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

July 30, 2013

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

SUBJECT: GRAND GULF NUCLEAR STATION, UNIT 1 - REQUEST FOR ADDITIONAL INFORMATION REGARDING OVERALL INTEGRATED PLAN FOR RELIABLE SPENT FUEL POOL INSTRUMENTATION (ORDER EA-12-051) (TAC NO. MF0955)

Dear Sir or Madam:

By letter dated February 26, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13064A417), 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 Grand Gulf Nuclear Station, Unit 1 (GGNS). 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 26, 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 within 30 days of receipt of this request or provide the date this information will be submitted in the 30-day 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,

Alan Wang

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

Docket No. 50-416

Enclosure:
Request for Additional Information

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 OPERATIONS, INC.

GRAND GULF NUCLEAR STATION, UNIT 1

DOCKET NO. 50-548

1.0 INTRODUCTION

By letter dated February 26, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13064A417), 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) Order modifying licenses with regard to requirements for Reliable Spent Fuel Pool (SFP) Instrumentation (Order Number EA-12-051; ADAMS Accession No. ML12054A679) for Grand Gulf Nuclear Station, Unit 1 (GGNS). The 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 your February 26, 2013, response and determined that the following request for additional information (RAI) is needed to complete its technical review. The NRC staff requests that you respond within the 30 days or provide the date 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 GGNS, this level, (1) is established based on the level at which siphon break occurs which is at elevation 204' feet 8" inches (Reference 6). This elevation is above the point where the fuel pool cooling pumps trip (Reference 7).
>
> (2) The level at which the normal fuel pool cooling pumps lose required NPSH [net positive suction head] assuming saturated conditions in the

pool. The fuel pool cooling pumps would trip based on water level in pool drain tank. This level would be lower than the level determined in (1) above.

The higher of the above points is (1). Therefore, LEVEL 1 is elevation 204 feet 8 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 192 feet - 2.125 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 192 feet - 2.125 inches (i.e., 10 feet above Level 3.)

The equipment and instructions to reestablish SFP inventory will be provided as required by NEI 12-06 Revision 1 (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 182 feet 2.125 inches (References 8 and 9). Therefore, Level 3 is elevation 182 feet 2.125 inches ± 1 foot band.

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 182 feet 11.125 inches.

RAI-1

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 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.

b) The OIP states, in part, 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.

Please provide a discussion regarding dose rates for stored spent fuel versus that of other material that may be stored in the pool and the potential impact on the evaluation for Level 2.

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 use of rigid conduit, provides reasonable protection against falling debris and structural damage.
>
> Instrument power is derived from the display/processors. The location of the display/processors is in the Computer Room in the control building as shown on Attachments 1 and 2. The Computer Room is expected to be a mild environment after a Beyond Design Basis External (BDBE) event and can be easily accessed from the MCR [Main Control Room]; therefore, personnel can promptly obtain readings from the display. This building provides adequate protection against the effects of temperature, flood, humidity, radiation, seismic events, and missile hazards.

RAI-2

Please modify the marked-up plant drawing of the plan view of the SFP area to depict 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

> 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. 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.

d) A description of how other material 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...

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).

Components of the instrument channels will be qualified for shock and vibration using one or more of the following methods...

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...

RAI-4

Please provide the following:

a) A description of the specific method or combination of methods the licensee intends 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 120VAC [Volts Alternating Current] battery-backed instrument 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.

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 [Hertz] 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 [uninterruptible power supply] automatically transfers to a dedicated backup battery. If normal power is restored, the channel will automatically transfers 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 [direct current] source.

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

RAI-6

Please provide the following:

a) A description of the normal electrical AC power sources and capacities for the primary and backup channels. Please provide justification for using a common 480 VAC motor control center for the normal feed to both 120 VAC instrument buses, including the contingency plans that will be implemented in the event that power cannot be restored to that particular 480 VAC bus within the required mitigating strategies time frame following a BDB loss of all AC power.

b) 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 (e.g., 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.
>
> 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-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. 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.

3.9 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.

RAI-9

Please provide the following:

a) If both the primary and backup display locations are not located 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 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." Please 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 did not provide any statement in this section.

RAI-11

Please provide the following:

a) A description of 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.

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. 50-416

Enclosure:
Request for Additional Information

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ADAMS Accession No. ML13207A124 *via memo dated

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