



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

July 17, 2013

Mr. Ray Lieb
Site Vice-President
FirstEnergy Nuclear Operating Company
Mailstop A-DB-3080
5501 N. State, Route 2
Oak Harbor, OH 43449-9760

SUBJECT: DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1 - REQUEST FOR
ADDITIONAL INFORMATION REGARDING OVERALL INTEGRATED PLAN
FOR RELIABLE SPENT FUEL POOL INSTRUMENTATION (TAC NO. MF0960)

Dear Mr. Lieb:

By letter dated February 27, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13059A495, FirstEnergy Nuclear Operating Company submitted the overall integrated plan for Davis-Besse Nuclear Power Station, Unit 1, to the U.S. Nuclear Regulatory Commission (NRC) in response to the March 12, 2012, Order modifying licenses with regard to reliable spent fuel pool instrumentation (Order EA-12-051). The NRC staff is reviewing your submittal and has determined that additional information is required to complete its review. The specific information requested is addressed in the enclosures to this letter.

Please provide a response to this information request by August 14, 2013. If some information is unavailable by August 14, 2013, then provide the date when any additional information will be submitted. Should you have any questions, please feel free to contact me at 301-415-1380.

Sincerely,

A handwritten signature in black ink, appearing to read "Blake Purnell".

Blake Purnell, Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-346

Enclosure:
RAI for Davis-Besse Nuclear Power Plant

cc w/encl: Distribution via Listserv

REQUEST FOR ADDITIONAL INFORMATION
OVERALL INTEGRATED PLAN IN RESPONSE TO
COMMISSION ORDER MODIFYING LICENSE REQUIREMENTS
FOR RELIABLE SPENT FUEL POOL INSTRUMENTATION
(ORDER NO. EA-12-051)
FIRSTENERGY NUCLEAR OPERATING COMPANY
FIRSTENERGY NUCLEAR GENERATION, LLC.
OHIO EDISON COMPANY
DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1
DOCKET NO. 50-346

1.0 INTRODUCTION

By letter dated February 27, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13059A495), FirstEnergy Nuclear Operating Company, (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 EA-12-051; ADAMS Accession No. ML12054A679) for Davis-Besse Nuclear Power Station, Unit 1. 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 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 27, 2013, submittal 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 adequate to support operation of the normal fuel pool cooling system

Indicated level on either the primary or backup instrument channel of greater than a to-be-determined elevation plus the accuracy of the SFP level instrument channel.

Enclosure

Once the water level in the pool drops below a to-be-determined elevation, water will no longer be extracted from the pool to be sent to SFP cooling equipment to provide heat removal from the SFP.

Level 2 - Level adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck

Indicated level on either primary or backup instrument channel of greater than 587'-8" plus the accuracy of the SFP level instrument channel, which is to be determined. This monitoring level ensures there is an adequate water level to provide substantial radiation shielding for a person standing on the SFP operating deck.

This level was selected based on the NEI 12-02 Rev. 1 guidance for selecting the plant specific elevation for Level 2 given as 10 feet (+/- 1 foot) above the highest point of any fuel rack seated in the spent fuel pool.

Level 3 - Level where fuel remains covered and actions to implement makeup water addition should no longer be deferred

Indicated level on either the primary or backup instrument channel of greater than 577'-8" (which is the top of the highest point on the spent fuel pool racks) plus the accuracy of the SFP level instrumentation, which is to be determined. This monitoring level assures that there is adequate water level above the stored fuel seated in the rack.

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 the 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:

The planned design of this system will consist of two measurement channels, one primary and one backup. Each channel consists of a level sensor, an electronics unit and an indicator. The primary and backup instrument channel sensors would be protected against missiles that may result from damage to the structure over the SFP.

The sensors will be mounted as close to the different SFP corners as possible to minimize the possibility of a single event or missile damaging both channels. The sensor arrangement has been proposed in a manner limiting any interference with existing equipment in or around the SFP. This proposed design would not pose any potential hazard to personnel working around the pool or on the level instrumentation itself.

The proposed design locates the electronics enclosures in an area removed from the SFP environment, which would be accessible in the event of a beyond-design basis external event that would restrict access to the SFP. The enclosures for the two instrument channels will be separated to minimize the possibility of a single event damaging both channels. Cabling for each channel will be run in separate conduit and/or cable tray to the control room indicators.

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:

Installed primary and back up SFP level instrument channel equipment within the spent fuel pool shall be mounted to retain its design configuration during and following the maximum seismic ground motion considered in the design of the spent fuel pool structure in accordance with NRC JLD-ISG-2012-03 and NEI 12-02 Rev.1 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:

The primary and backup instrumentation for the proposed design will be suitable and reliable at temperature, humidity, and radiation levels consistent with the SFP water at saturated conditions for an extended period of time. This reliability will be established through use of an augmented quality assurance process. Using the guidance of NEI 12-02 Rev. 1 and NRC JLD-ISG-2012-03 the equipment design will include reliability against effects of shock and vibration and seismic motion.

The design will consider the environmental conditions as discussed by NEI 12-02, Rev. 1, which recommends considering temperature, humidity, and radiation levels during normal operation and after a beyond-design basis external event for no fewer than seven days post-event or until off-site resources can be deployed by the mitigating strategies. Conditions to be considered are the radiological conditions for a normal refueling quantity of freshly discharged (100 hours) fuel with SFP water level at Level 3 as defined by NRC Order EA-12-051, temperatures of 212° F and 100% relative humidity, boiling water and/or steam, and concentrated borated water.

The sensor elements of the guided wave radar approach will consist solely of special cable that will not be negatively impacted by the environmental conditions described. The electronic enclosures will be mounted in an area outside the SFP area that would be accessible by personnel after a beyond-design basis external event and is expected to be a mild environment. The analog indicator will be mounted in the main control room, and as such will be suitable for the environmental conditions of the main control room following a beyond-design basis external event.

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 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. The primary and backup instrument channels will be physically and electrically separated to maintain channel independence. The sensors will be separated as far apart as practical within the constraints of existing pool geometry and equipment. Electronics enclosures will be separated by a suitable distance or may utilize structural features of the room in which they are located as a barrier to provide protection against a single event (missile, explosion, etc.) from damaging the electronics of both instrument channels. Power will be supplied from two separate power buses at a minimum, with a preference of different power divisions or channels as available. Cabling will be run in separate conduit and/or cable tray. The same technology will be used for both the primary and backup instrument channels.

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 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:

Each channel will normally be powered from independent 120 VAC [volts-alternating current] power sources and will have a dedicated battery backup. A minimum battery life of 24 hours will be provided to allow for power restoration from portable equipment.

RAI-6

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 an uninterruptible power supply), 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 beyond-design-basis 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:

The guided wave radar design provides continuous monitoring of the SFP water level. The accuracy of the SFP level instrument channel, from sensor to main control room indicator, will be consistent with the guidelines of NRC JLD-ISG-2012-03 and NEI 12-02 Rev. 1. Instrument channels will be designed to maintain their design accuracy without recalibration following a power interruption or change in power source.

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 beyond-design-basis 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 will be consistent with the guidelines of NRC JLD-ISG-2012-03 and NEI 12-02 Rev. 1. The instrument channel design will include provisions for routine testing and calibration. The instrumentation will allow for in-situ testing and calibration of the level instrumentation to minimize calibration effort and instrument downtime. Calibration procedures will be developed in accordance with plant procedures and vendor recommendations.

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. Discussion 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 display will be consistent with the guidelines of NRC JLD-ISG-2012-03 and NEI 12-02 Rev. 1. Trained personnel will, at a minimum, be able to monitor the SFP water level from an appropriate and accessible location, and will provide on demand or continuous indication of SFP water level. The SFP level instrumentation will provide for display of fuel pool level using an indicator located in the main control room. The indicator will be powered by the instrument loop and will not require additional power circuits from those described above.

RAI-9

Please provide the following:

- (a) The specific location for the primary and backup instrument channel display. It is not clear from the OIP whether both displays will be in the main control room.
- (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." Include consideration of various drain-down scenarios.

4.0 PROGRAM FEATURES

4.2 Procedures

The OIP states, in part, that:

Procedures will be established and maintained for the testing, calibration, operation and abnormal response issues associated with the primary and backup spent fuel pool instrumentation channels.

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

RAI-11

The OIP states, in part, that:

Per NRC Order EA-12-051, processes will be established and maintained for scheduling and implementing necessary testing and calibration of primary and backup SFP level instrument channels in order to maintain the design accuracy.

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) Describe how the guidance in NEI 12-02 section 4.3 regarding compensatory actions for one or both non-functioning channels will be addressed.
- (c) Describe what compensatory actions are planned in the event that one of the instrument channels cannot be restored to functional status within 90 days.

July 17, 2013

Mr. Ray Lieb
Site Vice-President
FirstEnergy Nuclear Operating Company
Mailstop A-DB-3080
5501 N. State, Route 2
Oak Harbor, OH 43449-9760

SUBJECT: DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1 - REQUEST FOR
ADDITIONAL INFORMATION REGARDING OVERALL INTEGRATED PLAN
FOR RELIABLE SPENT FUEL POOL INSTRUMENTATION (TAC NO. MF0960)

Dear Mr. Lieb:

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Sincerely,

/ RA /

Blake Purnell, Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-346

Enclosure:

RAI for Davis-Besse Nuclear Power Plant

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