Burkhardt, Janet

From: Wilkins, Lynnea
Sent: Friday, August 23, 2013 12:29 PM
To: 'HANSHER, BILL R'
Cc: Burkhardt, Janet; 'EDWARDS, MICHAEL L'; Sebrosky, Joseph
Subject: DRAFT: RAI for Fort Calhoun Station Re: Reliable Spent Fuel Pool Instrumentation Order Response (Overall Integrated Plan) (MF0968)

Bill,

By letter dated February 28, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13059A268), Omaha Public Power District submitted an Overall Integrated Plan (OIP) in response to the March 12, 2012, Commission Order licenses with regard to requirements for Reliable Spent Fuel Pool (SFP) Instrumentation (Order Number EA-12-051; ADAMS Accession No. ML12054A679) for Fort Calhoun Station. 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 your submittal and has determined that the information specified in the Request for Additional Information (RAI) below is needed for the staff to complete its evaluation.

Please contact me or Joe Sebrosky if a clarifying teleconference is needed for the attached RAIs.

Thanks
Lynnea

Lynnea Wilkins, Project Manager
Fort Calhoun Station, Unit 1
Cooper Nuclear Station
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation
US Nuclear Regulatory Commission
Phone: 301-415-1377

REQUEST FOR ADDITIONAL INFORMATION

OVERALL INTEGRATED PLAN IN RESPONSE TO

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

OMAHA PUBLIC POWER DISTRICT

FORT CALHOUN STATION

DOCKET NUMBER 50-285

1.0 INTRODUCTION

By letter dated February 28, 2013(Agencywide Documents Access and Management System (ADAMS) Accession No. ML13059A268), Omaha Public Power District submitted an Overall Integrated Plan (OIP) in response to the March 12, 2012, Commission Order licenses with regard to requirements for Reliable Spent Fuel Pool (SFP) Instrumentation (Order Number EA-12-051; ADAMS Accession No. ML12054A679) for Fort Calhoun Station. 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 information is needed to complete its review.

2.0 LEVELS OF REQUIRED MONITORING

The OIP states, in part, that

> Key spent fuel pool water levels:
>
> 1. **Level adequate to support operation of the normal fuel pool cooling system** – Indicated level on either the primary or backup instrument channel will be approximately elevation 1034.6' (existing low level alarm LIA-2846, 39.1 feet above pool floor) plus the accuracy of the SFP level instrument channel and the current LIA-2846 low water level alarm. The Level 1 elevation is approximately 23 feet above the lowest spent fuel pool cooling suction line, and is a conservative elevation that has been established above the lowest spent fuel pool cooling suction line. The exact elevation for Level 1 will be determined during the detailed design and engineering phase, but will be approximately the same as the low-level alarm elevation of the current LIA-2846 instrument.

ENCLOSURE

2. **Level adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck** - Indicated level on either the primary or backup instrument channel will be approximately elevation 1020' plus the accuracy of the SFP level instrument channel, which is to be determined. This elevation is approximately 10' above the top of the spent fuel storage racks (Reference 7). The top of the spent fuel storage racks is approximately at elevation 1009'-7" (per Reference 7). The top of the active fuel area is approximately elevation 1007'-5" and as such approximately an additional 2.5' of water shielding is available through setting the Level 2 elevation at 1020'. The Level 2 elevation of 1020' is approximately 12'-7" above the top of the active fuel. This water level should provide substantial radiation shielding for personnel to respond to Beyond-Design-Basis external events and initiate any SFP makeup strategies.

3. **Level where fuel remains covered** - Indicated level on either the primary or backup instrument channel will be approximately elevation 1011' (approximately one foot above the top of the highest spent fuel rack) plus the accuracy of the SFP level instrument channel, which is to be determined. This elevation is approximately 1' above the top of the spent fuel rack. This monitoring level assures that there is adequate water level above the stored fuel seated in the rack. Setting Level 3 elevation at 1011' provides a water level of approximately 3.5' over the top of the active fuel region.

RAI-1

Please provide the following:

a) For level 1, specify how the identified 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.

3.0 INSTRUMENTATION DESIGN FEATURES

3.2 Arrangement

The OIP states, in part, that

> SFP level probes are proposed to be installed in the southwest and northeast corners of the SFP (diagonally opposite corners).

Details of the probe locations will be finalized in the design and engineering phase. Details related to location of the transmitters and the cabling have not been finalized at this point in time and will be part of the design and engineering phase of the project.

Supports for the probes will be designed to shield the components from event-generated missiles. In the conceptual design, the SFP probes bolt to a mounting plate for installation at the corner of the SFP, or a plate for mounting near the side of the SFP. This mounting option will allow the probe to be installed within a few inches of the SFP liner, minimizing the chances of interference with other structures, and occupying limited space on the SFP deck. To the greatest extent possible, the supports will allow the fuel-handling machine to pass over them without interference. Details of the supports will be addressed in the design and engineering phase of the project. The location of the probes will not interfere with fuel cask handling transfers.

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 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 Class I to meet the NRC JLD-ISG-2012-03 and NEI 12-02 guidance requirements.

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 connection

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.

3.4 Qualification

The OIP states, in part, that

> Instrument channel reliability will be demonstrated via an appropriate combination of design, analyses, operating experience, and/or testing of channel components for the following sets of parameters:
>
> - conditions in the area of instrument channel component use for all instrument components,
> - effects of shock and vibration on all instrument channel components, and
> - seismic effects on instrument channel components used during and following a potential seismic event for only installed components.
>
> Augmented quality requirements, similar to those applied to fire protection, will be applied to this project.
>
> Temperature, humidity, and radiation levels consistent with conditions in the vicinity of the SFP and the area of use considering normal operational, event and post-event conditions for no fewer than seven days post-event will be addressed in the engineering and design phase. Examples of post-event (beyond-design-basis) conditions that will be considered are:
>
> - radiological conditions for a normal refueling quantity of fuel in the pool.
> - temperatures of 212°F and 100% relative humidity environment,
> - boiling water and/or steam environment,
> - a concentrated borated water environment.
>
> For seismic effects on instrument channel components used after a potential seismic event for only installed components (with the exception of battery chargers and replaceable batteries), the following measures will be used to verify that the design and installation is adequate. Applicable components of the instrument channels are 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 [methods listed].

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 and backup instrument channels are of the same technology, are permanently installed, separated by distance and utilize independent power supplies.

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 two instrumentation channels will each be powered normally by a separate power supply and will have dedicated batteries and local battery chargers. Minimum battery life of 72 hours will be provided. The battery systems will include provision for battery replacement should the battery charger be unavailable following the event. Spare batteries will be available. In the event of a loss of normal power, the battery chargers could be connected to another suitable power source.

RAI-6

Please provide the following:

a) A description of the electrical AC power sources and capacities for the primary and backup channels, for normal, post-event, and recovery from the event.

b) 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

> Instrument channels will be designed such that they will maintain their design accuracy following a power interruption or change in power source without recalibration.
>
> Accuracy will consider SFP conditions, e.g., saturated water, steam environment, or concentrated borated water. Additionally, instrument accuracy will be sufficient to allow trained personnel using plant procedures to determine when the actual level exceeds the specified lower level of each indicating range (levels 1, 2, and 3) without conflicting or ambiguous indication. The accuracy will be within the resolution requirements of Figure 1 of NEI 12-02.

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.

3.8 Testing

The OIP states, in part, that

> Instrument channel design will provide for routine testing and calibration consistent with Order EA-12-051 and the guidance in NEI 12-02.

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.

3.9 Display

The OIP states, in part,

> Planned locations for SFP level displays will be in a mild environment of the Auxiliary Building providing adequate protection from temperature, humidity, and radiation. Preliminarily, one channel will be located in a remote location in the Ventilation Equipment Room near FLEX strategy equipment, and one SFP level display is to be mounted in the Alternate Shutdown Panel in the Upper Electrical Penetration Room. Both locations have ready access by operators.

Remote indication will be provided in the alternate safe shutdown panel in the Auxiliary Building Upper Electrical Penetration Room. The other remote indication will be provided with portable equipment located near FLEX equipment along the north wall of the Ventilation Equipment Room. It has not been determined at this point in time if a readout will be provided in the control room or with the plant computer display system. That determination will be made during the design and engineering phase.

The display in the alternate shutdown panel Upper Electrical Penetration Room will be:

- promptly accessible to the appropriate plant staff giving appropriate consideration to various drain down scenarios,
- outside of the area surrounding the SFP floor, e.g., an appropriate distance from the radiological sources resulting from an event impacting the SFP,
- inside a structure providing protection against adverse weather, and
- outside of any very high radiation areas or LOCKED HIGH RAD AREA during normal operation.

Each instrument channel (Primary and Backup) will have the capability to drive an external remote 4 – 20 milliamp (ma) loop that can be used to provide level indication at a second display location or be used as an input to the plant computer. Failure of the external remote 4 – 20 ma signal will not adversely impact the primary display located in the transmitter (electronics) enclosure.

RAI-9

Please provide the following:

a) Since both the primary and backup display locations are not 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”. Include consideration of various drain-down scenarios.

c) Justification for use of the process computer system for relaying information to emergency decision makers, and describe the reliability design criteria applicable to the process computer system under BDB conditions

4.0 PROGRAM FEATURES

4.1 Procedures

The OIP states, in part, that

> Procedures will be developed using guidelines and vendor instructions to address the maintenance, operation, and abnormal response issues associated with the new SFP instrumentation consistent with NEI 12-02.
>
> Procedures will address a strategy to ensure SFP water level addition is initiated at an appropriate time consistent with implementation of NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide (Reference 6). The details of the procedure implementation will be linked to NRC Order 12-049, Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond- Design-Basis External Events (Reference 8). Procedures will address the following situations:
>
> - If, at the time of an event or thereafter until the unit is returned to normal service, an instrument channel ceases to function, its function will be recovered within a period of time consistent with the emergency conditions that may apply at the time.
>
> - If, at the time of an event or thereafter until the unit is returned to normal service, an instrument channel component must be replaced, we may use commercially available components that may or may not meet all of the qualifications (Section IX) to maintain the instrument channel functionality.

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.

4.2 Testing and Calibration

The OIP states, in part, that

> Processes will be established and maintained for scheduling and implementing necessary testing and calibration of the primary and backup spent fuel pool level instrument channels to maintain the instrument channels at the design accuracy. Testing and calibration of the instrumentation will be consistent with vendor recommendations and any other documented basis. Calibration will be specific to the mounted instrument and the monitor.

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.