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

June 20, 2013

Site Vice President
Entergy Nuclear Operations, Inc.
Vermont Yankee Nuclear Power Station
P.O. Box 250
Governor Hunt Road
Vernon, VT 05354

SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION - REQUEST FOR ADDITIONAL INFORMATION RE: OVERALL INTEGRATED PLAN FOR RELIABLE SPENT FUEL POOL INSTRUMENTATION (ORDER EA-12-051) (TAC NO. MF0780)

Dear Sir or Madam:

By letter dated February 28, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML13064A301and ML13064A302), Entergy Nuclear Operations, Inc. (Entergy) submitted an Overall Integrated Plan in response to the March 12, 2012, U.S. Nuclear Regulatory Commission (NRC) Order modifying licenses with regard to reliable spent fuel pool instrumentation (Order Number EA-12-051; ADAMS Accession No. ML12054A679) for the Vermont Yankee Nuclear Power Station.

The NRC staff is reviewing your submittal and has determined that the additional information, as requested in the enclosure, is needed to complete its review. Please provide a response to these questions within 30 days of the date of this letter. If any part of your response to this information request is unavailable within 30 days of this request, please provide the date when the additional information will be submitted.

If you have any questions regarding this RAI, please contact me at (301) 415-1030, or email Richard.Guzman@nrc.gov.

Sincerely,

James Kim for

Richard V. Guzman, Senior Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-271

Enclosure:
As stated

cc w/encl: Distribution via Listserv

REQUEST FOR ADDITIONAL INFORMATION

OVERALL INTEGRATED PLAN IN RESPONSE TO

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

ENTERGY NUCLEAR OPERATIONS, INC.

VERMONT YANKEE NUCLEAR POWER STATION

DOCKET NO. 50-271

1.0 INTRODUCTION

By letter dated February 28, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML13064A301and ML13064A302), Entergy Nuclear Operations, Inc. (Entergy or the licensee) submitted an Overall Integrated Plan (OIP) in response to the March 12, 2012, U.S. Nuclear Regulatory Commission (NRC) Order modifying licenses with regard to reliable spent fuel pool (SFP) instrumentation (Order Number EA-12-051; ADAMS Accession No. ML12054A679) for Vermont Yankee Nuclear Power Station. The NRC staff endorsed Nuclear Energy Institute (NEI) 12-02, "Industry Guidance for Compliance with [U.S. Nuclear Regulatory Commission] 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 NRC Interim Staff Guidance JLD-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.

2.0 LEVELS OF REQUIRED MONITORING

The OIP states, in part, that

> LEVEL 1: 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 VY, the level, (1), is established based on the level at which the SFP cooling pumps automatically trip which is at elevation 343 feet 1 inch. This elevation is above the point where the pumps lose suction.
>
> (2) The level at which the normal fuel pool cooling pumps lose required 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.

The higher of the above points is (1). Therefore, LEVEL 1 is elevation 343 feet 1 inch.

LEVEL 2: 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 331 feet 3 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 331 feet 3 inches ± 1 foot (i.e. 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: 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 321 feet 3 inches. Therefore, Level 3 is elevation 321 feet 3 inches ± 1 foot.

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 322 feet 0 inches.

RAI-1

Please provide the following:

a) For level 1, specify how the identified location 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. 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, mounting,

> 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.

d) The OIP refers to drawings G-191173 Sh. 1, Revision 40 and 5920-12795, Revision 0. Provide copies of these drawings and if they do not provide the necessary information requested in this RAI, supplement it with additional drawings, sketches, and/or explanations.

3.0 INSTRUMENTATION DESIGN FEATURES

3.2 Arrangement

The OIP states, in part, that

> Level instruments will be installed in the approximate locations shown on Attachment 1. Separation of the channels/probes reduces the potential for falling debris or missiles affecting both channels of instrumentation. This placement coupled with separate routing paths for cables and the use of rigid conduit provides reasonable protection against falling debris and structural damage.

RAI-2

Please provide a clearly labeled legible 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. Include the minimum separation between the primary and backup channel instrumentation.

3.3 Mounting

The IOP states, in part, 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 roof and/or other support structures for each planned point of attachment of the probe assembly. Indicate in a drawing the portions of the level sensor that will serve as points of attachment for mechanical/mounting and 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

> Components of the instrument channels will be qualified for shock and vibration using one or more of the following methods:
>
> - Components will be supplied by manufacturers that implement commercial quality programs (such as IS09001, Quality Management Systems - Requirements) with shock and vibration requirements included in the purchase specification at levels commensurate with portable hand-held devices or transportation applications;
>
> - Components have a history of operational reliability in environments with significant shock and vibration loading, such as portable hand-held device or transportation applications; or
>
> - Components are inherently resistant to shock and vibration loadings, such as cables.
>
> For seismic effects on instrument channel components used after a potential seismic event for only installed components (with the exception of replaceable batteries and chargers), the following measures will be used to verify that the design and installation is adequate:

- Components will be rated by the manufacturer (or otherwise tested) for seismic effects at levels commensurate with those of postulated design basis event conditions in the area of instrument channel component use using one or more of the following methods:

    - Demonstration of seismic motion will be consistent with that of existing design basis loads at the installed location;

    - Substantial history of operational reliability in environments with significant vibration, such as for portable hand-held devices or transportation applications. Such a vibration design envelope will be inclusive of the effects of seismic motion imparted to the components proposed at the location of the proposed installation;

    - Demonstration of seismic reliability using methods that predict equipment performance (e.g., analysis, testing, combination thereof, or use of experience data) where demonstration should be based on the guidance in Sections 7, 8, 9, and 10 of Reference 5 or a substantially similar industrial standard;

    - Demonstration that proposed devices are substantially similar in design to models that have been previously tested for seismic effects in excess of the plant design basis at the location where the instrument is to be installed (g-levels and frequency ranges); or

    - Seismic qualification using seismic motion consistent with that of existing design basis loading at the installation location.

RAI-4

Please provide the following:

a) A description of the specific method or combination of methods that will be applied 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 (1) the level sensor mounted in the SFP area, and (2) 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. Independence of power sources is described in Section 11. The two (2) permanently mounted instruments in the pool are physically separated as described in Section 6 and 7.

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 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, 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

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 beyond-design-basis 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 [beyond-design-basis event] BDBE event conditions.
> - Trending: The display trends and retains data when on 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 daccuracy. 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

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 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 the calibration and functional checks that will be performed, the frequency at which they will be conducted with a discussion on the measures taken to detect when the instrumentation is operable but degraded, and 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.

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.

BDBE event operation guidance will also address the following:

- A strategy to ensure SFP water addition is initiated at an appropriate time consistent with implementation of NEI 12-06 Revision 1.

- Restoration of non-functioning SFP level channels after an event. Restoration timing will be consistent with the emergency condition. After an event, commercially available components that may not meet all qualifications may be used to replace components to restore functionality.

RAI-9

Please provide a description of the standards, guidelines and/or criteria that will be utilized to develop procedures for inspection, maintenance, repair, operation, abnormal response, and administrative controls associated with the SFP level instrumentation, as well as storage and installation of portable instruments.

4.3 Testing and Calibration

The OIP states, in part, that

> 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-10

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 what compensatory actions are planned in the event that one of the instrument channels cannot be restored to functional status within 90 days.

June 20, 2013

Site Vice President
Entergy Nuclear Operations, Inc.
Vermont Yankee Nuclear Power Station
P.O. Box 250
Governor Hunt Road
Vernon, VT 05354

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Sincerely,

/ ***RA*** /

Richard V. Guzman, Senior Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-271

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As stated

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