

NRR-PMDAPEm Resource

From: Sreenivas, V
Sent: Tuesday, May 28, 2013 9:53 AM
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Cc: 'Tom Shaub'; 'david.sommers@dom.com'; Pascarelli, Robert; Khanna, Meena; Chung, Pong; Roque-Cruz, Carla; Cotton, Karen; Vicki Hull
Subject: REQUEST FOR ADDITIONAL INFORMATION - OVERALL INTEGRATED PLAN FOR RELIABLE SPENT FUEL POOL
Attachments: Overall integrated plan_RAI.pdf

By letter dated February 28, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13063A017), Virginia Electric and Power Company submitted an Overall Integrated Plan 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) for North Anna Power Station Units 1 and 2. The purpose of this email is to provide the results of the U.S. Nuclear Regulatory Commission (NRC) staff's detailed technical review of this request. The staff's Request for Additional Information (RAI) is enclosed.

Please submit the additional information by July 1, 2013 in order to complete its detailed technical review.

If you have any questions please contact me or Karen Cotton at your earliest.

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REQUEST FOR ADDITIONAL INFORMATION
OVERALL INTEGRATED PLAN IN RESPONSE TO
ORDER EA-12-051, "RELIABLE SPENT FUEL POOL INSTRUMENTATION"
VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNITS 1 AND 2
DOCKET NOS. 50-338 AND 50-339

1.0 INTRODUCTION

By letter dated February 28, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13063A017), Virginia Electric and Power Company 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 (Order Number EA-12-051; ADAMS Accession No. ML12054A679) for North Anna Power Station Units 1 and 2. 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 SFP 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 SFP 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 by the July 5, 2013 response date for this RAI, please provide the date this information will be submitted.

2.0 LEVELS OF REQUIRED MONITORING

The OIP states, in part, that

Level 1 -This is indicated level on either the primary or back-up instrument channel of greater than approximate elevation 286'-7" plus the accuracy of the SFP level instrument channel, which is to be determined. This level is based on the elevation at which the top of the SFP cooling pump suction lines penetrate the pool walls (Reference 4, Section 9.1.3.3.3).

Level 2.-This is indicated level on either the primary or back-up instrument channel of greater than approximate elevation 274'-2" plus the accuracy of the SFP level instrument channel, which is to be determined. This elevation is approximately 10' above the top of the fuel racks and ensures a minimum level of 10' above the top of the fuel (Reference 4).

ENCLOSURE

This water level ensures there is sufficient depth to provide radiation shielding for personnel to respond to Beyond-Design-Basis (BDB) External Events and to initiate SFP makeup strategies.

Level 3 - This is indicated level on either the primary or back-up instrument channel of greater than approximate elevation 264'-2" plus the accuracy of the SFP level instrument channel, which is to be determined. This monitoring level assures that the fuel remains covered (Reference 4, Section 9.1.3.3.3).

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.

3.0 INSTRUMENTATION DESIGN FEATURES

3.2 Arrangement

The OIP states, in part, that

The primary and back-up channel level sensor probes will be installed on opposite sides of the SFP to maintain adequate channel separation. In the conceptual design, the SFP probes bolt to a triangular mounting plate for installation at the corner of the SFP or a rectangular plate for mounting at the side of the SFP. The mounting options 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. Existing barriers and physical separation will be used to provide a level of protection for the sensor and interconnecting cable.... Specific details will be developed during the detailed design phase...

Vendor electronics will be located in a mild environment of the Auxiliary Building providing adequate protection from temperature, humidity, and radiation. Level indicators will be located in the Cable Spreading Room. This display location meets the guidance of NEI 12-02 since the Cable Spreading Room is promptly accessible from the Main Control Room, is within the Service Building which is designed to withstand tornado effects, and is not within a very high radiation or locked high radiation area. Specific details will be developed during the detailed design phase.

Cables associated with a channel's sensor, power supply and indicator will be independently routed in separate raceways from cables associated with the other channel.

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 sensor, and the proposed routing of the cables that will extend from the sensors toward the location of the read-out/display device.

3.3 Mounting

The OIP states, in part, that

Both the primary and backup systems will be installed as Seismic Category I to meet the NRC ISG 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 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.

3.4 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 are supplied by manufacturers using commercial quality programs (such as 1SO9001, *Quality management systems - Requirements* (Reference 6)) with shock and vibration requirements included in the

purchase specification at levels commensurate with portable hand-held device or transportation applications;

- Components have a substantial 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 the installed instrument channel components, the following measures will be used to verify that the design and installation are 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 at the location of the instrument channel component using one or more of the following methods:

- 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;
- Adequacy of seismic design and installation is demonstrated based on the guidance in Sections 7, 8, 9, and 10 of IEEE Standard 344-2004, *IEEE Recommended Practice for Seismic Qualification of Class IE Equipment for Nuclear Power Generating Stations*, (Reference 7) or a substantially similar industrial standard; or
- 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).

These requirements will be used as design input for the detailed design, vendor selection, and final implementation.

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 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 during and following seismic conditions to maintain its required accuracy.

3.5 Independence

The OIP states in part, that

Independence will be achieved through physical separation of the final installed instruments. The two (2) permanently installed instrument sensors will be separated by a distance comparable to the shortest length of a side of the pool, to the extent practical, based on the existing SFP geometry and construction. The cables associated with each channel will follow separate and independent routes from the instruments to each electronic's enclosure and from the enclosures to the displays. The normal AC or DC power source for each channel will be provided from independent and separate sources.

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 precluded.
- 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, the use of 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 normal power supply for each channel will be provided by different power sources such that loss of one power source will not result in the loss of both channels. In addition to the normal plant AC and/or DC power supply to each channel, a back-up power source will also be provided to each channel in the form of a back-up battery independent of the normal AC or DC power sources. Specific details will be developed during the detailed design phase.

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 FLEX Program plans.

3.7 Accuracy

The OIP states, in part, that

The instrument channels will maintain their design accuracy following a power interruption or change in power source without requiring recalibration. Since the instrumentation is generally commercial off the shelf supplied components, the vendor published instrument accuracies will be verified as acceptable and will be used as a basis for final configuration and calibration procedures.

Accuracy requirements will consider SFP conditions, e.g., saturated water, steam environment, and concentrated borated water. Additionally, instrument accuracy will be sufficient to allow trained personnel 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 GWR/TDR equipment selected will have accuracy within the resolution requirements of NEI 12-02, Figure 1.

Specific details regarding accuracy will be obtained from the supplier during the detailed design phase.

RAI-7

Please provide the following:

- a) An estimate of the expected instrument channel accuracy performance 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

Instrument channel design will provide for routine testing and calibration consistent with Order EA-12-051 and the guidance in NEI 12-02. The installed sensors will be designed to allow testing and/or calibration via in-situ methods while mounted in the pool. Removal of the sensor from the pool will not be required for calibration or testing.

Specific details regarding testing procedures and calibration requirements will be reviewed and determined with the supplier during the detailed design phase.

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 functional checks will be performed, and the frequency at which they will be conducted. Describe how calibration tests will be performed, and the frequency at which they will be conducted. Provide a discussion as to 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

Since final indicator location will be based on the detailed design package, the distance between the sensing element and the display is currently not fully defined.... Specific details regarding the display and display location(s) will be finalized during the detailed design phase.

RAI-9

Please provide the following:

- a) The specific location for the primary and backup instrument channel display.
- b) If the primary or backup display location is other than the main control room, then provide justification for prompt accessibility to displays 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 enable the information from these instruments to be considered "promptly accessible" to various drain-down scenarios and external events.

4.0 PROGRAM FEATURES

4.2 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. 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 8).

RAI-10

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

Processes will be established and maintained for scheduling and implementing necessary testing and calibration of the primary and back-up 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 what compensatory actions are planned in the event that one of the instrument channels cannot be restored to functional status within 90 days.