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February 27, 2014

AEP-NRC-2014-16
10 CFR 50.54(f)

Docket Nos.: 50-315
50-316

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Donald C. Cook Nuclear Plant Units 1 and 2
Six Month Status Report in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation
(Order Number EA-12-051)

References:

1. Letter from E. J. Leeds and M. R. Johnson, U. S. Nuclear Regulatory Commission (NRC), to All Power Reactor Licensees and Holders of Construction Permits in Active or Deferred Status, "Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," NRC Order Number EA-12-051, dated March 12, 2012, ADAMS Accession No. ML12054A682.

2. NRC Interim Staff Guidance JLD-ISG-2012-03, Compliance with Order EA-12-051, Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation, Revision 0, dated August 29, 2012, ADAMS Accession No. ML12221A339.

3. Nuclear Energy Institute 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.

4. Letter from J. P. Gebbie, Indiana Michigan Power Company (I&M), to NRC, "Donald C. Cook Nuclear Plant Units 1 and 2, Initial Status Report in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Reliable Requirements for Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)," AEP-NRC-2012-85, dated October 26, 2012, ADAMS Accession No. ML12312A473.

5. Letter from J. P. Gebbie, I&M, to NRC, "Donald C. Cook Nuclear Plant Unit 1 and Unit 2, Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)," dated February 27, 2013, ADAMS Accession No. ML13071A323.

A001
NRR

6. Letter from T. J. Wengert, NRC, to L. J. Weber, I&M, "Donald C. Cook Nuclear Plant, Units 1 and 2 - Request For Additional Information On The Overall Integrated Plan In Response To Order EA-12-051 Concerning Reliable Spent Fuel Pool Instrumentation (TAC NOS. MF0761 and MF0762)," dated June 19, 2013, ADAMS Accession No. ML13164A381.

7. Letter from J. P. Gebbie, I&M, to NRC, "Donald C. Cook Nuclear Plant Units 1 and 2 Response to Request for Additional Information Regarding the Overall Integrated Plan in Response to Order EA-12-051, Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," dated July 11, 2013, ADAMS Accession No. ML13196A250.

8. Letter from J. P. Gebbie, I&M, to NRC, "Donald C. Cook Nuclear Plant Units 1 and 2 Six Month Status Report in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)," dated August 26, 2013, ADAMS Accession No. ML13247A050.

9. Letter from T. J. Wengert, NRC, to L. J. Weber, I&M, "Donald C. Cook Nuclear Plant, Units 1 and 2 - Interim Staff Evaluation And Request For Additional Information Regarding The Overall Integrated Plan For Implementation Of Order EA-12-051, Reliable Spent Fuel Pool Instrumentation (TAC NOS. MF0761 AND MF0762)," dated November 13, 2013, ADAMS Accession No. ML13310B499.

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued an order (Reference 1) to Indiana Michigan Power Company (I&M), the licensee for the Donald C. Cook Nuclear Plant Units 1 and 2. Reference 1 was immediately effective and directed I&M to establish reliable spent fuel pool level instrumentation. Specific requirements are outlined in Attachment 2 of Reference 1.

Reference 1 required submission of an initial status report 60 days following issuance of the final interim staff guidance (Reference 2) and an overall integrated plan (OIP) pursuant to Section IV, Condition C. Reference 2 endorses industry guidance document Nuclear Energy Institute 12-02, Revision 1 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 4 provided I&M's initial status report regarding mitigation strategies. Reference 5 provided I&M's OIP. Reference 6 requested additional information regarding the OIP. Reference 7 provided the initial Request for Additional Information (RAI) response to Reference 6. Reference 8 provided the first six-month status report including RAI updates. Reference 9 is the NRC Interim Staff Evaluation and RAI.

Reference 1 requires submission of a status report at six-month intervals following submittal of the OIP. Reference 3 provides direction regarding the content of the status reports. The purpose of this letter is to provide the second six-month status report, effective up to February 14, 2014, pursuant to Section IV, Condition C.2, of Reference 1.

The Reference 9 RAIs have replaced the Reference 6 RAIs in Enclosure 2 (applicable RAIs from Reference 6 have been reproduced in Reference 9). Enclosure 2 includes the status of the Reference 9 RAIs and Enclosure 3 provides responses to the Reference 9 RAIs.

Enclosure 1 to this submittal provides an affirmation. Enclosure 2 provides an update of milestone accomplishments since the last status report, including any changes to the compliance method, schedule, RAI responses, or need for relief and the basis, if any. Enclosure 3 provides available RAI responses.

This letter contains no new or revised regulatory commitments. Should you have any questions, please contact Mr. Michael K. Scarpello, Regulatory Affairs Manager, at (269) 466-2649.

Sincerely,

Joel P. Gebbie
Site Vice President

JJV/amp

Enclosure:
1. Affirmation
2. Donald C. Cook Nuclear Plant Units 1 and 2, Second Six-Month Status Report for the Implementation of Order EA-12-051, Order Modifying Licenses with Regard to Requirements for Reliable Spent Fuel Pool Instrumentation
3. Donald C. Cook Nuclear Plant Units 1 and 2, Response to Request for Additional Information

c: S. R. Jones, NRR/DSS/SBPB, NRC
J. T. King, MPSC
S. M. Krawec, AEP Ft. Wayne, w/o enclosure
MDEQ – RMD/RPS
NRC Resident Inspector
C. D. Pederson, NRC Region III
T. J. Wengert, NRC Washington DC

AFFIRMATION

I, Joel P. Gebbie, being duly sworn, state that I am Site Vice President of Indiana Michigan Power Company (I&M), that I am authorized to sign and file this request with the U. S. Nuclear Regulatory Commission on behalf of I&M, and that the statements made and the matters set forth herein pertaining to I&M are true and correct to the best of my knowledge, information, and belief.

Indiana Michigan Power Company

Joel P. Gebbie
Site Vice President

SWORN TO AND SUBSCRIBED BEFORE ME

THIS 27 DAY OF February, 2014

Notary Public

My Commission Expires 04-04-2018

DANIELLE BURGOYNE
Notary Public, State of Michigan
County of Berrien
My Commission Expires 04-04-2018
Acting In the County of Berrien

ENCLOSURE 2 TO AEP-NRC-2014-16

Donald C. Cook Nuclear Plant Units 1 and 2, Second Six-Month Status Report for the Implementation of Order EA-12-051, Order Modifying Licenses with Regard to Requirements for Reliable Spent Fuel Pool Instrumentation

1 Introduction

Indiana Michigan Power Company (I&M), the licensee for Donald C. Cook Nuclear Plant (CNP), developed an Overall Integrated Plan (OIP) (Reference 1) documenting the requirements to install reliable spent fuel pool (SFP) level instrumentation in response to Reference 2. This enclosure provides an update of milestone accomplishments since submittal of the OIP. There are no changes to the compliance method, schedule, or need for relief/relaxation at this time.

2 Milestone Accomplishments

The following milestone(s) have been completed since the development of the OIP, and are current as of January 31, 2014.

- Commence Engineering Modification Design, order electronics - Engineering commenced on June 6, 2013, and electronics were ordered on July 2, 2013, by issuance of Purchase Order 01560122 (Reference 3).

3 Milestone Schedule Status

The following provides an update to the milestone schedule to support the OIP. This section provides the activity status of each item, and the expected completion date, noting any change. The dates are planning dates subject to change as design and implementation details are developed.

The revised milestone target completion dates do not impact the order implementation date.

Table 1

Milestone Completion Dates

Milestone	Target Completion Date	Activity Status	Revised Target Completion Date
Submit 60-Day Status Report	October 2012	Complete	
Submit OIP	February 2013	Complete	
Unit 1 refueling outage (1st RFO) start	March 2013	Complete	
Submit 6 Month Updates:			
Update 1	August 2013	Complete	
Update 2	February 2014	Complete with this submittal	

Table 1 Milestone Completion Dates			
Milestone	**Target Completion Date**	**Activity Status**	**Revised Target Completion Date**
Update 3	August 2014	Not Started	
Update 4	February 2015	Not Started	
Modifications:			
Commence Engineering Modification Design	April 2013	Complete	
Order Electronics	April 2013	Complete	
Complete Design	December 2013	In Progress	July 2014
Receive electronics	December 2013	Not Started	April 2014
Commence Installation	June 2014	Not Started	
Complete functional test	November 2014	Not Started	
Procedures:			
Issue Maintenance Procedures	August 2014	Not Started	
Training:			
Implement Training	September 2014	Not Started	
Submit Completion Report	February 2015	Not Started	

4 Changes to Compliance Method

There are no changes to the compliance method as documented in the OIP.

5 Need for Relief/Relaxation and Basis for the Relief/Relaxation

I&M expects to comply with the order implementation date and no relief/relaxation is required at this time.

6 Open Items from OIP and Draft Safety Evaluation

The following table provides a summary of the open items as discussed in the Request for Additional Information (RAI) (Reference 4). Currently, there is no Draft Safety Evaluation (SE) (Table 3).

Table 2
OPEN ITEM STATUS

RAI	Status
RAI #1 Please identify the final elevations identified as Levels 2 and 3 as well as the top of the fuel rack elevation.	Enclosure 3
RAI #2 Please identify the final SFP level instrumentation measurement range.	Enclosure 3
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.	Target Response Date: March 31, 2014
RAI #4 For RAI #3(a) above, please provide the analyses used to verify the design criteria and methodology for seismic testing of the SFP instrumentation and the electronics units, including, design basis maximum seismic loads and the hydrodynamic loads that could result from pool sloshing or other effects that could accompany such seismic forces.	Enclosure 3
RAI #5 For each of the mounting attachments required to attach SFP level equipment to plant structures, please describe the design inputs, and the methodology that was used to qualify the structural integrity of the affected structures/equipment.	Enclosure 3

Table 2
OPEN ITEM STATUS

RAI	Status
RAI #6 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: 1) the level sensor mounted in the SFP area; and 2) 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.	Enclosure 3
RAI #7 For RAI #6 above, please provide the results for the selected methods, tests and analyses used to demonstrate the qualification and reliability of the installed equipment in accordance with the Order requirements.	Enclosure 3
RAI #8 Please provide the following: a) A description of how the two channels of the proposed level measurement system meet this requirement [for separation] so that the potential for a common cause event to adversely affect both channels is minimized to the extent practicable. 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.	a) Target Response Date: March 31, 2014 b) Enclosure 3
RAI #9 Please provide the following: a) A description of the electrical alternating current power sources and capabilities for the primary and backup channels. b) Please provide the results of the calculation depicting the battery backup duty cycle requirements demonstrating that its capacity is sufficient to maintain the level indication function until offsite resource availability is reasonably assured.	Enclosure 3

Table 2
OPEN ITEM STATUS

RAI	Status
RAI #10 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.	Enclosure 3
RAI #11 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 preventive 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.	a) Target Response Date: March 31, 2014 b) Enclosure 3 c) Enclosure 3 d) Enclosure 3
RAI #12 Please provide a list of the procedures addressing operation (both normal and abnormal response), calibration, test, maintenance, and inspection procedures that will be developed for use of the spent SFP instrumentation. The licensee is requested to include a brief description of the specific technical objectives to be achieved within each procedure.	Target Response Date: March 31, 2014

Table 2 OPEN ITEM STATUS	
RAI	**Status**
RAI #13 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 Nuclear Energy Institute 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.	Enclosure 3

Table 3 Draft SE	
Open Item	**Status**
None	

7 Potential Draft SE Impacts

CNP has not yet received a Draft SE; therefore, no potential impacts can be determined.

8 References

The following references support the updates to the OIP described in this attachment.

1. Letter from J. P. Gebbie, Indiana Michigan Power Company (I&M), to U. S. Nuclear Regulatory Commission (NRC), "Donald C. Cook Nuclear Plant Unit 1 and Unit 2, Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)," dated February 27, 2013, ADAMS Accession No. ML13071A323.

2. Letter from E. J. Leeds and M. R. Johnson, NRC to All Power Reactor Licensees and Holders of Construction Permits in Active or Deferred Status, "Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," NRC Order Number EA-12-051, dated March 12, 2012, ADAMS Accession No. ML12054A682.

3. I&M Purchase Order 01560122 issued July 2, 2013 to Mohr Test and Measurement LLC.

4. Letter from T. J. Wengert, NRC, to L. J. Weber, I&M, "Donald C. Cook Nuclear Plant, Units 1 And 2 - Interim Staff Evaluation And Request For Additional Information Regarding The Overall Integrated Plan For Implementation Of Order EA-12-051, Reliable Spent Fuel Pool Instrumentation (TAC NOS. MF0761 and MF0762)," dated November 13, 2013, ADAMS Accession No. ML13310B499.

Enclosure 3 TO AEP-NRC-2014-16

Donald C. Cook Nuclear Plant Units 1 and 2
Response to Request for Additional Information

Note: The RAI responses below are based on the best available information and preliminary vendor documents. Since the analysis and design have not been completed, the information is subject to change.

RAI #1

Please identify the final elevations identified as Levels 2 and 3 as well as the top of the fuel rack elevation.

RESPONSE:

Level 2:

Spent Fuel Pool (SFP) Level of 24 feet (')-8 inches (") (Elevation (El.) 630'-10 ½")
Basis:

a) MD-12-SFP-002-N states that the highest point to the top of any spent fuel rack is 14'-8" (El. 620'-10 ½") from the bottom the SFP (El 606'- 2 ½"). An additional 10' gives 24'-8" (El. 630'-10 ½").

b) PMP-2080-EPP-101, Attachment 3 "Alert R-3 Loss of Water Level in any Area Holding Irradiated Fuel" designates "12 feet (of water) above the top of the spent fuel" as the level which "provides adequate radiation shielding for staff personnel from excessive radiation doses in the area of the SFP." Per MD-12-SFP-002-N, the top of the spent fuel assemblies are at 620'- 3 ½". Adding 12' corresponds to a SFP level of 26'-1" (El. 632'-3 ½"). This level provides maximum shielding to personnel.

Item 'a' is chosen (SFP Level at El. 630'-10 ½") for Level 2 as it provides the least amount of shielding over the fuel during accident conditions for analysis purposes. This approach is taken for consistency and conservatism in the radiation dose calculation being performed for this modification for equipment qualification as it provides the greatest dose to the equipment when the pool is at Level 2.

Level 3:

SFP Level of 14'-8" (El. 620'-10 ½")

Basis:
Nuclear Energy Institute (NEI)12-02 defines Level 3 nominally as the highest point of any fuel rack seated in the SFP. MD-12-SFP-002-N states that the highest point to the top of any spent fuel rack is 14'-8" (El. 620'-10 ½").

Fuel Rack Elevation:

MD-12-SFP-002-N states that the highest point to the top of any spent fuel rack is 14'-8" (El. 620'-10 ½").

RAI #2

Please identify the final SFP level instrumentation measurement range.

RESPONSE:

The instrumentation will be capable of measurement of a maximum pool water level at El. 649'-1". This bounds the required Level 1 measurement of 645'- 1 ½".

The instrumentation will be capable of measurement of a pool water level of 621'-2 ½", which bounds the required Level 3 measurement of 620'- 10 ½" ±1 foot.

Based on the above discussion, the current design provides for a level instrument measurement range of 27'-10 ½" (El. 649'-1" to El. 621'-2 ½").

Reference: MOHR Test and Measurement Drawings 1-0430-19.1A and 1-0430-19.1B.

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.

RESPONSE:

Target Response Date: March 31, 2014.

RAI #4

For RAI 3(a) above, please provide the analyses used to verify the design criteria and methodology for seismic testing of the SFP instrumentation and the electronics units, including, design basis maximum seismic loads and the hydrodynamic loads that could result from pool sloshing or other effects that could accompany such seismic forces.

RESPONSE:

The analyses will be contained in Proprietary MOHR Test and Measurement LLC Reports:

1. NAI-1725-004, "Seismic Induced Hydraulic Response in the CGS Spent Fuel Pool."
2. NAI-1791-001, "Seismic Induced Hydraulic Response in the D. C. Cook Spent Fuel Pool."
3. 1-0410-9, "MOHR SFP-1 Level Probe Assembly Seismic Analysis Report.
4. 1-0410-9.1, "MOHR SFP-1 Site-Specific Seismic Analysis Report: D. C. Cook Nuclear Plant (D.C. Cook)."
5. 1-0410-6, "MOHR EFP-IL SFPI System Seismic Test Report."

Mounting bracket design and Seismic Class I mounting analysis will be included in modification package EC-52892.

RAI #5

For each of the mounting attachments required to attach SFP Level equipment to plant structures, please describe the design inputs, and the methodology that was used to qualify the structural integrity of the affected structures/equipment.

RESPONSE:

The SFP Level Probe Mounting Brackets will be attached to the SFP wall (above the liner) consistent with Seismic Class I mounting practices. Design inputs will include the weight of the probes and forces determined by vendor analyses including seismic and pool sloshing effects on the probe. The design will provide assurance by evaluation, including calculation and analysis, that the structural integrity of the SFP wall is not adversely affected by the attachment

of the probes to the pool wall. The mounting bracket Seismic Class I mounting analysis will be included in modification package EC-52892.

RAI #6

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.

RESPONSE:

Temperature and Humidity: Equipment will be certified to function properly during and after exposure to temperatures from -10 to +55 degrees Celsius, and humidity from 5 to 95 percent (%).

Shock and Vibration: The electronic portion of the equipment and associated batteries will be tested to demonstrate general robustness including shock resistance for handling and transport, and vibration resistance appropriate for equipment in large power plants.

Radiation: Equipment located in the spent fuel pool area will be evaluated to withstand postulated accident conditions with an expected life of 40 years.

Reference Reports:

1. 1-0410-1, "MOHR EFP-IL SFPI System Temperature and Humidity Test Report."
2. 1-0410-2, "MOHR SFP-1 Level Probe Assembly Materials Qualification Report."
3. 1-0410-5, "MOHR EFP-IL System Shock and Vibration Test Report."

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: 1) the level sensor mounted in the SFP area, and 2) 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.

RESPONSE:

The system electronics and batteries will be seismically tested and qualified using Institute of Electrical and Electronics Engineers (IEEE)-344:2004 methodology.

The system probe assembly will be qualified by analysis.

Seismic and hydrodynamic finite element analysis will be performed by the vendor using relevant IEEE-344:2004 methodology.

With respect to the probe assembly, combined seismic and hydrodynamic analyses will be used to demonstrate that the probe waveguide's geometric dimensions do not change significantly as a result of the seismic conditions. In the absence of alteration to the geometric configuration of the probe waveguide there is no mechanism for seismic excitation of the probe assembly to alter system accuracy.

The accuracy of system electronics will be demonstrated following seismic excitation as part of the seismic testing protocol.

Reference Reports:

1. 1-0410-6, "MOHR EFP-IL SFPI System Seismic Test Report."
2. 1-0410-9, "MOHR SFP-1 Level Probe Assembly Seismic Analysis Report."
3. 1-0410-9.1, "MOHR SFP-1 Site-Specific Seismic Analysis Report: D. C. Cook Nuclear Plant (D.C. Cook)."
4. NAI-1725-004, "Seismic Induced Hydraulic Response in the CGS Spent Fuel Pool."
5. NAI-1791-001, "Seismic Induced Hydraulic Response in the D. C. Cook Spent Fuel Pool."

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.

RESPONSE:

With respect to the probe assembly, combined seismic and hydrodynamic analyses will be used to demonstrate that the probe waveguide's geometric dimensions do not change significantly as a result of the seismic conditions. In the absence of alteration to the geometric configuration of the probe waveguide there is no mechanism for seismic excitation of the probe assembly to alter system accuracy.

The accuracy of system electronics will be demonstrated following seismic excitation as part of the seismic testing protocol.

Reference Reports:

1. 1-0410-6, "MOHR EFP-IL SFPI System Seismic Test Report."
2. 1-0410-9, "MOHR SFP-1 Level Probe Assembly Seismic Analysis Report."

3. 1-0410-9.1, "MOHR SFP-1 Site-Specific Seismic Analysis Report: D. C. Cook Nuclear Plant (D.C. Cook)."

4. NAI-1725-004, "Seismic Induced Hydraulic Response in the CGS Spent Fuel Pool."

5. NAI-1791-001, "Seismic Induced Hydraulic Response in the D. C. Cook Spent Fuel Pool."

RAI #7

For RAI #6 above, please provide the results for the selected methods, tests and analyses used to demonstrate the qualification and reliability of the installed equipment in accordance with the Order requirements.

RESPONSE:

The results will be included in the following reports from MOHR Test and Measurement LLC:

- 1-0410-1 MOHR EFP-IL SFPI System Temperature and Humidity Test Report.
- 1-0410-2 MOHR SFP-1 Level Probe Assembly Materials Qualification Report.
- 1-0410-3 MOHR EFP-IL System Proof of Concept Report.
- 1-0410-4 MOHR EFP-IL SFPI System EMC Test Report.
- 1-0410-5 MOHR EFP-IL SFPI System Shock and Vibration Test Report.
- 1-0410-6 MOHR EFP-IL SFPI System Seismic Test Report.
- 1-0410-7 MOHR EFP-IL SFPI System Battery Life Report.
- 1-0410-8 MOHR EFP-IL SFPI System Boric Acid Deposition Report.
- 1-0410-9 MOHR SFP-1 Level Probe Assembly Seismic Analysis Report.
- 1-0410-9.1 MOHR SFP-1 Site-Specific Seismic Analysis Report: D. C. Cook Nuclear Plant (D.C Cook).
- 1-0410-10 MOHR EFP-IL SFPI System Power Interruption Report.
- NAI-1725-004 Seismic Induced Hydraulic Response in the CGS Spent Fuel Pool.
- NAI-1791-001 Seismic Induced Hydraulic Response in the D. C. Cook Spent Fuel Pool.

RAI #8

Please provide the following:

a) ***A description of how the two channels of the proposed level measurement system meet this requirement [for separation] so that the potential for a common cause event to adversely affect both channels is minimized to the extent practicable.***

RESPONSE:

Target Response Date: March 31, 2014.

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.***

RESPONSE:

The Unit 1 instrument will be mounted in the Northwest corner of the SFP and the Unit 2 instrument will be mounted in the Northeast corner of the SFP. The instrument displays will be wall mounted in the respective control rooms (CR).

The conceptual design provides two independent level instruments in the SFP with cabling routed to two display/processors mounted in each respective CR. Power for each channel is provided from independent 120 Volt (V) Alternating Current (AC), 60 Hertz power sources. Backup power is provided by a battery capable of providing display operation for seven days. Each display/processor will have a dedicated battery. The design prevents failure of a single channel from causing the redundant channel to fail.

The design provides two identical non-safety related wide-range level instruments which feed two independent trains of non-safety cable and indicators to provide a highly reliable remote display of SFP water level in each CR. Physical separation of the two channels will be accomplished by separately routing cable and conduit.

RAI #9

Please provide the following:

a) ***A description of the electrical ac power sources and capabilities for the primary and backup channels.***

RESPONSE:

The level indicating systems will be installed as independent, redundant systems. Each will be powered by an independent 120VAC source. Each system will be provided with a battery back-up power supply capable of powering the system for seven days.

- Primary power for the level indicating systems with the display installed in the Unit 1 CR will be 120 VAC power panel 1-CCRP-3.

- Primary power for the level indicating systems with the display installed in the Unit 2 CR will be 120 VAC power panel 2-CCRP-3.

- The Unit 1 channel will receive power from a different 480V bus than the Unit 2 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 AC power.

- Each backup battery is maintained in a charged state by a commercial grade UPS. The batteries are sized to be capable of supporting monitoring for seven days of operation. This provides adequate time to allow the batteries to be replaced with a fresh battery or until off-site resources can be deployed by the mitigating strategies resulting from Order EA-12-049.

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

The sample rate estimates have been developed by the vendor using conservative instrument power requirements and measured battery capacity with draw-downs during and following exposure of the batteries to their maximum operating temperature for up to seven days. The instrument configuration is planned to be established for an automated sample rate when under battery power consistent with seven days continuous operation. Permanent installed battery capacity for seven days continuous operation is planned consistent with NEI 12-02 duration without reliance on or crediting of potentially more rapid flexible strategies (FLEX) program power restoration. Batteries are readily replaceable via spare stock without the need for recalibration to maintain accuracy of the instrument. These measures ensure adequate power capacity and margin.

Reference Reports:

1. 1-0410-10, "MOHR EFP-IL SFPI System Power Interruption Report."

2. 1-0410-7, "MOHR EFP-IL SFPI System Battery Life Report."

b) Please provide the results of the calculation depicting the battery backup duty cycle requirements demonstrating that its capacity is sufficient to maintain the level indication function until offsite resource availability is reasonably assured.

RESPONSE:

The sample rate estimates have been developed by the vendor using conservative instrument power requirements and measured battery capacity with draw-downs during and following exposure of the batteries to their maximum operating temperature for up to seven days. The instrument configuration is planned to be established for an automated sample rate when under battery power consistent with seven days continuous operation. Permanent installed battery capacity for seven days continuous operation is planned consistent with NEI 12-02 duration without reliance on or crediting of potentially more rapid FLEX program power restoration. Batteries are readily replaceable via spare stock without the need for recalibration to maintain accuracy of the instrument. These measures ensure adequate power capacity and margin.

Reference Report: 1-0410-7, "MOHR EFP-IL SFPI System Battery Life Report."

RAI #10

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.

RESPONSE

Accuracy: The absolute system accuracy is expected to be better than ± 3 inches. This accuracy is applicable for normal conditions and also the temperature, humidity, chemistry, and radiation levels expected for beyond-design-basis event conditions. Accuracy will be validated by Factory Acceptance Testing.

Trending: The display trends and retains data when powered from either normal or backup power. This has been verified by vendor testing.

Restoration after Loss of Power: The system automatically swaps to available power (backup battery power or external power source) when normal power is lost. Neither the source of power nor system restoration impact accuracy. Previously collected data is retained. This has been verified by vendor testing.

Diagnostics: The system performs and displays the results of real-time information related to the integrity of the cable, probe, and instrument channel.

The instrument channel level accuracy is expected to be better than ± 3.0 inches for all expected conditions. The expected instrument channel accuracy performance would be approximately ±1% of span [based on the sensitive range of the detector]. This is a conservative bounding instrument channel accuracy with the vendor estimating expected instrument channel accuracy is approximately one-third of the above bounding accuracy.

In general relative to normal operating conditions, any applicable calibration procedure tolerances [or acceptance criterion] are planned to be established based on manufacturer's stated/recommended reference accuracy [or design accuracy]. The methodology used is planned to be captured in plant procedures and/or programs.

Reference Reports:

1. 1-0410-10, "MOHR EFP-IL SFPI System Power Interruption Report."

2. 1-0410-3, "MOHR EFP-IL System Proof of Concept Report."

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.

RESPONSE

The expected methodology to be used for determining the maximum allowed deviation from the instrument channel design accuracy that will be employed under normal operating conditions will be "Root Sum Squared" of channel accuracy plus an allowance for margin.

RAI #11

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.

RESPONSE:

Target Response Date: March 31, 2014.

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.

RESPONSE:

Each instrument electronically logs a record of measurement values over time in non-volatile memory that can be compared to demonstrate constancy, including any changes in pool level, such as that associated with the normal evaporative loss/refilling cycle. The channel level measurements can be directly compared to each other (i.e., regular cross-channel comparisons). Any existing permanently installed SFP level instrumentation or other direct measurements of SFP level may be used for diagnostic purposes if cross-channel comparisons are anomalous.

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.

RESPONSE:

Functional checks are automated and/or semi-automated (requiring limited operator or technician interaction) and are performed through the instrument menu software and initiated by the operator or technician. There are a number of other internal system tests that are performed by system software on an essentially continuous basis without user intervention but can also be performed on an on-demand basis with diagnostic output to the display for the operator or technician to review. Other tests such as menu button tests, level alarm, and alarm relay tests are only initiated manually by the operator or technician. Functional checks will be performed at a frequency, at a minimum, commensurate with vendor requirements.

Calibration checks are described in detail in the Vendor Operator's Manual, and the applicable information will be contained in plant procedures or preventive maintenance tasks. Calibration checks will be performed at a frequency, at a minimum, commensurate with vendor requirements, not to exceed calibration frequency required by Order EA-12-051.

d) A description of what preventive 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.

RESPONSE:

Formal calibration checks are recommended by the vendor on a two-year interval to demonstrate calibration to external National Institute of Standards and Technology-traceable standards. Formal calibration check surveillance interval and timing would be established consistent with the requirements of Order EA-12-051.

RAI #12

Please provide a list of the procedures addressing operation (both normal and abnormal response), calibration, test, maintenance, and inspection procedures that will be

developed for use of the spent SFP instrumentation. The licensee is requested to include a brief description of the specific technical objectives to be achieved within each procedure.

RESPONSE:

Target Response Date: March 31, 2014.

RAI #13

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.***

RESPONSE:

Functional checks are automated and/or semi-automated and are performed through the instrument menu software and initiated by the operator. There are a number of other internal system tests that are performed by system software on an essentially continuous basis without user intervention but can also be performed on an on-demand basis with diagnostic output to the display for the operator to review. Functional checks are described in detail in the Vendor Manual, and the applicable information is planned to be contained in plant procedures and preventive maintenance tasks. Functional tests are planned to be performed periodically at appropriate frequencies established equivalent to or more frequently than vendor requirements.

Channel calibration tests per maintenance procedures with limits established in consideration of vendor equipment specifications are planned to be performed at frequencies established in consideration of vendor recommendations.

Spent fuel pool instrumentation (SFPI) channel/equipment maintenance/preventative maintenance and testing program requirements to ensure design and system readiness are planned to be established in accordance with Donald C. Cook Nuclear Plant processes and procedures and in consideration of vendor recommendations to ensure that appropriate regular testing, channel checks, functional tests, periodic calibration, and maintenance is performed (and available for inspection and audit). These maintenance and testing program requirements will be developed during the SFPI modification design process.

Both SFPI channels incorporate permanent installation of relatively simple, robust equipment. Permanent installation coupled with stocking of adequate spare parts reasonably diminishes the likelihood that a single channel (and greatly diminishes the likelihood that both channels) is (are) out-of-service for an extended period of time.

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.

RESPONSE:

Both SFPI channels incorporate permanent installation of relatively simple and robust equipment. Permanent installation coupled with stocking of adequate spare parts reasonably diminishes the likelihood that a single channel (and greatly diminishes the likelihood that both channels) is (are) out-of-service for an extended period of time.

The primary or back-up instrument channel can be out of service for testing, maintenance, and/or calibration for up to 90 days provided the other channel is functional. Additionally, compensatory actions must be taken if the instrumentation channel is not expected to be restored or is not restored within 90 days.

For a single channel that is not expected to be restored, or is not restored within 90 days, the compensatory actions will include steps necessary to ensure availability of normal alarms and proper function of the remaining indication channel validated by direct visual monitoring.

If both channels become non-functioning then actions will be initiated within 24 hours to restore one of the channels of instrumentation and to implement compensatory actions within 72 hours. Compensatory actions will include steps necessary to ensure availability of normal alarms and increased direct visual monitoring of spent fuel pool level.

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.

RESPONSE:

For a single channel that is not expected to be restored, or is not restored within 90 days, the compensatory actions will include steps necessary to ensure availability of normal alarms and proper function of the remaining indication channel validated by direct visual monitoring.

Reference:

Letter from T. J. Wengert, U. S Nuclear Regulatory Commission, to L. J. Weber, Indiana Michigan Power Company, "Donald C. Cook Nuclear Plant, Units 1 And 2 - Interim Staff Evaluation And Request For Additional Information Regarding The Overall Integrated Plan For Implementation Of Order EA-12-051, Reliable Spent Fuel Pool Instrumentation (TAC NOS. MF0761 AND MF0762)," Dated November 13, 2013, ADAMS Accession No. ML13310B499.