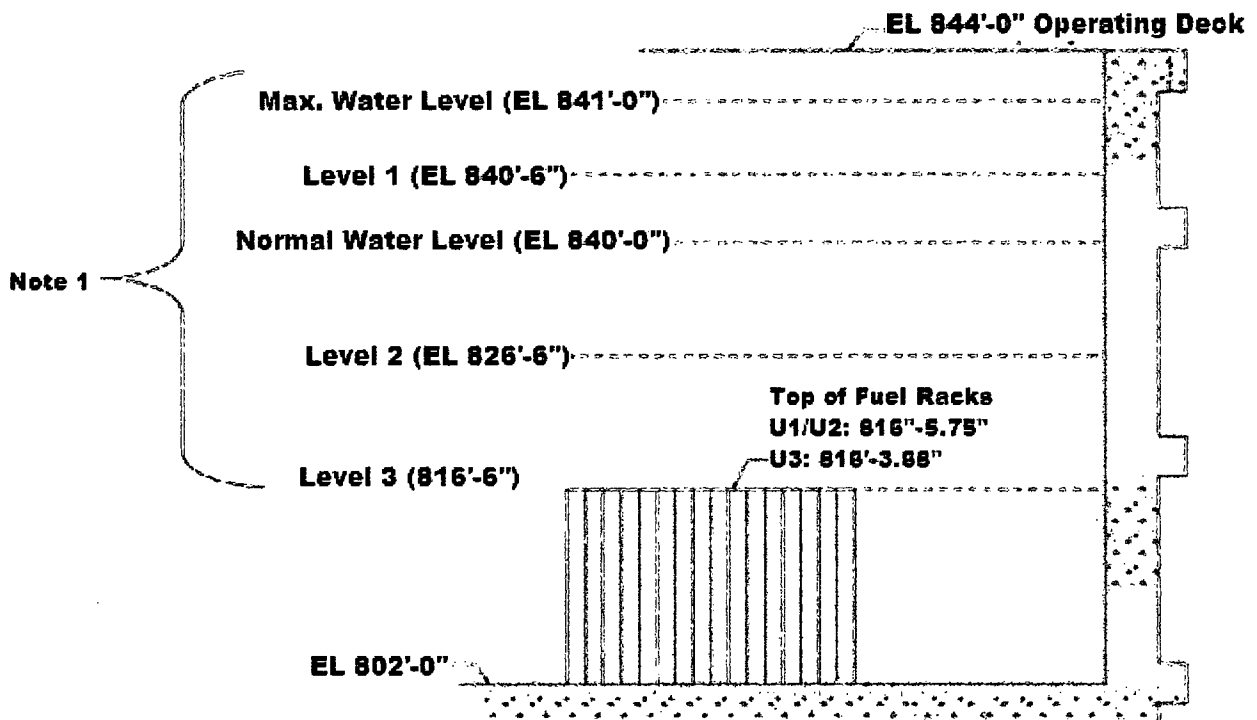
- b) The radar level instrument design will locate components in the SFP area such that they remain above the maximum water level in the SFP and the equipment mounts will not require any connections to be made to the pool liner. The mounting brackets for the wave guided assemblies and receiving horns will be secured to the SFP operating deck which is at El. 844'-0". The specific installation locations for the wave guided assemblies and receiving horns has not been finalized and this information is not available within the 28-day

response period allotted for this RAI. Duke Energy anticipates submitting this information on equipment elevation, equipment orientation and the location of the mounting points associated with the wave guided assemblies and receiving horns when answering RAI-2 in the February 2014, Six-Month Status Report for the Implementation of Order EA-12-051.

Figure 1 provides the elevations representing Level 1, Level 2 and Level 3, the top of the fuel and the level monitoring range.

### FIGURE 1

Level Range Minimum EL. 816' - 6" to Approximately EL. 841' - 0"



Note 1: Final location of equipment is not determined, but the range will meet or exceed elevations defined by the maximum pool level and the top of the fuel racks.

**NRC 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 mounting brackets, and the proposed routing of the cables that will extend from the sensors toward the location of the read-out/display device.

**ONS Response:**

Information is not available within the 28-day response period allotted for this RAI. Duke Energy anticipates submitting a response to RAI-2 for ONS in the February 2014, Six-Month Status Report for the Implementation of Order EA-12-051. This response will also include information that was not addressed in RAI-1 on equipment elevation, equipment orientation and the location of the mounting points associated with the wave guided assemblies and receiving horns.

**NRC 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.

**ONS Response:**

Information is not available within the 28-day response period allotted for this RAI. Duke Energy anticipates submitting a response to RAI-3 for ONS in the February 2014, Six-Month Status Report for the Implementation of Order EA-12-051.



**NRC 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.

**ONS Response:**

Information is not available within the 28-day response period allotted for this RAI. Duke Energy anticipates submitting a response to RAI-4 for ONS in the February 2014, Six-Month Status Report for the Implementation of Order EA-12-051.

**NRC RAI-5:**

Please provide the following:

- a) 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.
- 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.

**ONS Response:**

Information is not available within the 28-day response period allotted for this RAI. Duke Energy anticipates submitting a response to RAI-5 for ONS in the February 2014, Six-Month Status Report for the Implementation of Order EA-12-051.

**NRC RAI-6:**

Please provide the following:

- a) A description of the electrical [alternating current] 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), 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).

**ONS Response:**

Information is not available within the 28-day response period allotted for this RAI. Duke Energy anticipates submitting a response to RAI-6 for ONS in the February 2014, Six-Month Status Report for the Implementation of Order EA-12-051.

**NRC 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.

**ONS Response:**

Information is not available within the 28-day response period allotted for this RAI. Duke Energy anticipates submitting a response to RAI-7 for ONS in the February 2014, Six-Month Status Report for the Implementation of Order EA-12-051.

**NRC 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.

**ONS Response:**

Information is not available within the 28-day response period allotted for this RAI. Duke Energy anticipates submitting a response to RAI-8 for ONS in the February 2014, Six-Month Status Report for the Implementation of Order EA-12-051.

**NRC RAI-9:**

Please provide the following:

- a) The specific location for each of the primary and backup instrument channel displays.
- 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.
- c) If the primary and backup display location is other than the main control room, then provide justification for prompt accessibility to displays including primary and alternate route evaluation, habitability at display location(s), continual resource availability for personnel responsible to promptly read displays, and provisions for communications with decision makers for the various SFP drain down scenarios and external events.
- d) 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.

**ONS Response:**

Information is not available within the 28-day response period allotted for this RAI. Duke Energy anticipates submitting a response to RAI-9 for ONS in the February 2014, Six-Month Status Report for the Implementation of Order EA-12-051.

**NRC 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 spent fuel pool 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.

**ONS Response:**

Information is not available within the 28-day response period allotted for this RAI. Duke Energy anticipates submitting a response to RAI-10 for ONS in the February 2014, Six-Month Status Report for the Implementation of Order EA-12-051.

**NRC 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.

**ONS Response:**

Information is not available within the 28-day response period allotted for this RAI. Duke Energy anticipates submitting a response to RAI-11 for ONS in the February 2014, Six-Month Status Report for the Implementation of Order EA-12-051.