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1CAN041501

April 14, 2015

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

SUBJECT: Completion of Required Action by NRC Order EA-12-051
Reliable Spent Fuel Pool Level (SFP) Instrumentation
Arkansas Nuclear One – Unit 1
Docket No. 50-313
License No. DPR-51

REFERENCE: NRC Order Number EA-12-051, *Order to Modify Licenses with Regard to Reliable SFP Instrumentation*, dated March 12, 2012 (0CNA031207) (ML12054A679)

Dear Sir or Madam:

On March 12, 2012, the NRC issued Order EA-12-051, *Order Modifying Licenses with Regard to Reliable SFP Instrumentation* (referenced above), to Entergy Operations, Inc. (Entergy). This Order was effective immediately and directed Entergy to install reliable SFP instrumentation as outlined in Attachment 2 of the Order at Arkansas Nuclear One, Unit 1 (ANO-1). This letter, along with its enclosures, provides the notification required by Section IV.C.3 of the Order that full compliance with the requirements described in Attachment 2 of the Order has been achieved for ANO-1.

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 April 14, 2015.

Sincerely,

ORIGINAL SIGNED BY JEREMY G. BROWNING

JGB/nbm

Attachments: 1. Compliance with Order EA-12-051
2. NRC Requests for Information

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Attachment 1 to

1CAN041501

Compliance with Order EA-12-051

Compliance with Order EA-12-051

BACKGROUND

On March 12, 2012, the NRC issued Order EA-12-051, *Order Modifying Licenses with Regard to Reliable Spent Fuel Pool (SFP) Instrumentation* (Reference 1) to Entergy Operations, Inc. (Entergy). This Order was effective immediately and directed Entergy to install reliable SFP instrumentation as outlined in Attachment 2 of the Order at Arkansas Nuclear One, Unit 1 (ANO-1). The information provided herein documents full compliance for ANO-1 in response to the Order.

COMPLIANCE

Entergy has installed two independent full scale level monitors on the ANO-1 SFP in response to Reference 1. ANO is a two unit site, and the ANO-1 SFP is independent of the ANO-2 SFP.

Entergy submitted the ANO Overall Integrated Plan (OIP) by Reference 2 and minor updates per Reference 5 and Reference 8 (specific to ANO-2). By Reference 3 the NRC provided requests for additional information (RAIs) for the OIP. Entergy provided responses to the RAIs by Reference 4 and updates per Reference 9. By Reference 6, the NRC provided its interim staff evaluation (ISE) and requested additional information necessary for completion of the review. The above cited RAI revisions impact the ISE and said RAI related discussion within the ISE. Entergy provided responses and/or updates to these ISE RAIs by References 7, 8, 9, ePortal, and this submittal (per inclusion in Attachment 2 as the bridging document).

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 11). ANO-1 EA-12-049 Order implementation schedule relaxation was approved on May 20, 2014 (Reference 12). Independent of these strategies yet to be implemented, ANO-1 EA-12-051 Order (Reference 1) compliance is assured from a power supply requirement perspective by design 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; thereby, maintaining the level indication function for full event duration, including until offsite resource availability is reasonably assured.

ACTIONS COMPLETED

EC-44046 (ANO-1 SFP Level Instrumentation (SFPI) for NRC Order EA-12-051) has been implemented providing SFP level monitoring capability in the back of the main control room.

IDENTIFICATION OF LEVELS OF REQUIRED MONITORING – COMPLETE

ANO-1 Level 1: Elev. 397 feet 5.21 inches

> Level adequate to support normal SFP cooling system operation and pump suction requirements.

ANO-1 Level 2: Elev. 385 feet 11.5675 inches +/- one foot

Ten feet (+/- one foot) above highest point of any fuel rack seated in SFP associated with providing substantial radiation shielding for personnel standing on the SFP operating deck.

ANO-1 Level 3: Elev. 375 feet 11.5675 inches +/- one foot

Highest point of any fuel rack seated in SFP (within +/- one foot) associated with level where fuel remains covered.

INSTRUMENT DESIGNED FEATURES – COMPLETE

ANO-1 SFP level instrument channels incorporate two permanently installed, physically independent, and physically separated channels (with channel separation in accordance with existing plant design basis requirements). Sensors at the SFP are spatially separated near opposite corners of the SFP with cables both being protected with metal raceway and maintaining the same relative spatial separation until promptly exiting the SFP floor. Displays are installed in the back of the main control room. Power sources include 1) independent Class 1E plant alternating current (AC) power sources, 2) channel-specific stand-alone battery power with analyzed seven-day capacity, as well as 3) connections and cables for external direct current (DC) alternate power source capability. Equipment and raceway are mounted/installed to ANO-1 Seismic Category I requirements.

PROGRAM FEATURES – COMPLETE

Training has been conducted as needed. Technical Requirements Manual (TRM) entry has been implemented to control functionality and actions for non-functionality along with implementation of a channel functional test procedure and a preventive maintenance (PM) task to control scheduling within TRM requirements. Routine monitoring is provided per Operations log entry implementation.

MILESTONE SCHEDULE – ITEMS COMPLETE

ANO-1 Milestones	**Completion Date**
ANO-1 Reliable SFPI Design Modification Package Developed/Issued (EC-44046)	April 10, 2014
ANO-1 Reliable SFPI Installed	March 1, 2015 (startup from outage)
#1 NRC RAIs (Received June 26, 2013)	July 25, 2013 (Ref. 4) (Updated per Ref 9)
#2 NRC ISE RAIs (Received October 29, 2013)	References 7, 8, 9, and this submittal

Based on the above, the requirements of Order EA-12-051 have been achieved for ANO-1. A summary of ANO-1 compliance with Reference 1 is provided as follows:

COMPLIANCE ELEMENTS SUMMARY

In accordance with NRC Order EA-12-051, Entergy shall have a reliable indication of the water level in associated spent fuel storage pools capable of supporting identification of the following pool water level conditions by trained personnel:

(1) level that is adequate to support operation of the normal fuel pool cooling system,

(2) level that is adequate to provide substantial radiation shielding for a person standing on the SFP operating deck, and

(3) level where fuel remains covered and actions to implement make-up water addition should no longer be deferred.

Per References 2, 4, 9, and 10, key SFP water levels, including the three critical levels defined in Nuclear Energy Institute (NEI) 12-02, Revision 1, were identified. Both the primary and backup instrument level channels are permanent, mounted directly within the SFP, and measure level over a single continuous span from *above* Level 1 down to *below* the upper limit of Level 3. Access to the SFP area is not required to operate the instrument channels or obtain level data. Displays and signal processors are located in the main control room. The three critical levels for ANO-1 are as follows:

LEVEL 1: Level 1 is the level adequate to support operation of the normal SFP cooling system associated with the level at which reliable pump suction loss occurs due to uncovering the coolant inlet pipe or any weirs or vacuum breakers since it is more limiting than level associated with pump net positive suction head requirements. This level, is established for ANO-1 based on nominal coolant inlet pipe elevation [as it does not incorporate a vacuum (or siphon breaker)]. The elevation associated with this level is 397 feet 5.21 inches for ANO-1.

LEVEL 2: Level 2 is the level adequate to provide substantial radiation shielding for a person standing on the SFP operating deck. 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. 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 Level 2 has been chosen as ten feet (+/- one foot) above the highest point of any fuel rack seated in the SFP, 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. The elevation associated with this level is 385 feet 11.5675 inches +/- one foot for ANO-1.

LEVEL 3: Level 3 is the level where fuel remains covered. It is defined as the highest point of any fuel rack seated in the SFP (within +/- one foot). The highest point (nominal) of any fuel rack seated in the SFP is 375 feet 11.5675 inches for ANO-1. Therefore, Level 3 is elevation 375 feet 11.5675 inches +/- one foot for ANO-1.

1. **In accordance with NRC Order EA-12-051, the SFP level instrumentation shall include the following design features:**

a. Instruments: The instrumentation shall consist of a permanent, fixed primary instrument channel and a backup instrument channel. The backup instrument channel may be fixed or portable.

Per References 2 and 10, both ANO-1 primary and backup SFP level instrument channels are fixed or permanently installed. Both instrument probes are permanently installed near (within approximately one foot) opposite (northeast and northwest) corners of the SFP. Both instrument displays/processors are permanently installed in the back of the main control room.

b. Arrangement: The SFP level instrument channels shall be arranged in a manner that provides reasonable protection of the level indication function against missiles that may result from damage to the structure over the SFP. This protection may be provided by locating the primary instrument channel and fixed portions of the backup instrument channel, if applicable, to maintain instrument channel separation within the SFP area, and to utilize inherent shielding from missiles provided by existing recesses and corners in the SFP structure.

Per References 2, 4, and 10 and in accordance with the guidance of Section 3.2 of NEI 12-02 Revision 1, ANO-1 primary and backup SFP level instrument probes are spatially separated and installed near (within approximately one foot) opposite SFP corners. Corner locations provide inherent protection of the probes. Channel separation for cable routing away from the probes maintains the same relative spatial separation distance as the SFP corner mounting locations. Channel routing on the SFP floor is limited with prompt exist/penetration below the SFP floor. Probe top section and channel cabling are protected by metallic raceway and the probe mounting bracket structure itself, all of which incorporate a low profile design. Concrete curbs in the vicinity that rise a few inches above floor elevation provide additional inherent protection. As described, reasonable protection of the SFP level function is provided from potential SFP area overhead structure missiles.

c. Mounting: Installed instrument channel equipment within the SFP shall be mounted to retain its design configuration during and following the maximum seismic ground motion considered in the design of the SFP structure.

Per References 2, 4, and 10, as well as Reference 8 and its supporting Attachment 2 “Bridging Document”, the entire ANO-1 SFP instrument channel (equipment from the SFP to the main control room) is mounted and designed to requirements equal to or greater than ANO-1 seismic design bases, seismic Category I requirements. As such, the SFP instrument channels are designed and installed to retain their design configuration during and following maximum requirements of the ANO-1 seismic design bases.

d. Qualification: The primary and backup instrument channels shall be reliable at temperature, humidity, and radiation levels consistent with the SFP water at saturation conditions for an extended period. This reliability shall be established through use of an augmented quality assurance process (e.g., a process similar to that applied to the site fire protection program).

Per References 2, 4, and 10, as well as Reference 8 and its supporting Attachment 2 "Bridging Document", the entire ANO-1 SFP instrument channel (equipment from the SFP to the main control room) is designed and qualified to ANO-1 environmental extremes applicable for the area of interest (e.g., SFP, main control room). The SFP area environmental extremes are in accordance with NEI 12-02, Revision 1, SFP example conditions (as summarized below). The SFP instrumentation channels have been designated as Augmented Quality per Entergy processes covering procurement, design, and installation. As such, the SFP instrument channels have demonstrated reliability through establishment of Augmented Quality processes at applicable environmental extremes.

SFP Area Parameter	SFP Area NEI 12-02 Rev 1 Example Condition	SFP Area EC Qualification
Radiation	SFP @ Water Level 3 (low) for 7-day min. event/post-event (or until FLEX strategy mitigation)	SFP @ Water Level 3 (low) for 7-day event/post-event (no credit for earlier FLEX mit.)
	Fuel freshly discharged (100 Hours)	Full core off-load @ 100 hours remainder SFP @ 18 mo. (consv.)
	+ normal dose	SFP @ normal water level for 40 yr
Temperature	212°F	212°F
Humidity	100% (boiling borated water &/or steam)	100% (boiling bor. water &/or steam)

e. Independence: The primary instrument channel shall be independent of the backup instrument channel.

Per References 2, 4, 8, and 10, ANO-1 SFP instrument channels have highly reliable independent power sources (as detailed in the next section) and channel independence achieved by incorporation of two permanently installed, physically independent, and physically separated channels (with channel separation in accordance with existing plant design basis requirements) that are designed and installed to seismic category I requirements (as described in section "c" above). As such, the SFP instrument channels are independent.

f. Power supplies: Permanently installed instrumentation channels shall each be powered by a separate power supply. Permanently installed and portable instrumentation channels shall provide for power connections from sources independent of the plant ac and dc power distribution systems, such as portable generators or replaceable batteries. Onsite generators used as an alternate power source and replaceable batteries used for instrument channel power shall have

sufficient capacity to maintain the level indication function until offsite resource availability is reasonably assured.

Per References 2, 4, 8, 9, and 10, the two ANO-1 SFP instrument channels are "channelized" and powered from opposing power divisions (e.g., red train and green train) safety-related vital 120-volt AC (VAC) power sources. Power is supplied for one channel from 120 VAC Panel RS3, which is a Class 1E inverter-backed (or emergency diesel generator (EDG) and battery-backed) panel supplied from 125-volt DC (VDC) Bus D01. Power is supplied for the other channel from 120 VAC Panel RS4, which is a Class 1E inverter-backed (or EDG and battery-backed) panel supplied from 125 VDC Bus D02.

The two ANO-1 SFP instrument channels incorporate independent plant power sources [not only originating from different buses (NEI 12-02 required) but also from different power divisions (NEI 12-02 preferred) as well as incorporating channel-specific stand-alone backup battery power of sufficient capacity (NEI 12-02 acceptable in and of itself coupled with power restoration strategy)]. The permanently installed replaceable and rechargeable backup batteries are configured for an analyzed seven-day capacity. A third power alternative is available per external connections and cables included for each battery panel supplying each SFP processor/display panel to permit powering the system from an external DC source independent of plant sources.

The primary AC power source being supplied by two different "channelized" and Class 1E sources means its rapid restoration (e.g., within hours) per FLEX strategies during a beyond-design-bases external event (BDBEE) from sources independent of plant sources; although FLEX strategy rapid restoration need not be credited by virtue of the permanently installed battery capacity analyzed to cover full event duration (e.g., seven days). Installed rechargeable battery capacity for a full seven days coupled with FLEX power restoration strategies also precludes the need for crediting battery replacements, stocking of battery spare stock, and the alternate external DC power source capability. As such, the SFP instrument channels have highly reliable power sources, originating from separate power sources, with power capability independent from plant sources, and with on-board battery capacity analyzed for full event duration (e.g., seven days) or maximum offsite resource availability time frames which is well beyond FLEX strategy restoration time frames. An installed alternate power source is provided for instrument channel power with sufficient capacity to maintain the level indication function for full event duration including until offsite resource availability is reasonably assured.

g. Accuracy: The instrument channels shall maintain their designed accuracy following a power interruption or change in power source without recalibration.

Per References 2, 4, 9, and 10, as well as Reference 8 and its supporting Attachment 2 *Bridging Document*, 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) which is not affected by power interruption as supported by vendor test documentation. As such, the SFP instrument channels have been documented to maintain their designed accuracy following power interruption or change in power source without recalibration being required.

h. Testing: The instrument channel design shall provide for routine testing and calibration.

Per References 2, 4, 9, and 10, as well as Reference 8 and its supporting Attachment 2 *Bridging Document*, the ANO-1 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. As such, the SFP instrument channel's design provides for routine testing and calibration.

i. Display: Trained personnel shall be able to monitor the SFP water level from the control room, alternate shutdown panel, or other appropriate and accessible location. The display shall provide on-demand or continuous indication of SFP water level.

Per References 2, 4, and 10, the ANO-1 SFP instrument channel displays are located in the ANO-1 main control room. Level is displayed continuously when on primary AC power and on-demand when on backup DC power. As such, the SFP water level indication can be monitored by trained personnel from the main control room either continuously or on-demand.

2. In accordance with NRC Order EA-12-051, the SFP instrumentation shall be maintained available and reliable through appropriate development and implementation of the following programs:

a. Training: Personnel shall be trained in the use and the provision of alternate power to the primary and backup instrument channels.

Two ANO instrument and control maintenance technicians received training on the MOHR EFP-IL SFP Level Monitoring System at the vendor (MOHR) facilities.

Utilizing presentation, *EC-44046 ANO-1 SFP Instrumentation,* and Section 2.6.13 of System Training Manual 1-73, *SFP Instrumentation,* training has been provided to Operations, the Emergency Response Organization, Chemistry, and Radiation Protection personnel. Training on alternate power sources (on board seven day battery capacity, external DC power source capability, primary AC safety-related EDG and battery-backed power source restoration per FLEX strategies) has been addressed initially by the above. It is noted that FLEX strategies are being established as required by implementation of Order EA-12-049 (Reference 11) and that AN0-1 EA-12-049 Order implementation schedule relaxation was approved on May 20, 2014 (Reference 12).

On-site training is governed by Entergy Training processes including Systematic Approach to Training for both initial and continuing elements and target audience.

b. Procedures: Procedures shall be established and maintained for the testing, calibration, and use of the primary and backup SFP instrument channels.

Reference 9 provided a description of required and implemented procedures which superseded previously presented discussion regarding procedure plans. A new 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, 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.

c. Testing and Calibration: Processes shall be established and maintained for scheduling and implementing necessary testing and calibration of the primary and backup SFP level instrument channels to maintain the instrument channels at the design accuracy.

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

REFERENCES

1. NRC Order Number EA-12-051, *Order Modifying Licenses with Regard to Reliable SFP Instrumentation*, dated March 12, 2012 (0CNA031207) (ML12054A679)

2. *OIP in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Reliable SFP Instrumentation (Order Number EA-12-051)*, dated February 28, 2013 (0CAN021303) (ML13063A015)

3. *RAI for the OIP in Response to the Commission Order Modifying Licenses with Regard to Requirements for Reliable SFP Instrumentation (Order Number EA-12-051)*, dated June 26, 2013, (0CNA061308) (ML13156A313)

4. *Response to RAI* dated July 25, 2013 (0CAN071301) (ML13207A269)

5. *First Six-Month Status Report in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Reliable SFP Instrumentation (Order Number EA-12-051)*, dated August 28, 2013 (0CAN081303) (ML13241A415)

6. *Arkansas Nuclear One, Units 1 and 2 – ISE and RAI Regarding the Overall Integrated Plan for Implementation of Order EA-12-051, Reliable SFP Instrumentation (TAC NOs. MF0944 and MF0945)*, dated October 29, 2013 (0CNA101307) (ML13281A502)

7. *Second Six-Month Status Report in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Reliable SFP Instrumentation (Order Number EA-12-051)*, dated February 27, 2014 (0CAN021406) (ML14059A230)

8. *Third Six-Month Status Report in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Reliable SFP Instrumentation (Order Number EA-12-051)*, dated August 28, 2014 (0CAN081403) (ML14246A209)

9. *Fourth Six-Month Status Report in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Reliable SFP Instrumentation (Order Number EA-12-051)*, dated February 24, 2015 (0CAN021503)

10. EC-44046, ANO-1 Engineering Change implementing NRC Order EA-12-051 SFP Instrumentation

11. NRC Order Number EA-12-049, *Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for BDBEEs*, dated March 12, 2012 (0CNA031206) (ML12056A045)

12. *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 BDBEEs",* dated May 20, 2014 (1CNA051402) (ML14114A697)

Attachment 2 to

1CAN041501

NRC Requests for Information

NRC Requests for Information

As stated in Attachment 1, Entergy submitted ANO's Overall Integrated Plan (OIP) by Reference 2 and minor updates per Reference 5 and Reference 8 (specific to ANO-2) of Attachment 1.

By Reference 3 of Attachment 1 the NRC provided requests for additional information (RAIs) for the OIP. Entergy provided responses to the RAIs by Reference 4 of Attachment 1 and revisions (to RAI #5.b and RAI #9.b) per Reference 9 of Attachment 1.

By Reference 6 of Attachment 1, the NRC provided its interim staff evaluation (ISE) and requested additional information necessary for completion of the review. The above cited RAI revisions impact the ISE and their related discussion in the ISE. Entergy provided responses and/or updates to these ISE RAIs by References 7, 8, and 9 of Attachment 1 with Reference 8 of Attachment 1 referring to a preliminary bridging document on the ePortal and Reference 9 of Attachment 1 referring to a final bridging document uploaded to the ePortal September 30, 2014. This final bridging document is being provided below. Note that Reference 7 of Attachment 1 submitted responses for ISE RAI #4 (ANO-1) and ISE RAI #11 (ANO-1) which were subsequently updated by Reference 8 of Attachment 1. Note that Reference 8 of Attachment 1, submitted complete responses for ISE RAI #1(*), ISE RAI #4, and ISE RAI #11 with other responses [ISE RAI #2-3, ISE RAI #5-10, ISE RAI #12-13, ISE RAI #14-17(***)] (**) marked preliminary due to reference to the preliminary bridging document. (*)Subsequent to the submittal of Reference 8 of Attachment 1, Entergy determined the need to revise the ISE RAI #1 which was resubmitted by Reference 9 of Attachment 1. (**)Reference 9 of Attachment 1, acknowledged bridging document upload to ePortal September 30, 2014 for the other bridging document dependent responses [ISE RAI #2-3, ISE RAI #5-10, ISE RAI #12-17]. The final bridging document uploaded to ePortal September 30, 2014, is attached below. (***)Entergy updated and superseded initial ISE RAI #14-17 responses (considering them now informational only) which dealt with plans and expectations for Procedures and Testing Program; by submitting of a single new response per Reference 9 of Attachment 1 that was based on actual Reference 10 of Attachment 1 implementation.

ANO Bridging Document Between Vendor Technical Information and Licensee Use Based on NRC Staff Requests for Additional Information (RAIs) and NRC Vendor Audit

#	Topic	Parameter Summary	Vendor Reference Document #	Additional Comment	Test or Analysis Results	Licensee Evaluation
1	Design Specification	SFPI Requirements derived from References 1, 2, & 3	References 4-13, 23-25, 29, 37, & 43			Evaluation of the vendor information is within the scope of engineering change packages EC-44046 and EC-48348.
2	Test Strategy	Per Requirements in References 1, 2, & 3	References 4, 6-13, 23-25, 29, 37, & 43			The equipment testing performed for the SFPI has been found to be acceptable based on the current design requirements.
3	Environmental Qualification for Electronics Enclosure with Display	60-110°F (References 1, 2, 14, 18, 21, & 38)	Reference 4		14-131 °F	As discussed in the Overall Integrated Plan, the primary and backup SFPI channel displays for ANO-1 and ANO-2 are located in the Main Control Room (MCR). According to Calculation CALC-13-E-0005-01 (Reference 18), successful implementation of the FLEX strategy (Reference 39) results in a peak MCR temperature of 110 °F for ANO-1 during an extended loss of AC power. Likewise, the ANO-2 MCR has a peak temperature of 110 °F during an extended loss of AC power according to Calculation CALC-14-E-0002-03 (Reference 38) and successful implementation of the FLEX strategy (Reference 40). The SFPI vendor, MOHR, has successfully tested its system electronics to a nominal temperature range of 14 °F to 131 °F. The sensor electronics is capable of continuously performing

#	Topic	Parameter Summary	Vendor Reference Document #	Additional Comment	Test or Analysis Results	Licensee Evaluation
						its required function under the expected temperature conditions. Results of the vendor testing are available in proprietary MOHR Report 1-0410-1 (Reference 4), MOHR EFP-IL SFPI System Temperature and Humidity Report.
		5-95% RH	Reference 4		5-95% RH	The SFPI vendor, MOHR, has successfully tested its system electronics to operate in a humidity range of 5% to 95% relative humidity. Results of the vendor testing are available in proprietary MOHR Report 1-0410-1, MOHR EFP-IL SFPI System Temperature and Humidity Report (Reference 4). The MCR is regulated by the Control Room HVAC system to normally operate at 75 °F with a nominal RH of 43% for ANO-1 (Reference 14, Section 9.7.2.1) and 50% for ANO-2 (Reference 21, Section 9.4.1.1.1),although it fluctuates between an estimated range of 30-60%. During an extended loss of AC power, the Control Room HVAC system is no longer available. Prior to the doors from the MCR to the turbine building being opened at 4 hours, the relative humidity is expected to drop as temperature rises, because the heat loads in the MCR are dominated by the sensible heat of electrical equipment. At 4 hours, the doors from the MCR to the turbine building will be opened, exposing the MCR to atmospheric humidity. Under circumstances in which extreme heat is anticipated at ANO, the worst-case outside

#	Topic	Parameter Summary	Vendor Reference Document #	Additional Comment	Test or Analysis Results	Licensee Evaluation
						conditions are expected to be at 43% RH (103 °F db/83 °F wb) according to the ANO-1 FSAR (Reference 14, Section 9.7.2.1) or 30% RH (105 °F db/77.5 °F wb), per the Revised Summer Cooling Loads, Wintertime Heating Loads and Wintertime Correlations for the ANO-1&2 Control Rooms Calculation (Reference 47). Thus, in the event the door from the MCR to the turbine building is opened, this would not result in a rise of the relative humidity. These conditions are bounded by the 47 °C (116.6 °F) and 71 percent RH test case presented in MOHR Report 1-0410-1 (Reference 4) which was endorsed by The NRC Audit Report for MOHR (Reference 45). In the case of high humidity, ASHRAE (Reference 46, Chapter 14 Appendix: Design Conditions for Selected Locations) defines a 0.4% dehumidification condition to be 85 °F db, 77.2 °F dew point, and ~78% RH for Little Rock, Arkansas. Similarly 91.7 °F db, 80.2 °F wb, and ~60% RH is defined for a 0.4% evaporation condition. These conditions are also bounded by the test cases presented in MOHR Report 1-0410-1 (Reference 4). Therefore, the operational humidity range of 5% to 95% encompasses all expected conditions for the MCR and the sensor electronics are capable of continuously performing their required function under the expected humidity conditions.

#	Topic	Parameter Summary	Vendor Reference Document #	Additional Comment	Test or Analysis Results	Licensee Evaluation
		No radiation effects			N/A	Acceptable, the ANO Control Rooms are considered mild environments with no expected radiation. No additional testing is required per NRC Audit Report for MOHR (Reference 45).
4	Environmental Testing for Level Sensor Components in SFP Area-Submerged Portion of Probe Body	60-212 °F (References 1, 2, 14, & 21)	Reference 5	RAD TID is the total 40 yr dose plus the 7 day worst case accident dose at the lowest spacer location on the Probe body	480 °F long-term for PEEK Insulators	The NRC Audit Report for MOHR (Reference 45) concludes that the SFP-1 probe is suitable for operation in the SFP environment. The SFP is expected to remain at or above the minimum ambient temperature of the Auxiliary building (60 °F) as called out in ANO-1 FSAR (Reference 14) Section 9.7.2.1 and ANO-2 FSAR (Reference 21) Section 9.4.3.1. Maximum accident condition of the spent fuel pool is taken to be 212 °F boiling borated water/steam at atmospheric pressure. Based on the vendor analysis results, the sensitive materials in the probe body will not be challenged under the required conditions of References 1, 2, 14, and 21 and are acceptable.
		Submerged Component (References 1 & 2)	Reference 5		PEEK Insulators capable of long term submergence	
		4.87E+07 rad TID (Reference 1, 2 & 16)	Reference 5		10 Grad for PEEK Insulators	The NRC Audit Report for MOHR (Reference 45) concludes that the SFP-1 probe is suitable for operation in the SFP environment. Calculation CALC-13-E-0005-05 (Reference 16) defines a worst case dose of approximately 4.87E+07 rad to the probe via the applicable requirements of References 1 and 2. As such, the PEEK spacers are suitable for the application. Note this calculation is applicable to both ANO-1 and ANO-2.

#	Topic	Parameter Summary	Vendor Reference Document #	Additional Comment	Test or Analysis Results	Licensee Evaluation
5	Environmental Testing for Level Sensor Electronics Housing -Probe Head Located Above the SFP	60-212 °F (References 1, 2, 14, & 21)	Reference 5	Rad TID is the total 40 yr dose plus the 7 day worst case accident dose at the location	PEEK: 480 °F long term EPDM: 194 °F long-term, 500 days @ 232 °F, 12 days @ 311 °F Sylgard 170: 392 °F long-term	The NRC Audit Report for MOHR (Reference 45) concludes that the SFP-1 probe is suitable for operation in the SFP environment. The SFP area is expected to remain at or above the minimum ambient temperature of the Auxiliary Building (60 °F) as called out in ANO-1 FSAR (Reference 14) Section 9.7.2.1 and ANO-2 FSAR (Reference 21) Section 9.4.3.1. Maximum accident condition temperature and humidity directly above the spent fuel pool is taken to be a condensing steam environment which conservatively will be no greater than 212 °F, the temperature of boiling water at atmospheric pressure. Based on the vendor analysis results, the sensitive materials in the probe head will not be challenged under the required conditions of References 1, 2, 14, and 21 and are acceptable. There are no electronics in the probe head located above the SFP. See Topic #3 for discussion of electronics enclosure with display. For coaxial transmission cable beyond the Probe Head, MOHR uses Class 1E Nuclear Safety-Related RSCC Wire & Cable RSS-6-110A/LE which meets the requirements of Institute of Electrical and Electronic Engineers (IEEE) 383-1974, "IEEE Standard for Type Test of Class 1 E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations" and is acceptable (Reference 45).

#	Topic	Parameter Summary	Vendor Reference Document #	Additional Comment	Test or Analysis Results	Licensee Evaluation
		0-100% RH Condensing (References 1 & 2)	Reference 5		0-100% RH for PEEK _____ also EPDM and Sylgard 170	The NRC Audit Report for MOHR (Reference 45) concludes that the SFP-1 probe is suitable for operation in the SFP environment. 100% non-condensing RH is a conservative humidity range for normal operating conditions. Based on the vendor analysis results, the sensitive materials in the probe head will not be challenged under the required conditions of References 1 & 2 and are acceptable
		2.40E+06 rad TID (Reference 16)	Reference 5		PEEK: 10 Grad _____ EPDM: 2 Grad Sylgard 170: 200 Mrad	The NRC Audit Report for MOHR (Reference 45) concludes that the SFP-1 probe is suitable for operation in the SFP environment. CALC-13-E-0005-05 (Reference 16) defines a worst case dose of approximately 2.40E+06 rad to the area above the SFP. Based on the vendor analysis results, the sensitive materials in the probe head will not be challenged under the required conditions of References 1, 2, and 16 and are acceptable. Note this calculation is applicable to both ANO-1 and ANO-2.
6	Thermal & Radiation Aging-Organic Components in SFP Area	See Topic #4 & 5 above	Reference 5		See Topic #4 and 5 above	Acceptable, vendor test/analysis bound licensee parameters, see discussion above in Topic #4 and 5.
7	Basis for Dose Requirement	References 1 & 2	N/A			Entergy Calculation Procedure EN-DC-126 (Reference 15) was used to develop CALC-13-E-0005-05 (Reference 16) and CALC-13-E-0005-04 (Reference 17), based on the

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						requirements of NEI-12-02 (Reference 2) and EA-12-051 (Reference 1). The calculations determine conservative source terms and dose rates at key instrument locations, for both a 7 day accident scenario and 40-year TID. Note these calculations are applicable to both ANO-1 and ANO-2.
8	Seismic Qualification	Seismic Class I (References 1, 2, 3, 14, & 21)	References 8, 11, & 12		Seismic Class 1	Acceptable, MOHR has prepared a site-specific seismic analysis which bounds ANO's seismic criteria. The qualification report envelopes all components of the new SFP level instrumentation required to be operational during a BDBEE and post-event. This document is MOHR Report 1-0410-9.12 (Reference 12). MOHR Reports 1-0410-6 (Reference 8) and 1-0410-9 (Reference 11) are also available for review. Calculations CALC-13-E-0005-07 (Reference 20) for ANO-1 and CALC-14-E-0002-11 (Reference 22) for ANO-2 account for seismic loads and shows that the SFPI Probe Mounting Bracket is structurally adequate and seismically qualified as all Interaction Ratios (IR) are less than one (1.0). References 20 & 22 are available on the e-portal for review. Reference Topic #9 for discussion of seismically induced sloshing affect which is included.

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9	Sloshing	Water induced motion from seismic event does not cause equipment structural failure	References 11, 12, 23, 24, & 25	See Topic #8		Acceptable, the MOHR seismic qualification reports (References 8, 11, & 12) in combination with NAI Report # NAI-1725-003 (Reference 23), NAI Report # NAI-1725-004 (Reference 25) and ANO site specific NAI Report #NAI-1791-003 (Reference 24) adequately bound the hydro-dynamic loads associated with sloshing for ANO. Calculations CALC-13-E-0005-07 (Reference 20) for ANO-1 and CALC-14-E-0002-11 (Reference 22) for ANO-2 account for sloshing and shows that the SFPI Probe Mounting Bracket is structurally adequate and seismically qualified as all Interaction Ratios (IR) are less than one (1.0). The NAI documents (References 24 & 25) are used as input to the bracket design. References 20 & 22 are available on the e-portal for review.
10	Spent Fuel Pool Instrumentation System Functionality	System must allow for routine, in situ functionality	References 26, 27, & 28			The system features on board electrical diagnostics. SFPI channel/equipment maintenance/preventative maintenance and testing program requirements to ensure design and system readiness will be established in accordance with Entergy's 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). The instrument automatically monitors the integrity of its level measurement system using in-situ capability. Revision 0 of the

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						manuals have been provided by the vendor (References 26, 27 & 28) for use, although it is possible these could be amended by the vendor in the future based on installation experience.
11	Boron Build-Up	Buildup cannot produce error greater than 1' including all other error source terms (References 1 & 2)	Reference 10		Boron buildup can produce a maximum error of 2.5 inches	Acceptable, MOHR Report 1-0410-8 (Reference 10) concludes that the presence of borated water and/or boric acid deposits will not significantly impair the ability of the MOHR EFP-IL SFPI system to accurately measure water level in the SFP environment. Boric acid deposit buildup causes a conservative decrease in indicated level. Previous Topic #10 already discusses maintenance / preventative maintenance requirements being established in consideration of vendor recommendations (which includes and bounds those associated with boron build-up). Similarly, Topic #20 below discusses overall calibration or channel functional testing methodology expected to be based on vendor stated accuracy along with comparison of SFPI channels to actual pool level (which would also bound boron build-up effects specified in Reference 45). Visual inspection and/or wash down of the probe assembly could be initiated by accuracy requirements or routine inspection. The probe head assembly includes a connection mechanism for flushing water to remove boron build-up as may be necessary. Alternatively, the SFP water level can be raised until it covers and dissolves the boric acid deposit (Reference 28).

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12	Pool-side Bracket Seismic Analysis (References 1, 2, 14, and 21)	Seismic Class I (References 1, 2, 14, & 21)	References 11 & 12	See Topic #8	Seismic Class I	See Topic #8. Calculation CALC-13-E-0005-07 (Reference 20) for ANO-1 and Calc-14-E-0002-11 (Reference 22) for ANO-2 shows that the SFPI Probe Mounting Bracket is structurally adequate and seismically qualified as all Interaction Ratios (IR) are less than one (1.0). References 20 & 22 are available on the eportal for review. A revision to Calculation CALC-13-E-0005-07 (Reference 20) based on enhancements to the design is in progress and will be uploaded to the e-portal upon completion.
13	Additional Brackets (Sensor Electronics and Electronics Enclosure)	Seismic Class I (References 1, 2, 3, 14, & 21)	Reference 8	See Topic #8	Seismic Class I	See Topic #8. MOHR Report 1-0410-6 (Reference 8) documents seismic qualification of system enclosures (Display/processor, Battery). Equipment and raceway are installed/mounted to ANO Seismic Class I requirements.
14	Shock & Vibration	(References 1, 2, 3) MIL-STD-167-1 (Reference 30) for vibration and MIL-STD-901D (Reference 31) for shock	References 7, 11, 12, & 43		IEC 60068-2-27 (2008-02) (Reference 32) IEC 60068-2-6 (2007-12) (Reference 33)	The NRC Audit Report for MOHR (Reference 45) concludes that the shock and vibration test results were satisfactory. The report also acknowledges that the testing performed in MOHR Report 1-0410-16 (Reference 43) is sufficient to close the open item identified during the MOHR audit. Acceptable, the vendor testing provided adequately addresses the requirements for general robustness of the enclosures. The probe and repairable head are essentially a coax cable system that is considered inherently

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						resistant to shock and vibration. The probes and repairable head are evaluated to be adequately designed for resilience against shock and vibration (Reference 43). The new probe mounting components and fasteners are seismically qualified and designed as rigid components inherently resistant to vibration effects. The probes will be affixed to the bracket using a machine screw connection designed with proper thread engagement and lock washers. The indicator and battery enclosures will be mounted in the control room. The equipment is not affixed or adjacent to any rotating machinery that would cause vibration effects in the area of installation. The new instrument mounting components and fasteners are seismically qualified and designed as rigid components inherently resistant to vibration effects. Similarly, the effects of shock on the supporting fixtures for the control room instruments is not a credible threat; all equipment in the control room area is qualified seismically such that there are no expected impacts from adjacent objects during the BDBEE or design basis earthquake requirements imposed by NEI 12-02. Even though shock and vibration is not credible for Control Room equipment, it is adequately addressed by vendor test reports.

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15	Requirements Traceability Matrix	Software Traceability Matrix Required for Software Evaluation of Equipment	Reference 34			The instrument software Verification and Validation was performed by MOHR per Revision 2 of MOHR Report 1-0410-11 (Reference 34).
16	Factory Acceptance Test	Must demonstrate functionality of full EFP-IL and SFP-1	MOHR FAT Procedure			Acceptable channel factory acceptance tests have been completed successfully.
17	Channel Accuracy	±1 foot (Reference 2)	References 26 & 29		3.0 in max not including boric acid deposition or boiling effects	ANO-1 PO-10393246 and ANO-2 PO-10412526 impose a requirement for absolute system accuracy for Level measurement equal or better than ± 3 inches applicable for normal conditions and BDBEE conditions (e.g., temperature, humidity, chemistry, radiation levels, boiling water and/or steam environment, post-shock/vibration, post-seismic). Appendix A of Reference 26 states that the absolute accuracy is ±3.0 in max (±1.0 in typical), not including boric acid deposition effects. This error complies with the limit of ±1 foot set by NEI 12-02 (Reference 2). See line 11 for boric acid deposition effects. Additionally, the probe is designed to produce accurate level indication in boiling and frothing (multiphase) environments (Reference 29)

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18	Power Consumption	120 VAC, 60 Hz (References 14 & 21)	References 9 & 13		85-264 VAC 47-63 HZ 11.48 W (average) 18.83 W (maximum)	The NRC Audit Report for MOHR (Reference 45) concludes that no deficits were identified with respect to function reliability, accuracy, or calibration as a result of power interruption. Acceptable, the power requirements for the instrument are met by the power supply that will provide normal AC power to the units. MOHR Report 1-0410-10 (Reference 13) concludes that the accuracy is not affected by an interruption in power.
		7 day battery life required	Reference 9		7 day battery life @ 15 samples per hour rate	The NRC Audit Report for MOHR (Reference 45) concludes that battery life capability is satisfactory. Acceptable, the instrument testing demonstrates the battery capacity is sufficient for the maximum duration required by References 1 & 2.
19	Technical Manual	N/A	References 27 & 28			Revision 0 of the manuals have been provided by the vendor (References 27 & 28) for use, although it is possible these could be amended by the vendor in the future based on installation experience.

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20	Calibration	Must allow for in-situ calibration	References 26, 27, & 28	System is calibrated using CT-100 device and processing of scan files by vendor. Dry scan from original installation must be maintained		Revision 0 of the manuals have been provided by the vendor (References 26, 27, & 28) for use, although it is possible these could be amended by the vendor in the future based on installation experience. Previous Topic #10 already discusses maintenance / preventative maintenance requirements being established in consideration of vendor recommendations. Overall calibration or channel functional testing methodology is expected to be based on vendor stated accuracy and to incorporate a comparison of SFPI channels to actual pool level as well as a SFPI cross channel comparison.
21	Failure Modes and Effects Analysis (FMEA)	System provides reliable indication of fuel pool level, consistent with the requirements of References 1 & 2	Reference 44		SFPI system will meet requirements of References 1 & 2 when installed as required	Acceptable, the FMEA provided adequately addresses failure modes and effects for the full instrument channel with credit taken for the use of two redundant channels provided the installation meets all requirements stipulated in References 1 & 2.
22	Emissions Testing	EPRI TR-102323, Rev. 3 (Reference 36)	Reference 6 & 37		EPRI TR-102323, Rev. 3 (Reference 36)	Acceptable, MOHR reports 1-0410-4 (Reference 6) and 1-0410-4-S1 (Reference 37) demonstrate the new SFPI satisfies the EMI/RFI compliance guidelines of Revision 3 of EPRI TR-102323 (Reference 36) in accordance with

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						Entergy Engineering Standard EN-IC-S-004-MULTI (Reference 35). As demonstrated in the MOHR System EMC Test Report and Supplemental Information (References 6 & 37), the SFPI system passed the High Frequency Radiated and Conducted Emissions testing. FLEX Strategy Guidelines (FSG) governing the use of the SFPI are expected to include a cautionary statement to preclude radio usage within close proximity to the displays.

Spent Fuel Pool Instrumentation Order (EA-12-051)
Bridging Document Between Vendor Technical Information and Licensee Use
Based on NRC Staff Requests for Additional Information (RAIs) and NRC Vendor Audit

References

1. ML12054A679, NRC Order EA-12-051, "ORDER MODIFYING LICENSES WITH REGARD TO RELIABLE SPENT FUEL POOL INSTRUMENTATION", Nuclear Regulatory Commission, March 12, 2012
2. ML12240A307, NEI 12-02 (Revision 1, Industry Guidance for compliance with NRC Order EA-12-051, "To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation" August, 2012.
3. ML12221A339, Revision 0, JLD-ISG-2012-03, Compliance with Order EA-12-051, Reliable Spent Fuel Pool Instrumentation, August 29, 2012, Nuclear Regulatory Commission Japan Lessons-Learned Project Directorate.
4. 1-0410-1 "MOHR EFP-IL SFPI System Temperature and Humidity Test Report"
5. 1-0410-2 "MOHR SFP-1 Level Probe Assembly Materials Qualification Report"
6. 1-0410-4 "MOHR EFP-IL SFPI System EMC Test Report"
7. 1-0410-5 "MOHR EFP-IL SFPI System Shock and Vibration Test Report"
8. 1-0410-6 "MOHR EFP-IL SFPI System Seismic Test Report"
9. 1-0410-7 "MOHR EFP-IL SFPI System Battery Life Report"
10. 1-0410-8 "MOHR EFP-IL SFPI System Boric Acid Deposition Report"
11. 1-0410-9 "MOHR SFP-1 Level Probe Assembly Seismic Analysis Report"
12. 1-0410-9.12 "MOHR SFP-1 Site-Specific Seismic Analysis Report: Arkansas Nuclear One Unit #1 (ANO-1)"
13. 1-0410-10 "MOHR EFP-IL SFPI System Power Interruption Report"
14. FSAR, Rev. 26, "Arkansas Nuclear One-Unit 1"
15. EN-DC-126, Rev. 5, "Engineering Calculation Process"
16. CALC-13-E-0005-05, Rev. 0, "Spent Fuel Pool Instrumentation Shielding Calculation"
17. CALC-13-E-0005-04, Rev. 0, "Spent Fuel Pool Instrumentation Source Term Calculation"
18. CALC-13-E-0005-01, Rev. 0, "Heat-Up Calculation for AB Electrical Equipment Rooms and MCR following BDBEE"
19. CALC-88-E-0034-89, Rev. 006, "Seismic Qualification of C-553 and C-554 Cabinets"

20. CALC-13-E-0005-07, Rev. 0, “Design of SFPI Probe Mounting Bracket”
21. FSAR, Rev. 25 “Arkansas Nuclear One-Unit 2”
22. CALC-14-E-0002-11, Rev. 0, “ANO-2 Design of SFPI Probe Mounting Bracket”
23. NAI-1725-003, Rev. 0 “GOTHIC Verification and Sensitivity Studies for Predicting Hydrodynamic Response to Acceleration in Rectangular Shaped Pools”
24. NAI-1791-003, Rev. 0 “Seismic Induced Hydraulic Response in the Arkansas Nuclear One Spent Fuel Pool”
25. NAI-1725-004, Rev. 3 “Seismic Induced Hydraulic Response in the CGS Spent Fuel Pool”
26. 1-0410-12 “EFP-IL Signal Processor Operator’s Manual “
27. 1-0410-13 “EFP-IL Signal Processor Technical Manual”
28. 1-0410-14 “SFP-1 Level Probe Assembly Technical Manual”
29. 1-0410-15, “MOHR-EFP-IL SFPI System Uncertainty Analysis”
30. MIL-STD-167-1 “Mechanical Vibrations of Shipboard Equipment (Type 1-Environmentally and Type II-Internally Excited)”
31. MIL-S-901D “Shock Tests H.I.(High Impact) shipboard Machinery, Equipment, and Systems, Requirements for”
32. IEC 60068-2-27 (2008-02) “Environmental Testing-Part 2-27: Tests-Test Ea and Guidance: Shock”
33. IEC 60068-2-6 (2007-12) “Environmental Testing-Part 2-6: Tests-Test Fc: Vibration (sinusoidal)”
34. 1-0410-11 “MOHR EFP-IL SFPI System Software Verification and Validation”
35. EN-IC-S-004-MULTI, Rev. 001, “EMI/RFI Design Considerations
36. EPRI TR-102323, Rev. 3, “Guidelines for Electromagnetic Interference of Power Plant Equipment”
37. 1-0410-4-S1 “MOHR EFP-IL SFPI System Supplemental EMC Information”
38. CALC-14-0002-03, Rev. 0 “Auxiliary Building Heatup for rooms 2118, 2097, 2099, 2100, 2101, 2104, & 2091 under ELAP conditions”
39. EC-44042 ANO-1 FLEX BASIS
40. EC-48342 ANO-2 FLEX STRATEGY AND BASIS
41. PO-10393246 ANO-1 SFPI
42. PO-10412526 ANO-2 SFPI

43. 1-0410-16, “MOHR SFP-1 Level Probe Assembly Shock and Vibration Test Report
44. EVAL-194-4812-01 “MOHR EFP-IL Liquid Level Measurement System Failure Modes and Effects Analysis (FMEA)”
45. Donald C. Cook Nuclear Plant, Units 1 and 2 - Report for the Onsite Audit of MOHR Regarding Implementation of Reliable Spent Fuel Pool Instrumentation Related to Order EA-12-051 (TAC NOS. MF0761 and MF0762) dated August 27, 2014 (ADAMS Accession No ML14216A362)
46. 2009 ASHRAE Handbook Fundamentals, I-P Edition
47. 84D-2083-17 Rev. 0, “Revised Summer Cooling Loads, Wintertime Heating Loads and Wintertime Correlations for the ANO-1&2 Control Rooms”