July 3, 2013

Vice President, Operations
Entergy Operations, Inc.
River Bend Station
5485 US Highway 61N
St. Francisville, LA 70775

SUBJECT: RIVER BEND STATION, UNIT 1 - REQUEST FOR ADDITIONAL INFORMATION REGARDING OVERALL INTEGRATED PLAN FOR RELIABLE SPENT FUEL POOL INSTRUMENTATION (ORDER EA-12-051) (TAC NO. MF0953)

Dear Sir or Madam:

By letter dated February 28, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML130660550), Entergy Operations, Inc. (Entergy, the licensee), submitted an Overall Integrated Plan (OIP) in response to the March 12, 2012, U.S. Nuclear Regulatory Commission (NRC, Commission) Order modifying licenses with regard to requirements for Reliable Spent Fuel Pool (SFP) Instrumentation for the River Bend Station, Unit 1 (RBS). The NRC staff has 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, August 2012 (ADAMS Accession No. ML12240A307), with exceptions, as documented in Interim Staff Guidance (ISG) 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 your February 28, 2013, response and determined that additional information is needed to complete its technical review. Enclosed is the NRC staff's request for additional information (RAI). The NRC staff requests that the responses be made by July 26, 2013, or provide the date this information will be submitted in the July 26, 2013, response.

If you have any questions regarding this RAI or its response date, please contact me at (301) 415-1445 or via e-mail at Alan.Wang@nrc.gov.

Sincerely,

/ ***RA*** /

Alan B. Wang, Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-458

Enclosure:
Request for Additional Information

cc w/encl: Distribution via Listserv

If you have any questions regarding this RAI or its response date, please contact me at (301) 415-1445 or via e-mail at Alan.Wang@nrc.gov.

Sincerely,

/ ***RA*** /

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ADAMS Accession No. ML13179A193

OFFICE	NRR/DORL/LPL4/PM	NRR/DORL/LPL4/LA	NRR/DE/EICB/BC
NAME	ABWang	JBurkhardt	JThorp
DATE	7/3/13	7/2/13	6/24/13
OFFICE	NRR/DSS/SBPB/BC	NRR/DORL/LPL4/BC	NRR/DORL/LPL4/PM
NAME	GCasto	MMarkley	ABWang
DATE	6/25/13	7/3/13	7/3/13

OFFICIAL AGENCY RECORD

REQUEST FOR ADDITIONAL INFORMATION

OVERALL INTEGRATED PLAN IN RESPONSE TO

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

ENTERGY OPERATIONS, INC.

DOCKET NO. 50-548

1.0 Introduction

By letter dated February 28, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML130660550), Entergy Operations, Inc. (Entergy, the licensee), submitted an Overall Integrated Plan (OIP) in response to the March 12, 2012, U.S. Nuclear Regulatory Commission (NRC, Commission) Order modifying licenses with regard to requirements for Reliable Spent Fuel Pool (SFP) Instrumentation for the River Bend Station, Unit 1 (RBS). The NRC staff has 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, August 2012 (ADAMS Accession No. ML12240A307), with exceptions, as documented in Interim Staff Guidance (ISG) 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 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 River Bend, this level (1), is established based on the siphon break level at elevation 110 feet 0 inches….
>
> (2) the level at which the normal fuel pool cooling pumps lose required NPSH [net positive suction head] assuming saturated conditions in the pool. Reference 9 shows that this elevation is 109 feet 10-13/16 inches.
>
> The higher of the above points is (1). Therefore, LEVEL 1 is elevation 110 feet 0 inches.

Enclosure

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 94 feet 10-5/16 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 94 feet 10-5/16 inches ± 1 foot (i.e., 10 ft above Level 3).

The equipment and instructions needed to reestablish SFP inventory will be provided as required by NEI 12-06 [1]. 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 84 feet 10-5/16 inches. Therefore, Level 3 is elevation 84 feet 10-5/16 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 elevation 85 feet 7-5/16 inches.

Please provide the following:

a) 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). Please 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.

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[1] Nuclear Energy Institute, NEI 12-06 [Rev. 0], "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," August 2012 (ADAMS Accession No. ML12242A378).

b) The OIP states, in part, that "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 hardware stored in the SFP, please describe how Level 2 will be adjusted to other than the elevation provided above.

3.0 Instrumentation Design Features

3.1 Arrangement

The OIP states, in part, that

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

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 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.

3.2 Mounting

The OIP 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.

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. Please 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. Please 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.

3.3 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 and will consider the following:
>
> - Post-event conditions in the area of instrument channel components
> - Effects of shock and vibration on all instrument channel components
> - Seismic effects on instrument channel components during and following a potential seismic event.

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.

3.4 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 480 [Volt (V)] 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 Sections 6 and 7.

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.

3.5 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 a 120 [Volt alternating current (VAC)] VAC 60 [Hertz (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 [uninterruptible power supply (UPS)] automatically transfers to a dedicated backup battery. If normal power is restored, the channel will automatically transfer back to the normal [alternating current (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 [direct current (DC)] source.

- Instrument accuracy and performance are not affected by restoration of power or restarting the processor.

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 a 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).

3.6 Accuracy

The OIP states that in part,

> 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 BDB external event conditions.
> - Trending: The display trends and retains data when operating 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 impacts 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.
>
> The above features ensure that trained personnel can easily determine when SFP level falls below each regulatory level (levels 1, 2 and 3) without conflicting or ambiguous indication.

Please provide the following:

a) An estimate of the expected instrument channel accuracy performance (e.g., in percentage 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.

3.7 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.
>
> 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.

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. Please 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.

3.8 Display

The OIP states in part, that

> The primary and backup instrument displays will be located in the Control 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.

Please provide the following:

a) The specific location for the primary and backup instrument channel display.

b) Since both the primary and backup display locations are not in the main control room, please provide a description of the location for the primary and backup display 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.

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

4.0 <u>Program Features</u>

4.1 Procedures

The OIP states in part, that

> Procedures for operation, maintenance, and testing will be developed using regulatory guidelines and vendor instructions.
>
> BDBE event 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.

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.

4.2 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.
>
> 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.
>
> 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.

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. Please 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.