NRR-PMDAPEm Resource

From: Wall, Scott
Sent: Thursday, July 18, 2013 5:04 PM
To: Otto Gustafson
Cc: ERICKSON, JEFFREY S; MIKSA, JAMES P; Roque-Cruz, Carla; Mazumdar, Subinoy
Subject: Palisades Nuclear Plant - Requests for Additional Information Regarding Overall Integrated Plan for Reliable Spent Fuel Pool Instrumentation (TAC MF0769)
Attachments: Palisades - Requests for Additional Information - Order EA-12-051 (MF0769).pdf

Mr. Gustafson,

By letter to the U.S. Nuclear Regulatory Commission (NRC) dated February 28, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13060A360), Entergy Nuclear Operations, Inc. 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 the Palisades Nuclear Plant. The NRC staff in the Balance of Plant Branch (SBPB) and the Instrumentation and the Controls Branch (EICB) have identified areas in which additional information is needed to complete the Technical Review. The staff's Request for Additional Information (RAI) is provided as an attachment to this email.

You may accept this as a formal request for additional information and respond to the questions by August 19, 2013. Alternatively, you may request to discuss the content of the RAIs with the NRC staff in a conference call, including any change to the proposed response date. Please let me know if you have any questions or concerns.

Sincerely,

Scott P. Wall, PMP®, LSS BB, BSP
Senior Project Manager
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation
301.415.2855
Scott.Wall@nrc.gov

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Created By: Scott.Wall@nrc.gov

Recipients:
"ERICKSON, JEFFREY S" <JERICKS@entergy.com>
Tracking Status: None
"MIKSA, JAMES P" <jmiksa@entergy.com>
Tracking Status: None
"Roque-Cruz, Carla" <Carla.Roque-Cruz@nrc.gov>
Tracking Status: None
"Mazumdar, Subinoy" <Subinoy.Mazumdar@nrc.gov>
Tracking Status: None
"Otto Gustafson" <ogustaf@entergy.com>
Tracking Status: None

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REQUEST FOR ADDITIONAL INFORMATION

OVERALL INTEGRATED PLAN IN RESPONSE TO

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

ENTERGY NUCLEAR OPERATIONS, INC.

PALISADES NUCLEAR PLANT

DOCKET NO. 50-255

1.0 INTRODUCTION

By letter dated February 28, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13060A360), Entergy Nuclear Operations, Inc. 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 Palisades Nuclear Plant. 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 28, 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 period for this RAI, please provide the date that this information will be submitted.

2.0 LEVELS OF REQUIRED MONITORING

The OIP states, in part, that

> Level 1 is the level adequate to support operation of the normal fuel pool cooling system. It is the higher of the following two points:
>
> (1) the level at which reliable suction loss occurs due to uncovering the coolant inlet pipe or any weirs or vacuum breakers associated with suction loss. For Palisades, the elevation associated with this level is 645 feet 7 inches due to uncovering of the skimmer opening.
>
> (2) the level at which the normal fuel pool cooling pumps lose required [net positive suction head (NPSH)] assuming saturated conditions in the pool. An evaluation will be completed to demonstrate that this elevation is below the elevation that defines Level 1.

ENCLOSURE

The higher of the above points is (1). Therefore, Level 1 is elevation 645 feet 7 inches.

Level 2 is the level adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck. Level 2 may be based on either of the following:

(1) 10 feet ± 1 foot above the highest point of any fuel rack seated in the spent fuel pool. The elevation associated with this level is 634 feet 5 inches ± 1 foot (i.e., Level 3 + 10 feet).

(2) A designated level that provides adequate radiation shielding to maintain personnel dose within acceptable limits while performing local operations in the vicinity of the pool. This level is based on plant-specific or appropriate generic shielding calculations. The elevation associated with this level is not calculated since item (1) is used to establish Level 2 as permitted by NEI 12-02 Revision 1.

Therefore, Level 2 is elevation 634 feet 5 inches (10 feet above Level 3).

The equipment and instructions needed to reestablish SFP inventory will be provided as required by NEI 12-06 (Reference 3). This guidance will require action to reestablish SFP inventory upon or before reaching Level 3.

Level 3 is the level where fuel remains covered. It is defined as the highest point of any fuel rack seated in the spent fuel pool (within ± 1 foot).

The highest point of any fuel rack seated in the spent fuel pool is elevation 624 feet 5 inches. Therefore, Level 3 is elevation 624 feet 5 inches.

The SFP level instrument span will extend down to at least 3 inches below the upper limit of the range of Level 3 to account for accuracy or instrument loop uncertainty. Therefore, the SFP level probe will extend down to at least elevation 625 feet 2 inches.

RAI-1

Please provide the following:

a) For level 1, provide the results of the evaluation that will be completed to demonstrate that this 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.

c) The OIP states in section 8, "Other hardware stored in the SFP will be evaluated to ensure that it does not adversely interact with the SFP instrument probes during a seismic event." Given the potential for varied dose rates from other materials stored in the SFP, describe how level 2 will be adjusted to other than the elevation provided in section 2 above.

3.0 INSTRUMENTATION DESIGN FEATURES

3.2 Arrangement

The OIP states, in part, that

> The primary instrument channel is a permanent, fixed channel and located at the approximate locations shown on Attachment 1. The primary instrument channel will provide level indication through the use of Guided Wave Radar (GWR) technology through the use of the principle of Time Domain Reflectometry (TDR). The instrument provides a single continuous span from above Level 1 to within 1 foot of the top of the spent fuel racks.
>
> The backup instrument channel is identical to the primary channel and is a permanent, fixed channel. Components are located in the approximate locations shown on Attachment 1. The backup instrument channel will provide level indication through the use of Guided Wave Radar (GWR) technology using the principle of Time Domain Reflectometry (TDR). The instrument provides continuous level span from above Level 1 to within 1 foot of the top of the spent fuel racks.

RAI-2

Please clarify the sketch or marked-up plant drawing of the plan view of the SFP area that you submitted in Attachment 1, to depict the SFP inside dimensions in a more readable manner.

3.3 Mounting

The OIP states that

> Both the primary and backup system will be installed as seismic category I to meet the NRC JLD-ISG-2012-03 and NEI 12-02 guidance requirements.
>
> Other hardware stored in the SFP will be evaluated to ensure that it does not adversely interact with the SFP instrument probes during a seismic event.

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.

d) Address how other hardware stored in the SFP will not create adverse interaction with the fixed instrument location(s).

3.4 Qualification

The OIP states, in part, that

> Design criteria will ensure instrument channel reliability during normal, event, and post-event conditions for no fewer than seven days or until off-site resources can be deployed. Analyses, operating experience, and/or manufacturer testing of channel components will be used to validate design criteria [...].
>
> Components in the area of the SFP will be designed for the temperature, humidity, and radiation levels expected during normal, event, and post-event conditions for no fewer than seven days post-event or until off-site resources can be deployed by the mitigating strategies resulting from Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation for Beyond-Design-Basis External Events.
>
> Equipment located in the SFP will be qualified to withstand a total accumulated dose of expected lifetime at normal conditions plus accident dose received at post event conditions with SFP water level within 1 foot of the top of the fuel rack seated in the spent fuel pool (Level 3).
>
> The metal probe and cable in the spent fuel pool area are robust components that are not adversely affected by expected radiation, temperature, or humidity. The areas selected for display/processor installation are considered mild environments, such that personnel access is not prohibited by radiation,

temperature, or humidity, and are readily accessible by operators during or after a BDBE event.

Augmented quality requirements will be applied to all components in the instrumentation channels [...]

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 primary instrument channel will be independent of the backup instrument channel. Independence is obtained by physical separation of components between channels and the use of normal power supplied from separate 480V buses.

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 power supplies for the instrument channels are shown on Attachment 2 and arranged as follows:
>
> - Each instrument channel is normally powered from 120VAC 60 Hz plant power to support continuous monitoring of SFP level. The primary channel receives power from a different 480V bus than the backup channel. Therefore, loss of any one 480V bus does not result in loss of normal 120VAC power for both instrument channels.
>
> - On loss of normal 120VAC power, each channel's UPS automatically transfers to a dedicated backup battery. If normal power is restored, the channel will automatically [transfer] back to the normal AC power.
>
> - The backup batteries are maintained in a charged state by commercial-grade uninterruptible power supplies. The batteries are sized to be capable of supporting intermittent monitoring for a minimum of 3 days of operation. This provides adequate time to allow the batteries to be replaced or until off-site resources can be deployed by the mitigating strategies resulting from Order EA-12-049 Revision 0.
>
> - An external connection permits powering the system from any portable DC source.

RAI-6

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

> Accuracy will be consistent with the guidelines of NRC JLD-ISG-2012-03 Revision 0 and NEI 12-02 Revision 1. Accuracy and indication features are as follows:

- Accuracy: The absolute system accuracy is better than ± 3 inches. This accuracy is applicable for normal conditions and the temperature, humidity, chemistry, and radiation levels expected for BDBE event conditions.

- Trending: The display trends and retains data when powered from either normal or backup power.

- Restoration after Loss of Power: The system automatically swaps to available power (backup battery power or external DC source) when normal power is lost. Neither the source of power nor system restoration impact accuracy. Previously collected data is retained.

- Diagnostics: The system performs and displays the results of real-time information related to the integrity of the cable, probe, and instrument channel.

RAI-7

Please provide the following:

a) An estimate of the expected instrument channel accuracy performance in percent 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

> Testing and calibration will be consistent with the guidelines of NRC JLD-ISG-2012-03 Revision 0 and NEI 12-02 Revision 1 and vendor recommendations.
>
> The display/processor performs automatic in-situ calibration and automatically monitors for cable, connector, and probe faults using time domain reflectometry (TDR) technology. Channel degradation due to age or corrosion is not expected but can be identified by monitoring trends.

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 the preventative maintenance tasks 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.

3.8 Display

The OIP states, in part, that

> The primary and backup instrument displays will be located in the Main Control Room and the Auxiliary Building as shown on Attachments 1 and 2.
>
> The display will be consistent with the guidelines of NRC JLD-ISG-2012-03 Revision 0 and NEI 12-02 Revision 1.

RAI-9

Please provide the following:

a) Since the backup display location is not in the main control room, please provide a more detailed description of the location for the back-up display, addressing 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.

b) The reasons justifying why the location selected will enable the information from the back-up 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 for maintenance and testing will be developed using regulatory guidelines and vendor instructions.

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 states, in part, that

> Testing and calibration will be consistent with the guidelines of NRC JLD-ISG-2012-03 Revision 0 and NEI 12-02 Revision 1 and vendor recommendations.
>
> Station procedures and preventive maintenance tasks will be developed to perform required surveillance testing, calibration, backup battery maintenance, functional checks, and visual inspections of the probes.

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.