



Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72802
Tel 479-858-3110

Jeremy G. Browning
Site Vice President
Arkansas Nuclear One

OCAN021503

February 24, 2015

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
11555 Rockville Pike
Rockville, MD 20852

SUBJECT: Fourth Six-Month Status Report in Response to March 12, 2012, *Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool (SFP) Instrumentation* (Order Number EA-12-051)
Arkansas Nuclear One – Units 1 and 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6

REFERENCES: 1. NRC Order Number EA-12-051, *Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation*, dated March 12, 2012 (OCNA031207) (ML12054A679)

2. Entergy letter to NRC, *Overall Integrated Plan (OIP) in Response to March 12, 2012, Commission Order Modifying License with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)*, dated February 28, 2013 (OCAN021303) (ML13063A015)

3. Entergy letter to NRC, *Third 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 28, 2014 (OCAN081403) (ML14246A209)

Dear Sir or Madam:

On March 12, 2012, the NRC issued an order (Reference 1) to Entergy Operations, Inc. (Entergy), which required submission of an OIP pursuant to Section IV, Condition C. The subject OIP was provided by Reference 2.

Reference 1 also requires submission of a status report at six-month intervals following submittal of the OIP. Reference 3 provided the third six-month status report. The purpose of this letter is to provide the fourth six-month status report pursuant to Section IV, Condition C.2, of Reference 1, that delineates progress made in implementing the requirements of Reference 1. The attached report provides an update of milestone accomplishments since the last status report, including any changes to the compliance method, schedule, or need for relief and the basis, if any.

This letter contains no new regulatory commitments. Should you have any questions regarding this submittal, please contact Stephenie Pyle at 479.858.4704.

I declare under penalty of perjury that the foregoing is true and correct; executed on February 24, 2015.

Sincerely,

ORIGINAL SIGNED BY JEREMY G. BROWNING

JGB/nbm

Attachment: Arkansas Nuclear One Units 1 and 2 Fourth Six-Month Status Report for the Implementation of Order EA-12-051, *Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation*

cc: Mr. Marc L. Dapas
Regional Administrator
U. S. Nuclear Regulatory Commission, Region IV
1600 East Lamar Boulevard
Arlington, TX 76011-4511

NRC Senior Resident Inspector
Arkansas Nuclear One
P.O. Box 310
London, AR 72847

U. S. Nuclear Regulatory Commission
Attn: Ms. Andrea E. George
MS O-8B1
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

U. S. Nuclear Regulatory Commission
Attn: Mr. Peter Bamford
MS O13F15M
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

Attachment to

OCAN021503

Arkansas Nuclear One (ANO) Units 1 and 2 (ANO-1 and ANO-2) Fourth Six Month Status Report for the Implementation of Order EA-12-051, *Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation*

**ANO-1 and ANO-2 Fourth Six Month Status Report for the Implementation of
Order EA-12-051, Order to Modify Licenses with Regard to Reliable Spent Fuel
Pool Instrumentation**

1. Introduction

Entergy Operations, Inc. (Entergy) developed an overall integrated plan (OIP) provided via Reference 1 for ANO-1 and ANO-2, documenting the requirements to install reliable Spent Fuel Pool instrumentation (SFPI), in response to Reference 2. This attachment provides an update of milestone accomplishments since the last status report, including any changes to the compliance method, schedule, or need for relief/relaxation and the basis, if any.

2. Milestone Accomplishments

The following milestone(s) have been completed since July 31, 2014, and are current as of February 19, 2015.

- ANO-2 Modification Package (EC-48348) issued
- NRC #1 Request for Additional Information (RAI) response originally submitted July 25, 2013 (this item is updated/revised per this submittal)
- NRC #2 Interim Staff Evaluation (ISE) RAI response completed September 30, 2014, via ePortal upload of "Bridging Document" (this item is updated/revised per this submittal)
- ANO-1 Modification Package (EC-44046) installed

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.

Milestone	Target Completion Date [†]	Activity Status	Revised Target Completion Date
ANO-1 Reliable SFPI – Design Modification Package Developed/Issued	March 2014	EC-44046 Issued	NA
ANO-1 Reliable SFPI – Installed	1R25 (Early 2015 Refueling Outage)	EC-44046 Installed 1R25**	NA
ANO-2 Reliable SFPI – Design Modification Package Developed/Issued	September 2014	EC-48348 Issued	NA
ANO-2 Reliable SFPI Installed	2R24 (Fall 2015 Refueling Outage)	Pending	NA
#1 NRC RAI (Received June 26, 2013)	June 26, 2013	Received	NA
#1 NRC RAI (Responded July 25, 2013)	July 25, 2013	Submitted*	NA
#2 NRC ISE RAI (Received October 29, 2013)	October 29, 2013	Received	NA
#2 NRC ISE RAI (Responded September 30, 2014, via “Bridging Document” upload to ePortal)	September 30, 2014	Submitted*	NA

[†] Target Completion Date is the last submitted date from either the overall integrated plan or previous six-month update.

* Updated/Revised per this submittal.

**Strategies to ensure that SFP water level addition is initiated at an appropriate time and that supporting plant power systems are repowered with portable independent equipment are being established as required by implementation of Order EA-12-049 (Reference 6). ANO-1 EA-12-049 Order implementation schedule relaxation was approved on May 20, 2014 (Reference 7). Independent of the strategies yet to be implemented, ANO-1 EA-12-051 Order (Reference 2) compliance is assured from a power supply requirement perspective by incorporation of permanently installed battery capacity (independent of plant sources) analyzed for full required event duration of seven days without a requirement to rely on more rapid restoration strategies per Order EA-12-049 (Reference 6); thereby, maintaining the level indication function for full event duration, including until offsite resource availability is reasonably assured.

4. Changes to Compliance Method

There are no additional changes to the compliance method.

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

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

6. Open Items from OIP and ISE

Entergy has received an ISE that includes 17 RAIs. The following table provides RAI status.

RAI	ANO-1 Response Status	ANO-2 Response Status
1	Response updated, see Section 9	Response updated, see Section 9
2	Uploaded to e-portal September 30, 2014	Uploaded to e-portal September 30, 2014
3	Uploaded to e-portal September 30, 2014	Uploaded to e-portal September 30, 2014
4	Submitted in Reference 3	Submitted in Reference 3
5	Uploaded to e-portal September 30, 2014	Uploaded to e-portal September 30, 2014
6	Uploaded to e-portal September 30, 2014	Uploaded to e-portal September 30, 2014
7	Uploaded to e-portal September 30, 2014	Uploaded to e-portal September 30, 2014
8	Uploaded to e-portal September 30, 2014	Uploaded to e-portal September 30, 2014
9	Uploaded to e-portal September 30, 2014	Uploaded to e-portal September 30, 2014
10	Uploaded to e-portal September 30, 2014	Uploaded to e-portal September 30, 2014
11	Submitted in Reference 3	Submitted in Reference 3
12	Uploaded to e-portal September 30, 2014	Uploaded to e-portal September 30, 2014
13	Uploaded to e-portal September 30, 2014	Uploaded to e-portal September 30, 2014
14	Uploaded to e-portal September 30, 2014 – Response updated, see Section 9	Uploaded to e-portal September 30, 2014 – Response updated, see Section 9
15	Uploaded to e-portal September 30, 2014 – Response updated, see Section 9	Uploaded to e-portal September 30, 2014 – Response updated, see Section 9
16	Uploaded to e-portal September 30, 2014 – Response updated, see Section 9	Uploaded to e-portal September 30, 2014 – Response updated, see Section 9
17	Uploaded to e-portal September 30, 2014 – Response updated, see Section 9	Uploaded to e-portal September 30, 2014 – Response updated, see Section 9

7. Potential ISE Impacts

Potential impacts to the ISE in addition to those identified in Section 6 are associated with revisions to initial RAI (Reference 4) responses and their discussion within the ISE. The Reference 4 RAI responses and the ISE RAI responses were based on the projected design and implementation strategies at the time. The Reference 4 RAI response updates below and the ISE RAI response updates contained in Section 9 illustrate the final SFPI design/implementation for ANO-1 and planned design/implementation for ANO-2.

Reference 4 RAI Responses for RAI #5.b and RAI #9.b are revised as follows.

Reference 4 RAI #5.b

The Reference 4 RAI #5.b response is revised to acknowledge no requirement to credit SFPI battery replacement or maintaining of spare battery stock (and no requirement to credit alternate external DC source connection capability) by virtue of a design incorporating permanently installed rechargeable battery capacity for a full required event duration of seven days (in lieu of OIP three day minimum) coupled with FLEX power restoration strategies, although installed batteries are replaceable and alternate external DC source connection capability is available. It is noted that the "Bridging Document" should also be referenced for related information. RAI #5.b response is revised as follows (additions italicized):

RAI #5.b 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 BDBEE for the minimum duration needed, consistent with the plant Diverse and Flexible Coping Strategies (FLEX) Program plans.

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 and alternate external DC power source connection capability is available; however, a design incorporating installed rechargeable battery capacity for a full seven days coupled with FLEX power restoration strategies precludes the requirement for crediting battery replacement or battery spare stock or use of the alternate external DC power source capability.~~ *Power sources can change without the need for recalibration to maintain accuracy of the instrument. These measures ensure adequate power capacity and margin.*

Reference 4 RAI #9.b

The Reference 4 RAI #9.b response is revised to be more consistent with NEI 12-02, Revision 1, guidance. The table and associated note are revised as follows (changes not tracked). Additions to the leading paragraph are italicized.

RAI #9.b Please provide 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.

Both primary and backup SFPI channels incorporate permanent installation (with no reliance on portable, post-event installation) of relatively simple and robust augmented quality equipment. Permanent installation coupled with *vendor* stocking of adequate spare parts reasonably diminishes the likelihood that a single channel (and ~~greatly~~ *reasonably* diminishes the likelihood that both channels) is (are) out-of-service for an extended period of time. ~~Planned~~ Compensatory actions for unlikely extended out-of-service events are summarized as follows:

# Channel(s) Out-of-Service	Required Restoration Action	Compensatory Action if Required Restoration Action Not Completed within Specified Time
1	Restore channel to functional status within 90 days	Immediately implement compensatory measures
2	Restore one channel to functional status within 24 hours	Within 48 hours implement compensatory measures

Note: For ANO-1, the implemented Technical Requirements Manual (TRM) Bases discusses potential compensatory measures which may be considered, consistent with NEI 12-02, Revision 1, guidance, including use of suitable alternate equipment or supplemental personnel stationed at the SFP. For ANO-2, comparable TRM implementation is planned.

8. References

1. Entergy letter to NRC, *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 28, 2013 (0CAN021303) (ML13063A015)
2. NRC Order Number EA-12-051, *Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation, dated March 12, 2012 (0CNA031207) (ML12054A679)*
3. Entergy letter to NRC, *Third 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 28, 2014 (0CAN081403) (ML14246A209)

4. Entergy letter to NRC, *Response to Request for Additional Information (RAI) for the Overall Integrated Plan (OIP) in Response to the Commission Order Modifying Licenses with Regard to Requirements for Reliable Spent Fuel Pool (SFP) Instrumentation*, dated July 25, 2014 (OCAN071301) (ML13207A269)
5. ANO Engineering Change (EC)-44046, *NRC Order EA-12-051 SFP Instrumentation Implementation*
6. NRC Order Number EA-12-049, *Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events*, dated March 12, 2012 (OCNA031206) (ML12056A045)
7. NRC letter to Entergy, *Arkansas Nuclear One, Unit 1 - Relaxation Of The Schedule Requirements For Order EA-12-049 "Issuance Of Order To Modify Licenses With Regard To Requirements For Mitigation Strategies For Beyond-Design-Basis External Events,"* dated May 20, 2014 (1CNA051402) (ML14114A697)

9. Updates to Responses to ISE RAIs for ANO-1 and ANO-2

RAI #1: Please provide information regarding the projected dose rate impact of any irradiated hardware stored in the SFP on the Level 2 value. Please provide any changes in the elevation identified as Level 2, if applicable.

Original Entergy Response (Reference 3)

Interim Staff Guidance (ISG) JLD-ISG-2012-03, *Compliance with Order EA-12-051, Reliable SFP Instrumentation*, states "The NRC staff considers that the methodologies and guidance in conformance with the guidelines provided in Nuclear Energy Institute (NEI) 12-02, Revision 1, subject to the clarifications and exceptions in Attachment 1 to this ISG, are an acceptable means of meeting the requirements of Order EA-12-051."

NEI 12-02, Revision 1, Section 2.3.2, defines Level 2 as a "level that is adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck." Level 2 represents the range of water level where any necessary operations in the vicinity of the SFP can be completed without significant dose consequences from direct gamma radiation from the stored spent fuel. Level 2 is based on either of the following:

- Ten feet (+/- one foot) above the highest point of any fuel rack seated in the SFPs, or
- a designated level that provides adequate radiation shielding to maintain personnel radiological dose levels within acceptable limits while performing local operations in the vicinity of the pool. This level shall be based on either plant-specific or appropriate generic shielding calculations, considering the emergency conditions that may apply at the time and the scope of necessary local operations, including installation of portable SFP instrument channel components. Additional guidance can be found in EPA-400, USNRC Regulatory Guide 1.13, and ANSI/ANS-57.2-1983.

Entergy has selected the ten-foot option which has been determined by the NRC to meet the requirements of the order with no further evaluation or review required.

The following is added to that provided in the Third Six-Month Status Report (Reference 3):

Permanently stored irradiated material in the SFP is not hung from the SFP walls; therefore, there are no specific requirements in the procedures controlling irradiated equipment or materials stored in the SFP. Because Entergy has chosen Level 2 as ten feet (+/- one foot) above the highest point of any fuel rack seated in the SFPs, no additional analysis is required. Additionally, the ANO FLEX strategy ensures that activities in the proximity of the SFP are completed prior to the calculated time to boil and thus prior to reduction of SFP level; therefore, this strategy ensures that necessary operations in the vicinity of the SFP can be completed without significant dose consequences.

RAI #14: Please provide 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.

RAI #15: Please provide a description of the in-situ calibration process at the SFP location that will result in the channel calibration being maintained at its design accuracy.

RAI #16: 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.

RAI #17: Please provide 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.

The updated responses to RAIs #14, #15, #16, and #17 are combined due to their commonalities. The following supersedes previous responses.

The ANO SFP instrument channels automatically monitor the integrity of the measurement system using in-situ capability or on-board diagnostics. Deviation of measured test parameters from manufactured or as-installed configuration beyond a configurable threshold prompts operator intervention. The probe itself is a perforated tubular coaxial waveguide with defined geometry and is not calibrated. Channel design provides capability for calibration or validation against known/actual SFP level.

The ANO-1 SFP instrument channels have a reasonably high certified design accuracy of equal to or better than +/- three inches (excluding boric acid deposition effects that cause a conservative decrease in indicated level).

A new ANO-1 procedure, OP-1304.223, *Unit 1 Spent Fuel Pool Level Instrumentation Channel Functional Test*, has been implemented. The ANO-1 TRM has been revised to include actions to be taken for the primary and back-up SFP level instruments with respect to functionality (new TRM 3.10.1). In addition, ANO-1 procedure OP-1015.003A, *Unit 1 Operations Logs*, has been revised to add SFP level instruments LIT-2020-3 and LIT-2020-4. An Operations procedure was not required based on the simple indication function and use.

An ANO-1 Preventative Maintenance task has been established for scheduling and implementing necessary functional testing in accordance with ANO-1 TRM requirements. The testing per ANO-1 OP-1304.223 provides for calibration or validation of the primary and backup ANO-1 SFP level instrument channels against known/actual SFP level to maintain design accuracy within limits established. The testing also provides for ANO-1 SFP level instrument cross channel comparison. This is augmented by routine monitoring per ANO-1 procedure OP-1015.003A, *Unit 1 Operations Logs*.

For ANO-2, comparable procedures and testing program implementation is planned.