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JAFP-17-0018
February 28, 2017

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

Subject: Eighth 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)

James A. FitzPatrick Nuclear Power Plant
Docket No. 50-333
License No. DPR-059

- Reference:**
1. NRC Order Number, EA-12-051, Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation dated March 12, 2012 (ML12056A044)
 2. NRC Interim Staff Guidance, Compliance with Order EA-12-051, Reliable Spent Fuel Pool Instrumentation, JLD-ISG-2012-03, dated August 29, 2012 (ML12221A339)
 3. Industry Guidance for Compliance with NRC Order EA-12-051, To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation, NEI 12-02, Revision 1, dated August 24, 2012 (ML12240A307)
 4. ENOI letter, Initial Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), JAFP-12-0125, dated October 29, 2012 (ML12305A316)
 5. ENOI letter, James A. FitzPatrick Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying License with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), JAFP-13-0023, dated February 28, 2013 (ML13063A267)
 6. ENOI letter, JAFP-16-0045, Notification of Permanent Cessation of Power Operations, dated March 16, 2016 (ML16076A391)
 7. ENOI letter, Request for Relaxation of March 12, 2012 Commission Orders Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events and Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-049 and EA-12-051), JAFP-16-0061, dated April 14, 2016 (ML16105A379)

8. ENOI letter, Supporting Information for Request for Relaxation of March 12, 2012 Commission Orders Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events and Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-049 and EA-12-051), JAFP-16-0096, dated June 16, 2016 (ML16168A452)
9. ENOI letter, Request for Extension to Comply with March 12, 2012 Commission Orders Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events and Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-049 and EA-12-051), JAFP-16-0147, dated September 8, 2016 (ML16252A477)
10. ENOI and Exelon Generation letter, Application for Order Approving Transfer of Renewed Facility Operating License and Proposed Conforming License Amendment, dated August 18, 2016 (ML16235A081)
11. NRC letter, James A. FitzPatrick Nuclear Power Plant – Acceptance of Requested Licensing Action Re: Application for Order Approving Transfer of Renewed Facility Operating License and Proposed Conforming License Amendment (CAC No. MF8293), dated October 3, 2016 (ML16266A483)
12. NRC letter, James A. FitzPatrick Nuclear Power Plant – 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" and Order EA-12-051, "Reliable Spent Fuel Pool Instrumentation" (CAC Nos. MF1077 AND MF1076), dated December 2, 2016 (ML16173A342)

Dear Sir or Madam:

On March 12, 2012, the Nuclear Regulatory Commission ("NRC" or "Commission") issued an order [Reference 1] to James A. FitzPatrick Nuclear Power Plant (JAF). Reference 1 was immediately effective and directs JAF to install 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 pursuant to Section IV, Condition C.2. Reference 2 endorsed industry guidance document NEI 12-02 Revision 1 [Reference 3] with clarifications and exceptions identified in Reference 2. Reference 4 provided the JAF initial status report regarding spent fuel pool instrumentation. Reference 5 provided the JAF overall integrated plan.

Reference 6 notified the NRC that Entergy Nuclear Operations, Inc. (ENOI) had decided to permanently cease power operations of JAF in January 2017. Due to the possible option to sell JAF in lieu of permanent cessation of power operation ENOI submitted a request for relaxation of Order EA 12-049 and Order EA 12-051 full compliance dates to June 30, 2017 [Reference 9]. By letter dated August 18, 2016, [Reference 10] ENOI and Exelon Generation Company, LLC (Exelon) jointly submitted an application for an order and conforming license amendment transferring the JAF facility from ENOI to Exelon. Reference 11 provides the acceptance by the NRC staff to complete a detailed technical review of the application of the proposed transfer of

renewed operating license of the JAF facility. Reference 12 approved a relaxation to the orders to June 30, 2017.

Reference 1 requires submission of a status report at six-month intervals following submittal of the overall integrated plan. Reference 3 provides direction regarding the content of the status reports. The purpose of this letter is to provide the eighth 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.

This letter contains no new regulatory commitments. If you have any questions regarding this report, please contact William Drews, Regulatory Assurance Manager, at 315-349-6562.

I declare under penalty of perjury that the foregoing is true and correct. Executed on 28th day of February, 2017.

Sincerely,



Brian R. Sullivan
Site Vice President

BRS/WCD/mh

Attachment: James A. FitzPatrick Nuclear Power Plant's (JAF's) Eighth 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

cc: Director, Office of Nuclear Reactor Regulation
NRC Region I Administrator
NRC Resident Inspector
NRC Project Manager
NYSPPSC
NYSERDA President

JAFP-17-0018

Attachment

**James A. FitzPatrick Nuclear Power Plant's (JAF's) Eighth 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**

(18 Pages)

James A. FitzPatrick Nuclear Power Plant's (JAF's) Eighth 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

James A. FitzPatrick Nuclear Power Plant (JAF) developed an Overall Integrated Plan (Reference 1), documenting the requirements to install reliable spent fuel pool level instrumentation (SFPI), in response to Reference 2. This report 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, 2016 and are current as of January 31, 2017:

- Seventh Six-Month Status Report – August 2016 (JAFP-16-0140).
- Develop Training Plan

3. Milestone Schedule Status

The following provides an update to the milestone schedule to support the Overall Integrated Plan. 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
Submit 60 Day Status Report	October 2012	Complete	
Submit Overall Integrated Plan	February 2013	Complete	
Submit 6 Month Updates:			
Update 1	August 2013	Complete	
Update 2	February 2014	Complete	
Update 3	August 2014	Complete	
Update 4	February 2015	Complete	
Update 5	August 2015	Complete	
Update 6	February 2016	Complete	
Update 7	August 2016	Complete	
Update 8	February 2017	Complete	
Modifications:			
Modifications Evaluation	September 2015	Complete	

James A. FitzPatrick Nuclear Power Plant's (JAF's) Eighth 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

Milestone	Target Completion Date*	Activity Status	Revised Target Completion Date
Design Engineering	September 2015	Complete	
Implementation Outage	TBD**	Complete	February 2017
Procedures:			
Create Procedures	TBD**	In Progress	June 2017
Training:			
Develop Training Plan	TBD**	Complete	December 2016
Training Complete	TBD**	Not Started	June 2017
SFP LI Implementation	TBD**	In Progress	June 2017
Full Site SFPI Implementation	TBD**	In Progress	June 2017
Submit Completion Report	TBD**	Not Started	August 2017
Respond to ISE RAIs received December 12, 2013 (Reference 3)	March 31, 2016	Complete (See Section 6)	
Respond to RAIs received August 29, 2013	October 3, 2013	Complete (Reference 5)	

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

**These milestones are being reassessed and revised target completion dates will be determined and included in a future six-month update (see Section 4).

4. Changes to Compliance Method

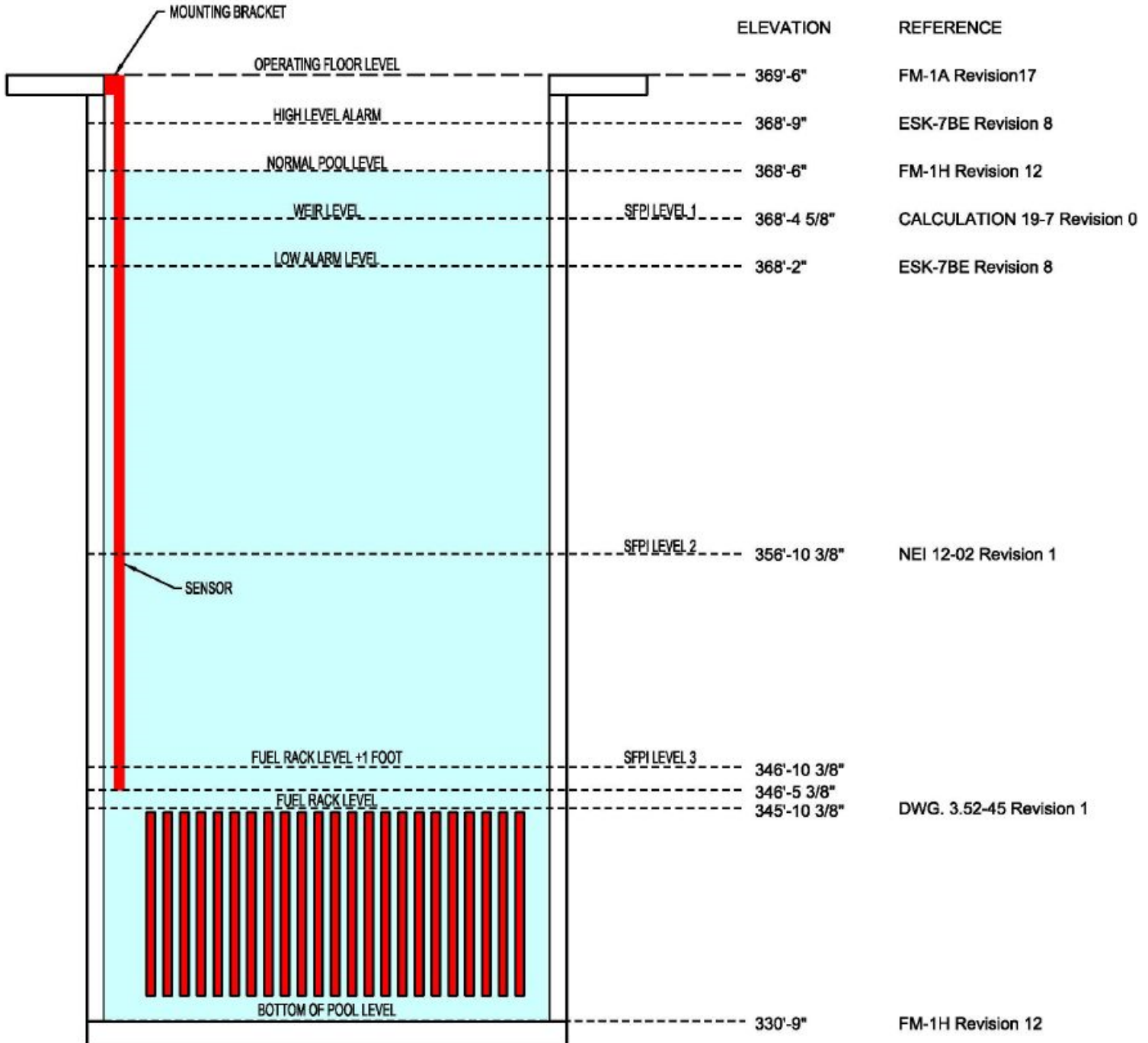
The final SFPI design makes several minor dimension changes to the probe elevation and level designations, which are captured in ECN 67191 (Reference 16). The revised probe elevation resolves a discrepancy of 1" between the specified procurement flange elevation and the as-built flange elevation. Bracket mounting calculation JAF-CALC-15-00005 (Reference 15) was reviewed and is still bounding.

SFPI Level 3 is now defined as 1' above the fuel racks (346'-10 3/8"), for consistency with the Entergy fleet. It was previously defined as 6" above the fuel racks during the design phase. Subsequently, Level 2 is now defined as 10' above the Level 3 definition (11' above the fuel racks). All elevations meet the NEI 12-02 guidance for Levels 2 and 3.

The elevation of the bottom of the probe based on the as-built flange height and final SFPI Levels 1, 2, and 3 are included in the figure below.

James A. FitzPatrick Nuclear Power Plant's (JAF's) Eighth 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

POOL LEVELS AND REFERENCES



James A. FitzPatrick Nuclear Power Plant's (JAF's) Eighth 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

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

JAF submitted a request for relaxation of Order EA-12-049 and Order EA-12-051 full compliance dates to June 30, 2017 (References 10 and 14). This request was based, in part, on Entergy's plan to permanently cease power operations at JAF on January 27, 2017, as certified in its letter to the NRC dated March 16, 2016 (Reference 13). By letter dated August 18, 2016 (Reference 12), Entergy and Exelon Generation Company, LLC (Exelon) jointly submitted an application for an order and conforming license amendment transferring the JAF facility operating license from Entergy to Exelon, contingent upon certain closing conditions. This letter describes the circumstances leading to the license transfer request. Entergy submitted a second request for relaxation of the Order EA-12-049 and Order EA-12-051 full compliance dates, also to June 30, 2017. This request was based, in part, on a plan to operate JAF after a refueling outage which starts in January 2017, contingent upon achieving the closing conditions associated with the license transfer. In light of the facts presented in Entergy's letters (References 10, 11 and 12), the NRC staff approved a relaxation of the orders to June 30, 2017 (Reference 17).

James A. FitzPatrick Nuclear Power Plant's (JAF's) Eighth 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

6. Open Items from Overall Integrated Plan and Interim Staff Evaluation

FitzPatrick has received an Interim Staff Evaluation that includes 18 RAIs. Responses to the RAIs were provided in References 6 and 7. During the onsite audit (Reference 9), which was conducted in October of 2016, revisions and additional information were made to these responses. In addition, one technical review gap resolved during the onsite audit was also added and is included in this update.

RAI / SE #	Response Status
1	See Section 9
2	See Section 9
3	See Section 9
4	See Section 9
5	See Section 9
6	See Section 9
7	See Section 9
8	See Section 9
9	See Section 9
10	See Section 9
11	See Section 9
12	See Section 9
13	See Section 9
14	See Section 9
15	See Section 9
16	See Section 9
17	See Section 9
18	See Section 9
SE.3	See Section 9

7. Potential Interim Staff Evaluation Impacts

In addition to the changes to the compliance method identified in Section 4, Entergy has not identified any additional potential impacts to the Interim Staff Evaluation since the previous six-month status report (Reference 8).

James A. FitzPatrick Nuclear Power Plant's (JAF's) Eighth 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

8. References

The following references support the updates to the Overall Integrated Plan described in this attachment.

1. Entergy to NRC, James A. FitzPatrick Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying License with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), JAFP-13-0023, dated February 28, 2013 (ML13063A267)
2. Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation, EA-12-051, dated March 12, 2012 (ML12056A044)
3. NRC to Entergy, James A. FitzPatrick Nuclear Power Plant – 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 No. MF1076), dated December 12, 2013 (ML13338A645)
4. NRC to Entergy, James A. FitzPatrick Nuclear Power Plant - Request for Additional Information Regarding Overall Integrated Plan for Reliable Spent Fuel Pool Instrumentation (Order EA-12-051) (TAC No. MF1076), dated August 29, 2013 (ML13226A534)
5. Entergy to NRC, Response to Request for Additional Information for the Overall Integrated Plan for the Commission Order Modifying Licenses with Regard to Requirements for Reliable Spent Fuel Pool Instrumentation, JAFP-13-0132, dated October 3, 2013 (ML13276A483)
6. Entergy to NRC, Fourth 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), JAFP-15-0027, dated February 27, 2015 (ML15058A607)
7. Entergy to NRC, Fifth 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), JAFP-15-0105, dated August 28, 2015 (ML15240A377)
8. Entergy to NRC, Seventh 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), JAFP-16-0140, dated August 25, 2016 (ML16238A522)
9. NRC to Entergy, James A. FitzPatrick Nuclear Power Plant - Report for the Audit Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Pool Instrumentation Related to Orders EA-12-049 and EA-12-051 (CAC Nos. MF1077 and MF1076), dated December 14, 2016 (ML16343A011)
10. Entergy to NRC, JAFP-16-0096, Supporting Information for Request for Relaxation of March 12, 2012 Commission Orders Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events and Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-049 and EA-12-051), dated June 16, 2016 (ML16168A452)

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11. Entergy to NRC, JAFP-16-0147, Request for Extension to Comply with March 12, 2012 Commission Orders Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events and Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-049 and EA-12-051), dated September 8, 2016 (ML16252A477)
12. Entergy and Exelon Generation to NRC, Application for Order Approving Transfer of Renewed Facility Operating License and Proposed Conforming License Amendment, dated August 18, 2016 (ML16235A081)
13. Entergy to NRC, JAFP-16-0045, Certification of Permanent Cessation of Power Operations, dated March 16, 2016 (ML16076A391)
14. Entergy to NRC, JAFP-16-0061, Request for Relaxation of March 12, 2012 Commission Orders Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events and Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-049 and EA-12-051), dated April 14, 2016 (ML16105A379)
15. Entergy calculation, JAF-CALC-15-00005, Rev. 0, Spent Fuel Pool Level Probe Mounting Bracket
16. Engineering change, ECN 67191, Rev. 0
17. NRC to Entergy, James A. FitzPatrick Nuclear Power Plant - 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" and Order EA-12-051, "Reliable Spent Fuel Pool Instrumentation" (CAC Nos MF1077 and MF1076), dated December 2, 2016 (ML16173A342)

James A. FitzPatrick Nuclear Power Plant's (JAF's) Eighth 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

9. Responses to all SFPI RAI and SE Items

RAI #1

Please provide information regarding specific procedures controlling irradiated hardware stored in the SFP. Include details of any analysis performed to determine the projected dose rate impact and the appropriate Level 2 elevation as a result of dose from irradiated material stored in the SPF.

Interim Staff Guidance JLD-ISG-2012-03 "Compliance with Order EA-12-051, Reliable Spent Fuel Pool Instrumentation" states, "The NRC staff considers that the methodologies and guidance in conformance with the guidelines provided in 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 R1 section 2.3.2, "Level 2- level that is adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck" defines Level 2.

Level 2 represents the range of water level where any necessary operations in the vicinity of the spent fuel pool 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:

- 10' (+/- 1') above the highest point of any fuel rack seated in the spent fuel pools, 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 10' option, which has been determined by the NRC to meet the requirements of the order with no further evaluation or review required.

Irradiated equipment and materials are permanently stored in the SFP and hung on the SFP walls. Therefore, specific procedures control irradiated equipment and materials stored in the SFP. These procedures are as follows:

- Control of Highly Irradiated Objects – EN-RP-123
- Spent Fuel Pool Material Control – AP-17.03
- Transfer of Control Blades in the Spent Fuel Pool Using Control Blade Hangers – MP-004.25
- LPRM Removal and Installation – MP-004.18
- IRM/SRM Instrument Dry Tube Removal and Installation – MP-004.20

Because JAF has chosen Level 2 as 10' (+/- 1') above the highest point of any fuel rack seated in the spent fuel pools, no additional analysis is required. Additionally, the JAF FLEX strategy ensures that all activities in the proximity of the SFP are completed prior to the calculated time to boil and thus prior to reduction of spent fuel pool level; therefore, this strategy ensures that necessary operations in the vicinity of the spent fuel pool can be completed without significant dose consequences.

James A. FitzPatrick Nuclear Power Plant's (JAF's) Eighth 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

RAI #2

Please provide the results of 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.

The vendor, MOHR, prepared a series of generic seismic qualification reports for the SFP level instrument which bound JAF's seismic criteria. The qualification reports envelop all components of the new SFP level instrumentation required to be operational during a BDBEE and post-event. Therefore, the SFP instrumentation and electronic units are acceptable for use at the site. The analyses are contained in proprietary MOHR Test and Measurement LLC Reports:

1. NAI-1725-004, Rev. 3, "Seismic Induced Hydraulic Response in the CGS Spent Fuel Pool"
2. 1-0410-6, Rev. 1, "MOHR EFP-IL SFPI System Seismic Test Report"
3. 1-0410-9, Rev. 2, "MOHR SFP-1 Level Probe Assembly Seismic Analysis Report"

The probe mounting bracket is designed seismic category I with all Interaction Ratios (IRs) less than one (1.0), as documented in JAF-CALC-15-00005. Conservative hydrodynamic forces (sloshing) within the pool caused by a seismic event are documented in NAI-1725-004 and those forces are used as input to the SFPI mounting bracket design to ensure the probe will remain in place and functional during and after a BDBEE. The actual hydrodynamic loads at FitzPatrick are bounded by the loads given in NAI-1725-004, which are based on the seismic responses corresponding to the San Onofre Nuclear Generating Station and the Columbia Generating Station.

RAI #3

For each of the mounting attachments required to fasten 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.

Calculation JAF-CALC-15-00005 was developed to structurally qualify the SFPI probe mounting bracket. This mounting bracket will be installed in the SFP located in the Reactor Building at Elevation 369'-6" in the Northwest and Southwest corners of the pool (2 mounting brackets total). This calculation is a safety-related calculation that shows the mounting bracket is structurally and seismically adequate. The interaction ratio is less than 1.0. In addition, the qualification of the SFP steel liner is not adversely impacted as documented in the calculation.

Equipment installed in the Relay Room at EL. 284'-8" was analyzed as augmented quality and incorporated seismic category I requirements. All components and anchorage for mounting the level displays, battery enclosures, and power conditioners are designed to meeting seismic category I requirements. Based on vendor documentation and drawings, the evaluation performed in EC 52728 for the heaviest equipment shows that the natural frequency falls above 100 Hz. in the rigid range. All of the supports are structurally adequate and seismically qualified.

Per Section 3.1.2.3 of EC 52728, all conduit supports are designed in accordance with CES-2B and are both seismic category I qualified and structurally adequate. The Relay Room is a Safety Related Class I structure, per FSAR Section 12.2.2 and contains Safety Related equipment in the installation area. Therefore, all components and anchorage for mounting the level displays, battery enclosures and power conditioners are designed to meet seismic category I requirements.

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RAI #4

Please provide further information to describe how other material stored in the SFP will not create adverse interaction with the fixed instrument location(s).

Per EC52728, the Spent Fuel Pool is designed seismic category I in order to withstand Design Basis Event (DBE) earthquake loads. Interferences (i.e. Refueling Group equipment, tools, control blades, etc.) in the pool will be removed or relocated to make room for the new instruments. Additionally, this EC requires a storage restriction sign indicating 'restricted storage area within 4.5' of corner of the pool' to be tied to SFP railing to ensure no adverse radiological, personnel, EMI/RFI (electromagnetic interference) or seismic II/I interactions with the probe instrument.

RAI #5

Please provide analysis of the maximum expected radiological conditions (dose rate and total integrated dose) to which the sensor electronics (including power boxes, signal processors, and display panels) will be exposed. Also, provide documentation indicating the maximum total integrated dose the sensor electronics can withstand and how it was determined. Discuss the time period over which the analyzed total integrated dose was applied.

Calculation JAF-CALC-14-00025 provides analysis of the maximum expected radiological conditions to the probe standoff material and the SiO₂ cable and Rockbestos cable near the SFP. This calculation shows that based on both the 40 year normal operation and 7 day accident (SFP water at Level 3), dose from the fuel and irradiated control blades, the total integrated dose of 2.0E+08 rads to the probe is less than the minimum dose limit of the standoff material of 2.0E+09 rads. The combined normal and accident dose of 2.1E+07 rad is less than the dose limit of 1.0E+08 rads for the SiO₂ cable and 2.0E+08 rads for the Rockbestos cable.

The JAF Relay Room is in the Administration Building and is considered a mild environment per Section 3.2 of JAF-RPT-MISC-04046, Rev. 0, "Environmental Qualification Service Conditions," so the sensor electronics will function in this low radiation environment. The ELAP will not cause the radiological conditions to exceed the mild environment radiological limits for the Relay Room.

RAI #6

Please provide information indicating (a) the maximum expected ambient temperature in the room in which the sensor electronics will be located under BDB conditions, with no ac power available to run Heating Ventilation and Air Conditioning (HVAC) systems; and, (b) whether the sensor electronics are capable of continuously performing required functions under this expected temperature condition.

The display/processors will be located in the Relay Room, within the Control Room Ventilation Boundary. Calculation JAF-CALC-MISC-04509 determines that the maximum temperature in the Relay Room, for a configuration in which no ventilation is provided and the equipment inside is powered, will be 110°F after 93 hours and 112.5°F after 144 hours.

The normal operating temperature of the Relay Room is 75°F. 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 its required function under the expected temperature conditions. Results of the vendor testing are available in proprietary MOHR Report 1-0410-1 Rev. 1, "MOHR EFP-IL SFPI System Temperature and Humidity Report."

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RAI #7

Please provide information indicating (a) the maximum expected relative humidity in the room in which the sensor electronics will be located under BDB conditions, with no ac power available to run HVAC systems; and, (b) whether the sensor electronics are capable of continuously performing required functions under this expected humidity condition.

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 Rev. 1, "MOHR EFP-IL SFPI System Temperature and Humidity Report."

Humidity in the Relay Room is normally regulated by the Relay Room Ventilation and Cooling (RRHV) system at 40-50%. During an extended loss of AC power, the RRHV system is no longer available. Assuming the Relay Room is isolated from outside air, the temperature is expected to increase and the relative humidity is expected to decrease because the heat loads are dominated by the sensible heat of electrical equipment. Therefore, the maximum temperature of 112.5°F and humidity of 50% is still bounded by the 47 °C (116.6 °F) and 71% relative humidity (RH) test case presented in proprietary MOHR Report 1-0410-1, which was endorsed by the NRC Audit Report for MOHR.

In the event outside air is introduced to the Relay Room, due to open doors or RRHV system connections to other rooms, ASHRAE defines the 0.4% dehumidification condition to be 80.5 °F db, 72.4 °F dew point, and ~67% RH for Syracuse, New York. Similarly, 84.8 °F db, 75.4 °F wb, and ~65% RH is defined for a 0.4% evaporation conditions. These conditions are bounded by the 32°C (89.6°F) and 96% RH test case presented in proprietary MOHR Report # 1-0410-1.

Hence, the operational humidity range of 5–95% RH encompasses all expected conditions for the Relay Room and the sensor electronics are capable of continuously performing their required function under the expected humidity conditions.

RAI #8

Please provide 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 shock and vibration conditions.

The NRC Audit Report for MOHR concludes that the shock and vibration test results were satisfactory. The report also acknowledges that the testing performed in proprietary MOHR Report 1-0410-16, Rev. 0, "MOHR SFP-1 Level Probe Assembly Shock and Vibration Test Report," is sufficient to close the open item identified during the MOHR audit.

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 resistant to shock and vibration. The probes and repairable head are evaluated to be adequately designed for resilience against shock and vibration.

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.

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The indicator and battery enclosures will be mounted in the Relay 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. There are no expected impacts from adjacent objects during the BDBEE or design basis earthquake requirements imposed by NEI 12-02.

RAI #9

For RAI #8 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.

See Response to RAI #8.

RAI #10

Please provide the vendor analysis and seismic testing results and show the SFP level instrument performance reliability, following exposure to simulated seismic conditions representative of the environment anticipated for the SFP structures at JAF, has been adequately demonstrated.

See Response to RAI #2 for discussion on seismic qualifications.

The Factory Acceptance Test (FAT) was performed by MOHR on JAF's SFPI system (EFP-IL00053 and EFP-IL00054) on 8/25/2015. The FAT was conducted by comparing the test bed water level measured by calibrated manometer with the water level measured by SFPI probes. Three measurements which correspond to SFP water Level 1, 2, and 3 were collected. The fourth measurement was taken at the level specified by the JAF. The FAT test results demonstrate that the water levels measured by the SFPI probes are within +/-3" of the calibrated manometer reading. The specific test results related to the level accuracy are summarized in the tables below.

Table 1 – Probe EFP-IL 00053

Measurement ID	Manometer Reading (Inches)	EFP-IL 00053 Probe Reading (Inches)
1 st Measurement (Test Level 1)	-24.20	-24.71
2nd Measurement (Test Level 2)	-129.6	-130.50
3rd Measurement (Test Level 3: +5" from bottom of the probe)	-269.7	-270.85
4 th Measurement (JAF specified at 155')	-155.16 (reading from pressure transducer)	-155.03

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Table 2 – Probe EFP-IL 00054

Measurement Description	Manometer Reading (Inches)	EFP-IL 00054 Probe Reading (Inches)
1 st Measurement (Test Level 1)	-24.00	-24.60
2nd Measurement (Test Level 2)	-129.9	-130.52
3rd Measurement (Test Level 3: +5" from bottom of the probe)	-270	-270.54
4 th Measurement (JAF specified at 155')	-154.78 (reading from pressure transducer)	-154.79

All other parameters associated with the FAT fell within design parameters.

RAI #11

Please provide the NRC staff with the final configuration of the power supply source for each channel so the staff may conclude the two channels are independent from a power supply assignment perspective.

Each instrument loop is normally powered from a 120VAC 60 Hz plant distribution panel to support continuous monitoring of SFP level. The distribution panel for the primary Loop A receives power from a different 600V bus than the distribution panel for the backup Loop B. Therefore, loss of any one 600V bus does not result in loss of normal 120VAC power for both instrument loops.

The distribution panels selected to provide 120VAC to the level instrumentation are non-safety related panels.

Loop A 120V AC Power is from Distribution Panel 71RRACA8 on the east wall of the Relay Room. Distribution Panel 71RRACA8 is fed from 71MCC-332 on 600V bus 13300, which is in turn fed from 4160V bus 10300. Bus 10300 is fed from the Normal Station Service Transformer (NSST) T-4 (Winding "Y") during normal plant operation and from Reserve Station Service Transformer (RSST) T-3 (Winding "Y") during start-up, shut down and standby via an offsite source.

Loop B 120V Power is from Distribution Panel 71AC10 on the north wall of the Relay Room. Distribution Panel 71AC10 is normally fed from 71MCC-342 via ATS 71TS-6 on 600V bus 13400, which is in turn fed from 4160V bus 10400. Bus 10400 is fed from the Normal Station Service Transformer (NSST) T-4 (Winding "Y") during normal plant operation and from Reserve Station Service Transformer (RSST) T-2 (Winding "Y") during start-up, shut down and standby via an offsite source.

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RAI #12

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

Per proprietary MOHR Report 1-0410-7, Rev. 2, "MOHR EFP-IL System Battery Life Report," the instrument testing demonstrates the battery capacity is sufficient for seven days continuous operation using conservative instrument power requirements. The permanent installed battery capacity of seven days is planned consistent with NEI 12-02 duration without reliance on or crediting of potentially more rapid FLEX program power restoration.

RAI #13

Please provide an analysis verifying the proposed instrument performance is consistent with these estimated normal and BDB accuracy values. Demonstrate that the channels will retain these accuracy performance values following a loss of power and subsequent restoration of power.

The accuracy specified in proprietary MOHR Report 1-0410-12, Rev. 1, "EFP-IL Signal Processor Operator's Manual," is 3.0", which is within the limit of $\pm 1'$ set by NEI 12-02. The probe is designed to produce accurate level indication in boiling and frothing (multiphase) environments. Proprietary MOHR Report 1-0410-10, Rev. 1, "MOHR EFP-IL SFPI System Power Interruption Report," concludes that the accuracy is not affected by an interruption in power.

During the on-site vendor audit at the MOHR facility (Ref. ML14216A362), the NRC reviewed MOHRs documentation related to the SFPI electronics, seismic qualifications, shock and vibration, instrument accuracy, power consumption, and EMC testing. The NRC staff verified the design and qualification process used by the vendor to confirm the reliability of the SFPI. The staff found the SFPI design and qualification process acceptable. The information and calculations provided by the vendor allowed the staff to identify licensee information that will require docketing to confirm that the installation of the instrumentation at the site is enveloped by the SFPI's design.

RAI #14

Please provide a description of the methodology to be used for determining the maximum allowed deviation from the instrument channel design accuracy under normal operating conditions. Staff understands this allowed deviation will serve as an acceptance criterion for a calibration procedure to alert operators and technicians that the channel requires adjustment to within normal design accuracy.

In general relative to normal operating conditions, any applicable calibration procedure tolerances (or acceptance criterion) will be established based on the vendor manuals stated/recommended reference accuracy (or design accuracy). The methodology used will also be based on the vendor manuals and captured in plant procedures and/or programs. During the vendor audit, instrument design accuracy of $\pm 3'$ was reviewed and found acceptable as discussed in the response to RAI #13 and as demonstrated in the FAT discussed in the response to RAI #10.

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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.

The instrument automatically monitors the integrity of its level measurement system using in-situ capability. 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 JAF SFP instrument channels have a reasonably high certified design accuracy of equal to or better than +/- 3". The following Preventative Maintenance (PM) tasks document the Entergy Fleet PM strategy for checking the MOHR instrumentation system calibration. JAF will follow this PM strategy, which incorporates the vendor calibration instructions.

Task Name	Objective	Frequency of Occurrence
Channel Calibration Check (Operator Rounds)	To validate that the MOHR instruments (both channels) are displaying the correct spent fuel pool level within the accuracy of the instruments and that the date stamp on the display is indicating correctly.	1D
Channel Check / Panel Functional Check	To check each channel against each other for comparison and to perform functional assessments of each panel.	1Y

RAI #16

For the SFP level instrumentation displays located outside the main control room, please describe the evaluation used to validate the display location can be accessed without unreasonable delay following a BDB event. Include the time available for personnel to access the display as credited in the evaluation, as well as the actual time (e.g., based on walkthroughs) that it will take for personnel to access the display. Include a description of the radiological and environmental conditions on the paths personnel might take. Describe whether the display location remains habitable for radiological, heat and humidity, and other environmental conditions following a BDB event. Describe whether personnel are continuously stationed at the display or monitor the display periodically.

The primary and backup SFPI displays will be located in the Relay Room. The panels are deemed promptly accessible since the Relay Room is directly below the Control Room and is within the same building (Administration Building). The stairway down to the Relay Room is accessed via an interior fire door from the Control Room. The Control Room personnel can access this area in approximately 1 minute. An allowance of 10 minutes is provided in the staffing analysis to account for unforeseen obstructions to the travel path. This is less than the 30 minute time to read the level required by Section 3.1 of NEI 12-02.

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The Relay and Control Rooms are considered mild environments per Section 3.2 of JAF-RPT-MISC-04046, Rev. 0, "Environmental Qualification Service Conditions." Since they are within the same building, the environments are essentially the same. Personnel will not be continuously stationed at the display; it will be monitored periodically.

RAI #17

Please provide a list of the procedures addressing operation (both normal and abnormal response), calibration, test, maintenance, and inspection that will be developed for use of the SFP instrumentation. Include a brief description of the specific technical objectives to be achieved within each procedure.

The following is the list of procedures addressing operation (both normal and abnormal response), calibration, test, maintenance, and inspection that will be developed for use of the SFP instrumentation:

Task Name	Objective	Frequency of Occurrence
Channel Calibration Check (Operator Rounds)	To validate that the MOHR instruments (both channels) are displaying the correct spent fuel pool level within the accuracy of the instruments and that the date stamp on the display is indicating correctly.	1D
Channel Check / Panel Functional Check	To check each channel against each other for comparison and to perform functional assessments of each panel.	1Y
Signal Processor Clock Battery Replacement	To prevent failure of the onboard clock battery and adverse impact to the signal processor operating system.	10Y
FLEX Strategy Guide (FSG)	New procedure that provides actions to restore SFP level using an alternate makeup source for a BDBEE resulting in an ELAP. This procedure includes remote SFPI display locations and a procedure for how and when to connect an external DC source to the power the SFP level indicator.	N/A
Technical Requirements Manual (TRM)	Provides compensatory actions for SFPI out of service.	N/A

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JAF has reviewed the Entergy fleet TRM template for SFPI and plans to incorporate this template into the TRM. For a single channel out of service, the template states that there is a 90 day allowed outage time before compensatory measures are implemented immediately. For both the primary and alternate channels out of service, the templates states that there is a 24 hour allowed outage time before compensatory measures are implemented within 72 hours.

RAI #18

Please provide further information describing the maintenance and testing program to be established and implemented 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 plans to ensure necessary channel checks, functional tests, periodic calibration, and maintenance will be conducted for the level measurement system and its supporting equipment.

The following is a list of Preventative Maintenance (PM) tasks documenting the Entergy Fleet PM Strategy for the MOHR instrumentation system. JAF will adopt this PM strategy.

Task Name	Objective	Frequency of Occurrence
Channel Calibration Check (Operator Rounds)	To validate that the MOHR instruments (both channels) are displaying the correct spent fuel pool level within the accuracy of the instruments and that the date stamp on the display is indicating correctly.	1D
Channel Check / Panel Functional Check	To check each channel against each other for comparison and to perform functional assessments of each panel.	1Y
Signal Processor Clock Battery Replacement	To prevent failure of the onboard clock battery and adverse impact to the signal processor operating system.	10Y

JAF has reviewed the Entergy fleet TRM template for SFPI and plans to incorporate this template into the TRM. For a single channel out of service, the template states that there is a 90 day allowed outage time before compensatory measures are implemented immediately. For both the primary and alternate channels out of service, the template states that there is a 24 hour allowed outage time before compensatory measures are implemented within 72 hours.

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SE.3

Please describe the impact of recent MOHR's SFPI equipment failures (failure of the filter coil (or choke) in particular) on the FitzPatrick's SFP level instrument. Also, any actions/measures FitzPatrick plans to implement to address this equipment failure.

The vendor MOHR has determined the source of the failures is a miniature surface mount common-mode choke component used on the Video and Digicomp printed circuit boards (PCB's) within the EFP-IL Signal Processor. Per MOHR's recommendation, the two boards have both already been replaced. The new boards have equivalent substitute components that are less susceptible to transient electrical events. The substitute components have equivalent size, mass, and solder attachment technique as the original component such that there is no impact to the system mechanical characteristics. The components demonstrate equivalent electrical performance such that EMC characteristics are not significantly changed.

MOHR has provided a copy of their Root Cause Analysis Report, Revision 1, dated 6/1/2015. It is the conclusion of this report that qualification of the equipment is not impacted by the replacement parts. MOHR modified the JAF equipment as described in proprietary MOHR Report 1-1010-2 Rev. 0, "EFP-IL MOD 1 Modification Package," prior to shipment to the JAF site. In the event one or both channels become non-functioning at any point in the future, compensatory actions will be covered under the plant's TRM.