Entergy Nuclear Operations, Inc.
Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

John A. Dent Jr.
Site Vice President

July 17, 2015

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
11555 Rockville Pike, OWFN-2 FL
Rockville, MD 20852-2738

SUBJECT: Pilgrim Nuclear Power Station's Notification of Full Compliance with Order EA-12-051, Order Modifying Licenses with Regard to Requirements for Reliable Spent Fuel Pool Instrumentation

Pilgrim Nuclear Power Station
Docket No. 50-293
License No. DPR-35

PNPS Letter 2.15.051

REFERENCES:

1. NRC Order Number EA-12-051, Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation, dated March 12, 2012 (ML12054A682)
2. Entergy Letter to NRC (PNPS 2.13.014), Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), dated February 28, 2013 (ML13063A097 and ML13063A098)
3. NRC Letter Regarding Interim Staff Evaluation and Request for Additional Information Regarding the Overall Integrated Plan for Implementation of Order EA-12-051, Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (TAC No. MF0778) (ML1333A910), dated December 5, 2013 (PNPS Letter 1.13.065)
4. NRC Letter Report for the Audit Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Instrumentation Related to Orders EA-12-049 and EA-12-051 (TAC Nos. MF0777 and MF0778), dated January 26, 2015 (PNPS Letter 1.15.003)

A001
NRR

Dear Sir or Madam:

The purpose of this letter is to notify the NRC that Pilgrim Nuclear Power Station (PNPS) is in full compliance with Order EA-12-051. On March 12, 2012, the U. S. Nuclear Regulatory Commission (NRC) issued Order EA-12-051 (Reference 1) to Entergy Nuclear Operations, Inc. (Entergy). Reference 1 was immediately effective and directed Entergy to install reliable spent fuel pool level instrumentation (SFPI).

Order EA-12-051, Section IV.A.2 requires completion of full implementation to be no later than two refueling cycles after submittal of the Overall Integrated Plan (OIP), as required by Condition C.1.a, or December 31, 2016, whichever comes first. In addition, Section IV.C.3 of Order EA-12-051 requires that Licensees and CP holders report to the NRC when full compliance is achieved. The OIP for EA-12-051 was submitted (Reference 2) on February 28, 2013. On May 20, 2015, PNPS entered Mode 2 (startup) following refueling outage 20 which was two refuel cycles after submittal of the OIP. Full compliance with Orders EA-12-051 was achieved at that time as discussed in the attachments.

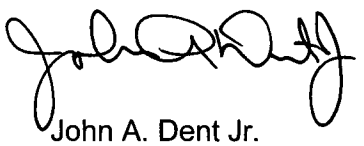
This letter, along with the attachments, provides the notification required by Section IV.C.3 of the Order that full compliance with the requirements described in Attachment 2 of the Order has been achieved for PNPS. The attached responses as requested from References 3 and 4 are based on information and analyses that have been completed as of the date of full compliance. As such, Energy considers these items complete pending NRC closure.

The notification of full compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events was submitted under separate cover via PNPS Letter No. 2.15.050 dated July 17, 2015. This was separated since no Final Integrated Plan is required for the SFPI Order as was required with the Mitigation Strategies Order submittal.

This letter contains no new regulatory commitments. Should you have any questions regarding this submittal, please contact Mr. Everett (Chip) Perkins Jr., Manager, Regulatory Assurance at (508) 830-8323.

I declare under penalty of perjury that the foregoing is true and correct; executed on July 17, 2015.

Sincerely,



John A. Dent Jr.
Site Vice President

JAD/rmb

Attachments:
1. Compliance Bases for Order EA-12-051
2. NRC Requests for Information and Responses
3. NRC Audit Questions and Status
4. Drawing C2900 PNPS Fuel Pool Levels and References
5. Drawing E304 SFP Layout (partial)

cc: Mr. Daniel H. Dorman
Regional Administrator, Region 1
U.S. Nuclear Regulatory Commission
2100 Renaissance Boulevard, Suite 100
King of Prussia, PA 19406-1415

U. S. Nuclear Regulatory Commission
Director, Office of Nuclear Reactor Regulation
Washington, DC 20555-0001

Mr. Richard V. Guzman, Senior Project Manager
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Mail Stop O-8C2A
Washington, DC 20555-0001

Mr. John Giarrusso Jr.
Planning, Preparedness & Nuclear Section Chief
Mass. Emergency Management Agency
400 Worcester Road
Framingham, MA 01702

NRC Resident Inspector
Pilgrim Nuclear Power Station

Stephen Monarque, Project Manager
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Mail Stop OWFN
Washington, DC 20555-0001

Attachment 1 to

Pilgrim Letter 2.15.051

Compliance Bases for 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 Pilgrim Nuclear Power Station (PNPS). The information provided herein documents full compliance by PNPS in response to the Order.

COMPLIANCE

Entergy has installed two independent full scale level monitors in the PNPS SFP in response to Reference 1.

Entergy submitted PNPS's Overall Integrated Plan (OIP) by Reference 2. By Reference 4 the NRC provided requests for additional information (RAIs) for the OIP. Entergy provided responses to the RAIs by References 3 and 7. 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 5, 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).

ACTIONS COMPLETED

EC-45088 (PNPS SFP Level Instrumentation (SFPI) for NRC Order EA-12-051) has been implemented providing SFP level monitoring capability in the Control Room.

IDENTIFICATION OF LEVELS OF REQUIRED MONITORING – COMPLETE

PNPS Level 1: 115 feet 8 inches
Level that is adequate to support operation of the normal fuel pool cooling system.

PNPS Level 2: 111 feet 3 inches
Level that is adequate to provide substantial radiation shielding for a person standing on the spent fuel pool and operating deck.

PNPS Level 3: 93 feet 10 inches
Level where fuel remains covered and actions to implement make-up water addition should no longer be deferred.

INSTRUMENT DESIGNED FEATURES – COMPLETE

PNPS SFP level instrument loops incorporate two permanently installed, physically independent, and physically separated loops (with loop 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 by metal raceway and maintaining relative spatial separation until promptly exiting the SFP floor. Displays are installed in the Control Room. Power sources include 1) independent plant alternating current (AC) power sources, 2) loop-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 PNPS Seismic Category I requirements.

PROGRAM FEATURES - COMPLETE

Training has been conducted as needed. Procedure 1.3.34 has been implemented to control functionality and actions for non-functionality. Routine monitoring is provided per operations log entry implementation.

MILESTONE SCHEDULE – ITEMS COMPLETE

PNPS Milestones	**Completion Date**
PNPS Reliable SFPI Design Modification Package Developed/Issued (EC-45088)	March 12, 2014
PNPS Reliable SFPI Installed	(startup from outage May 19, 2015)
#1 NRC RAIs (Received June) (1.13.031)	July 19, 2013 (2.13.057)
#2 NRC ISE RAIs (Received December, 2013) (1.13.065)	February 28, 2014 (2.14.012)

Based on the above, the requirements of Order EA-12-051 have been achieved for PNPS. A summary of PNPS's 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 3 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 loops 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 loops or obtain level data. Displays and signal processors are located in the control room. The three critical levels for PNPS 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 PNPS based on nominal coolant inlet pipe elevation [as it does not incorporate a vacuum (or siphon breaker)]. The elevation associated with this level is 115 feet 8 inches.

LEVEL 2: Level 2 is the level adequate to provide substantial radiation shielding for a person standing on the SFP operating deck. Entergy 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. Pilgrim then decided to make Level 2 the same as the current Technical Specification Limit which is approximately 19 feet above the top of the fuel racks. Procedure 1.16.1 "Spent Fuel Pool Non-SNM Inventory Control" provides controls for irradiated material and equipment stored in the SFP. Because Level 2 has been chosen as nineteen feet (greater than the ten feet requirement) above the highest point of any fuel rack seated in the SFP, no additional analysis is required. Additionally, the PNPS 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 111 feet 3 inches.

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 92 feet 10 inches. Therefore, Level 3 is elevation is 93 feet 10 inches.

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 3 and 10, both PNPS primary and backup SFP level instrument loops are fixed or permanently installed. Both instrument probes are permanently installed within one foot of the northwest and southwest corners of the SFP. Both instrument displays/processors are permanently installed in the 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 8 and 10, and in accordance with the guidance of Section 3.2 of NEI 12-02 Revision 1, PNPS primary and backup SFP level instrument probes are spatially separated and installed within one foot of separate SFP corners. Corner locations provide inherent protection of the probes. Loop separation for cable routing away from the probes maintains the same relative spatial separation distance as the SFP corner mounting locations. Loop routing on the SFP floor is limited with prompt exit to below the SFP floor. Probe top section and loop 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. Additional protection is provided by the Auxiliary bridge which is generally 'parked' at the west end of the SFP above the probes. 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 3 and 8, the entire PNPS SFP instrument loop (equipment from the SFP to the Control Room) is mounted and designed to requirements equal to or greater than PNPS seismic design bases, seismic category I requirements. As such, the SFP instrument loops are designed and installed to retain their design configuration during and following maximum requirements of the PNPS 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 3 and 10, the entire PNPS SFP instrument loop (equipment from the SFP to the Control Room) is designed and qualified to PNPS environmental extremes applicable for the area of interest (e.g., SFP, Control Room). The SFP area environmental extremes are in accordance with NEI 12-02 Revision 1 SFP example conditions. The SFP instrumentation loops have been designated as Augmented Quality per Entergy processes covering procurement, design, and installation. As such, the SFP instrument loops have demonstrated reliability through establishment of Augmented Quality processes at applicable environmental extremes.

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

Per References 8 and 10, the SFP instrument loops have highly reliable independent power sources (as described in Section f below) and loop independence achieved by incorporation of two permanently installed, physically independent, and physically separated loops (with loop 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 loops are independent.

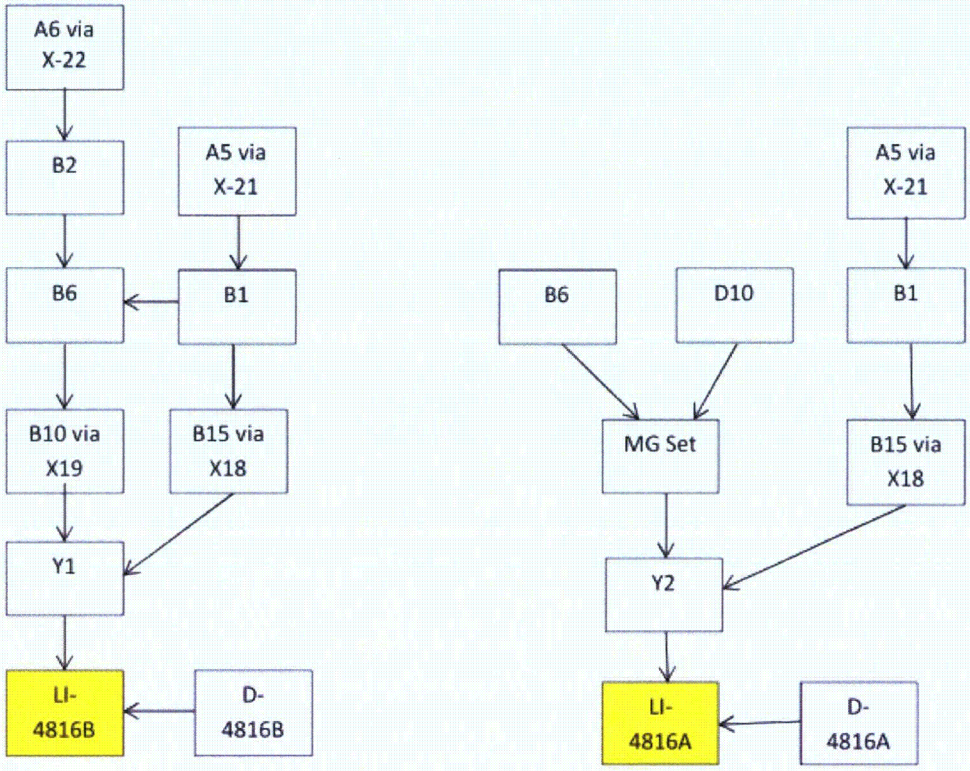
f. **Power supplies: Permanently installed instrumentation channels shall each be powered by a separate power supply. Permanently installed and portable instrumentation channels shall provide for power connections from sources independent of the plant AC and DC power distribution systems, such as portable 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 8 and 10, the two PNPS SFP instrument loops are powered from opposing power AC power sources. Power is supplied for one loop (LI-4816B) from 120 VAC Panel Y1. Power is supplied for the other loop (LI-4816A) from 120 VAC Panel Y2.

The two PNPS 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 loop-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.

As such, the SFP instrument loops 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 loop power with sufficient capacity to maintain the level indication function for full event duration including until offsite resource availability is reasonably assured.

SIMPLIFIED DIAGRAM SHOWING THE INDEPENDENT NORMAL POWER SUPPLIES AND THE INDEPENDENT BACKUP BATTERIES



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

Per Reference 10, the SFP instrument loops have a high certified design accuracy of equal to or better than +/- three inches which is not affected by power interruption as supported by vendor test documentation. As such, the SFP instrument loops 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 3, 8, and 10, the SFP instrument loops 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. Loop design provides capability for calibration or validation against known/actual SFP level. As such, the SFP instrument loop'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 Reference 10, the PNPS SFP instrument loop displays are located in the PNPS 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 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 PNPS instrument and control maintenance technicians received training on the MOHR EFP-IL SFP Level Monitoring System at the vendor (MOHR) facilities.

Presentation, *EC-45088 PNPS SFP Instrumentation,* and Section 2.6.13 of System Training Manual 1-73, *SFP Instrumentation,* training has been provided to operations, the necessary members of 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).
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.

The calibration and test procedure developed by MOHR is provided in their technical manual. The objectives are to measure system performance, determine if there is a deviation from normal tolerances, and return the system to normal tolerances.

Diagnostic procedures developed by MOHR are provided as automated and semi-automated routines in system software alerting the operator to abnormal deviation in selected system parameters such as battery voltage, 4-20 mA loop continuity, and TDR waveform of the transmission cable. The technical objective of the diagnostic procedures is to identify system conditions that require operator attention to ensure continued reliable liquid level measurement. Manual diagnostic procedures are also provided in the event that further workup is determined to be necessary.

Maintenance procedure 8.E.19 has been revised to address the functional check of the SFP level instruments. The procedure allows a technician trained in the EFP-IL system maintenance to ensure that system functionality is maintained.

Operations procedure 2.2.85 "Fuel Pool Cooling and Filtering System" provides sufficient instructions for operation of the equipment.

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.

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 vendor recommendations. This will ensure that appropriate regular testing, channel checks, functional tests, periodic calibration, and maintenance is performed (and available for inspection and audit).

REFERENCES

1. NRC Order Number EA-12-051, *Order Modifying Licenses with Regard to Reliable Spent Fuel Pool (SFP) Instrumentation*, dated March 12, 2012 (1.12.015) (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 (2.13.014) (ML13063A097)

3. *Response to Request for Additional Information for the Overall Integrated Plan in Response to the Commission Order Modifying Licenses with Regard to Requirements for Reliable Spent Fuel Pool Instrumentation* (Order Number EA-12-051), dated July 19, 2013 (2.13.057) (ML13207A142)

4. *Request for Additional Information for the Overall Integrated Plan for Reliable Spent Fuel Pool Instrumentation* (Order Number EA-12-051), dated June 20, 2013 (1.13.031) (ML13165A276)

5. *Pilgrim Nuclear Power Station's First Six-Month Status Report to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Reliable Spent Fuel Pool Instrumentation* (Order Number EA-12-051), dated August 28, 2013 (2.13.070) (ML13247A412)

6. *Pilgrim Nuclear Power Station - Interim Staff Evaluation And Request For Additional Information Regarding The Overall Integrated Plan For Implementation Of Order EA-12-051, "Issuance Of Order To Modify Licenses With Regard To Reliable Spent Fuel Pool Instrumentation"* (TAC NO. MF0778), dated December 5, 2013 (1.13.065) (ML13333A910)

7. *Pilgrim Nuclear Power Station's Second Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation* (Order Number EA-12-051), dated February 28, 2014 (2.14.012) (ML14069A307)

8. *Pilgrim Nuclear Power Station's Third Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation* (Order Number EA-12-051), dated August 28, 2014 (2.14.062) (ML14253A208)

9. *Pilgrim Nuclear Power Station's 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), dated February 27, 2015 (2.15.006) (ML15069A224)

10. EC-45088, PNPS Engineering Change implementing NRC Order EA-12-051 SFP Instrumentation

11. *Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design Basis External Events* (Order Number EA-12-049), dated March 12, 2012 (1.12.013) (ML12054A736)

Attachment 2 to Letter 2.15.051

NRC Requests for Information and Responses

NRC Requests for Information

As stated in Attachment 1, Entergy submitted PNPS's Overall Integrated Plan (OIP) by Attachment 1, Reference 2 and minor updates per References 5, 7, 8, and 9 of Attachment.

By Reference 4 of Attachment 1 the NRC provided requests for additional information (RAIs) for the OIP. Entergy provided responses to the RAIs by Reference 3.

RAI Number	RAI	Response
RAI-1.a	A clearly labeled sketch depicting the elevation view of the proposed typical mounting arrangement for the portions of instrument channel consisting of permanent measurement channel equipment (e.g., fixed level sensors and/or stilling wells, and mounting brackets). Indicate on this sketch the datum values representing Level 1, Level 2, and Level 3 as well as the top of the fuel. Indicate on this sketch the portion of the level sensor measurement range that is sensitive to measurement of the fuel pool level, with respect to the Level 1, Level 2, and Level 3 datum points.	The requested information is provided in Attachments 4 and 5. The attachments indicate Levels 1, 2, and 3 as well as the approximate location of the proposed mounting bracket incorporating the Seismic Category I attachment. The sensor is a perforated tubular coaxial waveguide that provides continuous level measurement axially and is sensitive over its entire length. These sketches apply to both the primary and backup loops. The spent fuel pool (SFP) level lower instrument span or probe bottom extends down to at least three inches below the upper limit of the range of Level 3 to account for loop accuracy or instrument loop uncertainty. Therefore, the SFP level probe bottom/span extends down to at least elevation 93 feet 6 inches (see Figure 1). The SFP level upper instrument span, at a minimum, includes normal water level high alarm. Note that Level 3 is shown in accordance with Nuclear Energy Institute (NEI) 12-02 Revision 1 guidance relative to the top of the rack; the top of the fuel is not shown.
RAI-1.b	The OIP states, "Other hardware stored in the SFP will be evaluated to ensure that it does not adversely interact with the SFP instrument probes during a seismic event." Given the potential for varied dose rates from other materials	NEI 12-02 gives two options to determine Level 2. The first option defines Level 2 as ten feet above the highest point of any fuel rack, based on the guidance in Regulatory Guide 1.13, Revision 2. The second option states that Level 2 is based on the need to provide adequate radiation shielding to maintain personnel radiological dose levels within acceptable limits while performing local operations in the vicinity of the pool. The evaluation of the level needed to provide personnel protection should consider the scope

RAI Number	RAI	Response
	stored in the SFP, describe how level 2 will be adjusted to other than the elevation provided in section 2 above.	of the local operations, including installation of portable FLEX components, along with the emergency conditions that may apply at the time of operator actions. Level 2 has been adjusted to account for materials stored in the SFP by specifying Level 2 at the Technical Specification minimum limit (refer to Attachment 4).
RAI-2.a	The design criteria that will be used to estimate the total loading on the mounting device(s), including static weight loads and dynamic loads. Describe the methodology that will be used to estimate the total loading, inclusive of design basis maximum seismic loads and the hydrodynamic loads that could result from pool sloshing or other effects that could accompany such seismic forces.	The loading on the probe mount and probe body includes both seismic and hydrodynamic loading using seismic response spectra that bounds the Pilgrim design basis maximum seismic loads applicable to the installation location(s). The static weight load is also accounted for in the modeling described below but is insignificant in comparison to seismic and hydrodynamic loads. Analytic modeling is being performed by the instrument vendor using Institute of Electrical and Electronic Engineers IEEE 344-2004 methodology. The simple unibody structure of the probe assembly make it a candidate for analytic modeling and the dimensions of the probe and complex hydrodynamic loading terms in any case preclude meaningful physical testing. A detailed computational SFP hydrodynamic model has been developed for the instrument vendor by Numerical Applications, Inc., author of the GOTHIC computational fluid dynamics code. The computational model accounts for multi-dimensional fluid motion, pool sloshing, and loss of water from the pool. Seismic loading response of the probe and mount is separately modeled using finite element modeling software. The GOTHIC-derived fluid motion profile in the pool at the installation site and resultant distributed hydrodynamic loading terms are added to the calculated seismic loading terms in the finite element model to provide a conservative estimate of the combined seismic and hydrodynamic loading terms for the probe and probe mount, specific to the chosen installation location for the probe.
RAI-2.b	A description of the manner in which the level sensor (and stilling well, if appropriate) will be attached to the	The proximal portion of the level probe is designed to be attached near its upper end (refer to vendor schematic Figure 2) to a Seismic Category I mounting bracket configured to suit the requirements of a particular SFP. The bracket may be bolted

RAI Number	RAI	Response
	refueling roof and/or other support structures for each planned point of attachment of the probe assembly. Indicate in a drawing the portions of the level sensor that will serve as points of attachment for mechanical/mounting and electrical connections.	and/or welded to the SFP deck and/or SFP liner/wall according to the requirements of the particular installation per Seismic Category I requirements.
RAI-2.c	A description of the manner by which the mechanical connections will attach the level instrument to permanent spent fuel pool structures so as to support the level sensor assembly.	See RAI-2.b response above.
RAI-2.d	Address how other hardware stored in the SFP will not create adverse interaction with the fixed instrument location(s).	An evaluation of non-special nuclear material inventory located in the SFP will be performed during the SFPI modification process. Non-special nuclear material access to the SFP is governed by Procedure 1.16.1, Spent Fuel Pool Non-SNM Inventory Control. This procedure will be used to prevent any instrument interference from non-special nuclear materials. Special nuclear materials are stored in SFP racks, under the administrative controls of EN-NF-200
RAI-3.a	A description of the specific method or combination of methods that will be applied to demonstrate the reliability of the permanently installed equipment under Beyond-Design-Basis (BDB) ambient temperature, humidity, shock, vibration, and radiation conditions.	As stated in NEI 12-02, "Components in the area of the SFP will be designed for the temperature, humidity, and radiation levels expected during normal, event, and post-event conditions...." Components in other areas are planned to be designed for their corresponding maximum conditions. The discussion below describes the testing and qualification intended to demonstrate equipment reliability as needed for the expected conditions associated with the SFP level loop active components (signal processor and probe assembly including vendor-supplied hardline coaxial cable pigtail). Class 1E nuclear-qualified interconnecting coaxial cable is planned to be utilized between the vendor-supplied probe coaxial cable pigtail and the signal processor / display located in the Control Room Annex adjacent to the Main Control Room door (an area that is classified as a mild environment).

RAI Number	RAI	Response
		Temperature: Signal processor: Designed for mild environment installation. Physical testing in an environmental chamber to demonstrate normal operation at the operating temperatures specified for the instrument. Probe assembly: Qualification by materials properties and use history of substantially similar probe designs in steam generator applications at significantly higher temperatures and pressures and saturated steam environments. Humidity: Signal processor: Designed for mild environment installation. Physical testing in an environmental chamber to demonstrate normal operation at the operating humidity specified for the instrument. Probe assembly: Qualification by materials properties and use history as noted above. Shock: Signal processor: Physical testing to commercial and/or military standards using shake-table and drop testing. Probe assembly: Finite element analysis in conjunction with seismic modeling described above. Vibration: Signal processor: Physical testing to applicable commercial and/or military standards using shake-table and drop testing. Probe assembly: The probe assembly and bracket together form a simple static unibody structure with intrinsic vibration resistance that is additionally subject to substantial damping due to the surrounding water medium. This is planned to be modeled using finite element modeling in conjunction with seismic modeling described above. Radiation: Signal processor: The signal processor is installed in a mild environment with radiation

RAI Number	RAI	Response
		levels similar to background radiation, with the acknowledgement that the radiation limit for the signal processor is similar to other commercial-grade complementary–metal–oxide–semiconductor (CMOS)-based electronics. Radiation testing is not planned. It should be noted that the instrument performs self-diagnostics before measurements are obtained and the electronics are easily accessible for periodic replacement. Probe assembly: Materials properties qualification is used.
RAI-3.b	A description of the testing and/or analyses that will be conducted to provide assurance that the equipment will perform reliably under the worst-case credible design basis loading at the location where the equipment will be mounted. Include a discussion of this seismic reliability demonstration as it applies to (1) the level sensor mounted in the spent fuel pool area, and (2) any control boxes, electronics, or read-out and re-transmitting devices that will be employed to convey the level information from the level sensor to the plant operators or emergency responders.	Signal processor (electronics): Triaxial shake-table testing is planned to be performed by the vendor to envelope seismic category 1 safe shutdown earthquake (SSE) conditions or Pilgrim design basis maximum seismic loads (relative to the location where the equipment is mounted) using IEEE-344-2004 methodology. Probe assembly (level sensor): Seismic and hydrodynamic finite element analysis is performed by the vendor using relevant IEEE 344-2004 methodology (using enveloping seismic category 1 SSE conditions or Pilgrim design basis maximum seismic loads relative to the location where the equipment is mounted), as described in the RAI-3.a response above
RAI-3.c	A description of the specific method or combination of methods that will be used to confirm the reliability of the permanently installed equipment such that following a seismic event, the instrument will maintain its required accuracy.	With respect to the probe assembly, combined seismic and hydrodynamic analysis will be used to demonstrate that the probe waveguide's geometric dimensions do not change significantly as a result of the seismic conditions. In the absence of alteration to the geometric configuration of the probe waveguide there is no mechanism for seismic excitation of the probe assembly to alter system accuracy. The accuracy of system electronics will be demonstrated following seismic excitation as part of the seismic testing protocol.

RAI Number	RAI	Response
RAI-4.a	A description of how the two channels of the proposed level measurement system meet this requirement so that the potential for a common cause event to adversely affect both channels is minimized to the extent practicable.	The primary instrument (Loop A) will be in the southwest corner of the SFP and the backup instrument (Loop B) will be in the northwest corner of the SFP. Locating the new instruments in the corners of the SFP takes advantage of missile and debris protection inherent in the corners. Loop A and B displays will be located in the Control Room Annex adjacent to the Control Room door. The conceptual design provides two independent level instruments in the SFP with cabling routed to two display/processors mounted in the Main Control Room Annex by the door to the Main Control Room. The Control Room Annex is classified as a mild environment. Power for each loop is provided from independent 120 VAC, 60 Hz power sources. Backup power is provided by a battery capable of providing continuous display operation for at least three days. The battery will be provided with the display/processor. The design prevents failure of a single loop from causing the alternate loop to fail. Loop separation and independence are maintained consistent with existing design basis requirements.
RAI-4.b	Further information on how each level measurement system, consisting of level sensor electronics, cabling, and readout devices will be designed and installed to address independence through the application and selection of independent power sources, independence of signals sent to the location(s) of the readout devices, and the independence of the displays.	The design provides two identical non-safety related wide-range level instruments which feed two independent trains of non-safety cable and indicators to provide a highly reliable remote display of SFP water level in the Control Room Annex. Physical separation of the two loops will be accomplished by separately routing cable and conduit as much as practical. The use of conduit on refueling floor will provide additional protection from damage due to debris during a BDB event. Each display/processor will have a battery installed in the display enclosure which is capable of providing power for at least three days.

RAI Number	RAI	Response
		See RAI-4.a response above.
RAI-5	Please provide the design criteria that will be applied to size the backup battery in a manner that ensures, with margin, that the channel will be available to run reliably and continuously following the onset of the BDB event for the minimum duration needed, consistent with the plant mitigation strategies for beyond-design-basis external events (Order EA-12-049).	The sample rate estimates have been developed by the vendor using conservative instrument power requirements and measured battery capacity with draw-downs during and following exposure of the batteries to their maximum operating temperature for up to seven days. The instrument configuration is planned to be established for an automated sample rate when under battery power consistent with seven days continuous operation. Permanent installed battery capacity for seven days continuous operation is planned consistent with NEI 12-02 duration without reliance on or crediting of potentially more rapid FLEX Program power restoration. Batteries are readily replaceable via spare stock without the need for recalibration to maintain accuracy of the instrument. These measures ensure adequate power capacity and margin.
RAI-6.a	An estimate of the expected instrument channel accuracy performance (e.g., in % of span) under both (a) normal spent fuel pool level conditions (approximately Level 1 or higher) and (b) at the BDB conditions (i.e., radiation, temperature, humidity, post-seismic and post-shock conditions) that would be present if the SFP level were at the Level 2 and level 3 datum points.	The instrument loop level accuracy will be specified as less than ± 3.0 inches for all expected conditions. The expected instrument loop accuracy performance would be approximately ±1% of span (based on the sensitive range of the detector).
RAI-6.b	A description of the methodology that will be used for determining the maximum allowed deviation from the instrument channel design accuracy that will be employed under normal operating conditions as an acceptance criterion for a calibration procedure to flag to operators and to technicians that the channel requires adjustment to	In general relative to normal operating conditions, any applicable calibration procedure tolerances (or acceptance criterion) are planned to be established based on manufacturer's stated/recommended reference accuracy (or design accuracy). The methodology used is planned to be captured in plant procedures and/or programs

RAI Number	RAI	Response
	within the normal condition design accuracy.	
RAI-7.a	A description of the capability and provisions the proposed level sensing equipment will have to enable periodic testing and calibration, including how this capability enables the equipment to be tested in-situ.	The level 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. Periodic calibration checks of the signal processor electronics to extrinsic National Institute of Standards and Technology (NIST)-traceable standards can be achieved through the use of standard measurement and test equipment. The probe itself is a perforated tubular coaxial waveguide with defined geometry and is not calibrated. It is planned to be periodically inspected electromagnetically using time-domain reflectometry (TDR) at the probe hardline cable connector to demonstrate that the probe assembly meets manufactured specification and visually to demonstrate that there has been no mechanical deformation or fouling.
RAI-7.b	A description how such testing and calibration will enable the conduct of regular channel checks of each independent channel against the other, and against any other permanently-installed spent fuel pool level instrumentation.	Each instrument electronically logs a record of measurement values over time in non-volatile memory that is compared to demonstrate constancy, including any changes in pool level, such as that associated with the normal evaporative loss/refilling cycle. The loop level measurements can be directly compared to each other (i.e., regular cross-loop comparisons). The two displays are installed in close proximity to each other, thus simplifying cross loop checks. Direct measurements of SFP level may be used for diagnostic purposes if cross-loop comparisons are anomalous.
RAI-7.c	A description of the calibration and functional checks that will be performed, the frequency at which they will be conducted with a discussion on the measures taken to detect when the instrumentation is operable but degraded, and how these surveillances will be incorporated into the plant surveillance program.	Performance tests (functional checks) are automated and/or semi-automated (requiring limited operator interaction) and are performed through the instrument menu software and initiated by the operator. There are a number of other internal system tests that are performed by system software on an essentially continuous basis without user intervention but which can also be performed on an on-demand basis with diagnostic output to the display for the operator to review. Other tests such as menu button tests, level alarm, and alarm relay tests are only initiated manually by the operator. Performance checks are described in detail in the Vendor Operator's Manual, and the applicable information is planned to be contained in plant operating procedures.

RAI Number	RAI	Response
		Performance tests are planned to be performed periodically as recommended by the equipment vendor, for instance quarterly but no less often than the calibration interval of two years. Loop functional tests per operations procedures with limits established in consideration of vendor equipment specifications are planned to be performed at appropriate frequencies established equivalent to or more frequently than existing spent fuel pool instrumentation. Manual calibration tests are as described above in RAI-7a and b. Manual calibration and operator performance checks are planned to be performed in a periodic scheduled fashion with additional maintenance on an as-needed basis when flagged by the system's automated diagnostic testing features. Loop calibration tests per maintenance procedures with limits established in consideration of vendor equipment specifications are planned to be performed at frequencies established in consideration of vendor recommendations.
RAI-7.d	A description of the preventative maintenance tasks required to be performed during normal operation, and the planned maximum surveillance interval that is necessary to ensure that the channels are fully conditioned to accurately and reliably perform their functions when needed.	Periodic (e.g., quarterly or monthly) review of the system level history and log files and routine attention to any warning message on the system display is recommended by the vendor. Formal calibration checks are recommended by the vendor on a two-year interval to demonstrate calibration to external NIST-traceable standards. Formal calibration check surveillance interval and timing would be established consistent with applicable guidance [i.e., NEI 12-02 Section 4.3; on a refueling outage interval basis and within 60 days of a planned refueling outage]. Items such as system batteries are planned to be assessed under the Preventive Maintenance (PM) program for establishment of replacement frequency. Surveillance/PM timing/performance are planned to be controlled via tasks in the PM program.
RAI-8	Please provide a description of the standards, guidelines and/or criteria that will be utilized to develop procedures for inspection,	Vendor recommended inspection, maintenance, and repair procedures for the liquid level measurement system have been developed through the vendor's 30-year experience developing and manufacturing liquid level measurement and cable testing instrumentation. These are for the most part specific to the system's proprietary

RAI Number	RAI	Response
	maintenance, repair, operation, abnormal response, and administrative controls associated with the Spent Fuel Pool level instrumentation, as well as storage and installation of portable instruments.	electronics, subject to relevant industry standards for electronics fabrication and inspection and vendor's quality management system. Where relevant, standards for naval shipboard liquid level indicating equipment have been used to develop procedures for operation, abnormal response, and administrative controls. Portable instrumentation is not utilized. Both primary and backup SFPI loops incorporate permanent hard-wired installation. The specific procedures to be used to capture the required activities described in this RAI response have not yet been developed but are planned to be developed in accordance with the vendor recommendations and Entergy processes and procedures.
RAI-9.a	Further information describing the maintenance and testing program the licensee will establish and implement to ensure that regular testing and calibration is performed and verified by inspection and audit to demonstrate conformance with design and system readiness requirements. Include a description of your plans for ensuring that necessary channel checks, functional tests, periodic calibration, and maintenance will be conducted for the level measurement system and its supporting equipment.	See RAI-6, 7, and 8 responses above for related descriptions of associated maintenance and testing program details. SFPI loop/equipment maintenance/preventative maintenance and testing program requirements to ensure design and system readiness are planned to be established in accordance with Entergy's processes and procedures and in consideration of vendor recommendations to ensure that appropriate regular testing, loop checks, functional tests, periodic calibration, and maintenance is performed. Subject maintenance and testing program requirements are planned to be developed during the SFPI modification design process.
RAI-9.b	A description of how the guidance in NEI 12-02 section 4. 3 regarding	Both primary and backup SFPI loops incorporate permanent installation (with no reliance on portable, post-event installation) of relatively simple and robust augmented quality

<table>
<tr><th>RAI Number</th><th>RAI</th><th>Response</th></tr>
<tr><td></td><td>compensatory actions for one or both non-functioning channels will be addressed.</td><td>equipment. Permanent installation coupled with stocking of adequate spare parts reasonably diminishes the likelihood that a single loop (and greatly diminishes the likelihood that both loops) is (are) out-of-service for an extended period of time. Planned compensatory actions for unlikely extended out-of-service events are summarized as follows:
<table>
<tr><th># Channel(s) Out-of-Service</th><th>Required Restoration Action</th><th>Compensatory Action if Required Restoration Action not completed within Specified Time</th></tr>
<tr><td>1</td><td>Restore channel to functional status within 90 days (or if channel restoration not expected within 90 days, then proceed to Compensatory Action).</td><td>Immediately initiate action in accordance with Note below.</td></tr>
<tr><td>2</td><td>Initiate action within 24 hours to restore one channel to functional status. Restore one channel to functional status within 72 hours.</td><td>Immediately initiate action in accordance with Note below.</td></tr>
</table>
Note: Present a report to the on-site safety review committee within the following 14 days. The report shall outline the planned alternate method of monitoring, the cause of the non-functionality, and the plans and schedule for restoring the instrumentation channel(s) to functional status.</td></tr>
<tr><td>RAI-9.c</td><td>A description of what compensatory</td><td>The requested information is provided in the RAI-9.b response.</td></tr>
</table>

RAI Number	RAI	Response
	actions are planned in the event that one of the instrument channels cannot be restored to functional status within 90 days.	

PNPS 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, 17-18, 37-38			Evaluation of vendor information is within the scope of EC 45088 (Reference 36).
2	Test Strategy	Per Requirements in References 1, 2, & 3	References 4, 6-13, 17-18, 37-38			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, & 29)	Reference 4		14-131°F	The SFPI sensor electronics are embedded in the SFPI Processor/Display in the Control Room. Calculation M1382 (Reference 29) demonstrates that successful implementation of the FLEX strategy results in the Control Room temperature remaining below 110°F during an extended loss of AC power. This is acceptable as MOHR has tested its system electronics to operate in 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. 0, MOHR EFP-IL SFPI System Temperature and Humidity Report (Reference 4).
		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

#	Topic	Parameter Summary	Vendor Reference Document #	Additional Comment	Test or Analysis Results	Licensee Evaluation
						the vendor testing are available in proprietary MOHR Report 1-0410-1, MOHR EFP-IL SFPI System Temperature and Humidity Report (Reference 4). Humidity on the Control Building 37' elevation is normally regulated by the Control Building HVAC system. During an extended loss of AC power, the Control Building HVAC system is no longer available. In this situation the relative humidity is expected to drop, because the heat loads in the Control Building 37' elevation are dominated by the sensible heat of electrical equipment. According to a psychometric chart, an increase in the dry bulb temperature (due to sensible heat gain) results in a decrease in relative humidity, given a constant mass of water per mass of air (humidity ratio). Because the FLEX strategy does not require outside air to be circulated into the Control Building 37' elevation level (Reference 41) the humidity is not expected to rise to levels that challenge the operation of the SFPI instrumentation. Therefore, the operational humidity range of 5% to 95% encompasses all expected conditions for the SFPI display location. The sensor electronics is capable of continuously performing its required function under the expected humidity conditions.
		No radiation effects			N/A	Acceptable, the Control Building is considered a mild environment with no expected radiation. No additional testing is required per NRC Audit

#	Topic	Parameter Summary	Vendor Reference Document #	Additional Comment	Test or Analysis Results	Licensee Evaluation
						Report for MOHR (Reference 40).
4	Environmental Testing for Level Sensor Components in SFP Area-Submerged Portion of Probe Body	60-212°F (References 1, 2, & 14)	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 40) 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 (60°F) as called out in UFSAR (Reference 14) Table 10.9-1. Maximum accident condition of the spent fuel pool is taken to be 212°F boiling 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 1, 2, and 14 and are acceptable.
		Submerged Component (References 1 & 2)	Reference 5		PEEK Insulators capable of long term submergence	
		1.05E8 rad TID (References 1, 2, & 16)	Reference 5		10 Grad for PEEK Insulators	The NRC Audit Report for MOHR (Reference 40) concludes that the SFP-1 probe is suitable for operation in the SFP environment. Calculation S&SA202 (Reference 16) defines a worst case dose of approximately 1.05E8 rad to the probe via the applicable requirements of References 1 and 2. As such, the PEEK spacers are suitable for the application.
5	Environmental Testing for Level Sensor Electronics Housing-Probe Head located Above the SFP	60-212°F (References 1, 2, & 14)	Reference 5	Rad TID is the total 40 yr dose plus the 7 day worst case accident	PEEK: 480°F EPDM: 194°F long-term, 12 day @ 311°F Sylgard 170: 392°F long-	The NRC Audit Report for MOHR (Reference 40) 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 (60°F) as

#	Topic	Parameter Summary	Vendor Reference Document #	Additional Comment	Test or Analysis Results	Licensee Evaluation
				dose at the location	term	called out in the UFSAR (Reference 14) Table 10.9-1. 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 Reference 1, 2, and 14, and are acceptable. 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 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations" and is acceptable (Reference 40).
		0-100% RH Condensing (References 1 & 2)	Reference 5		0-100% RH for PEEK, EPDM and Sylgard 170	The NRC Audit Report for MOHR (Reference 40) 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 and 2, and are acceptable.

#	Topic	Parameter Summary	Vendor Reference Document #	Additional Comment	Test or Analysis Results	Licensee Evaluation
		8.42E5 rad TID (Reference 16)	Reference 5		PEEK: 10 Grad EPDM: 2 Grad Sylgard 170: 200 Mrad	The NRC Audit Report for MOHR (Reference 40) concludes that the SFP-1 probe is suitable for operation in the SFP environment. S&SA202 (Reference 16) defines a worst case dose of approximately 8.42E5 rad. Based on the vendor analysis results, the sensitive materials in the probe head will not be challenged under the required conditions of Reference 1, 2, and 16, and are acceptable.
6	Thermal & Radiation Aging-Organic Components in SFP Area	See Topics #4 & 5 above	Reference 5		See above Topics #4 and 5	Acceptable, vendor test/analysis bound licensee parameters, see discussion above in Topics #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 S&SA202 (Reference 16) based on the requirements of NEI 12-02 (Reference 2) and EA-12-051 (Reference 1). The calculation determines the dose for various locations and SFP water levels for both a 7 day accident scenario and 40 year TID.
8	Seismic Qualification	Seismic Class I (References 1, 2, 3. & 14)	Reference 9 & 12		Seismic Class 1	Acceptable, MOHR has prepared a series of seismic qualification reports for the SFP level instrument. The qualification reports envelop all components of the new SFP level instrumentation required to be operational during a BDBEE and post-event. These documents are MOHR Reports 1-0410-6 (Reference 9) and 1-0410-9 (Reference 12). Calculation C15.0.3625 (Reference 30) was

#	Topic	Parameter Summary	Vendor Reference Document #	Additional Comment	Test or Analysis Results	Licensee Evaluation
						prepared in accordance with EN-DC-126 (Reference 15) and accounts for seismic loads. It shows that the SFPI Probe Mounting Bracket is structurally adequate and seismically qualified as all Interaction Ratios (IR) are less than one (1.0).
9	Sloshing	Water induced motion from seismic event does not cause equipment structural failure	References 12, 17, & 18	See Topic #8		Acceptable, the MOHR seismic qualification reports (References 9 & 12) in combination with NAI Report # NAI-1725-003 (Reference 17), NAI Report # NAI-1725-004 (Reference 18) and NAI-1725-003 (Reference 17) adequately bound for the hydrodynamic loads associated with sloshing for PNPS. Calculation C15.0.3625 (Reference 30) was prepared in accordance with EN-DC-126 (Reference 15) and accounts for hydrodynamic loads and sloshing loads. It 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 document (References 18) is used as input to the bracket design. Reference 30 will be available on e-portal for review.
10	Spent Fuel Pool Instrumentation System Functionality	System must allow for routine, in situ functionality	References 25, 26, & 27			The system features on board electrical diagnostics. SFPI loop/equipment maintenance/preventative maintenance and testing program requirements to ensure design and system readiness will be established in accordance with Entergy's processes and

#	Topic	Parameter Summary	Vendor Reference Document #	Additional Comment	Test or Analysis Results	Licensee Evaluation
						procedures and in consideration of vendor recommendations to ensure that appropriate regular testing, loop 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. Technical manuals have been provided by the vendor (References 26 & 27) for use, although it is possible these could be amended 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 11		Boron buildup can produce a maximum error of 2.5 inches	Acceptable, MOHR Report 1-0410-8 (Reference 11) 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. Regardless of these findings, PNPS is a BWR and does not use borated water in their SFP. 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 loop functional testing methodology expected to be based on vendor stated accuracy along with comparison of SFPI loops to actual pool level (which would also bound boron build-up

#	Topic	Parameter Summary	Vendor Reference Document #	Additional Comment	Test or Analysis Results	Licensee Evaluation
						effects specified in Reference 40). 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 27). .
12	Pool-side Bracket Seismic Analysis (References 1, 2, & 15)	Seismic Class I (References 1, 2, & 14)	Reference 12	See Topic #8	Seismic Class I	Calculation C15.0.3625 (Reference 30) was prepared in accordance with EN-DC-126 (Reference 15) and accounts for seismic accelerations. It shows that the SFPI Probe Mounting Bracket is structurally adequate and seismically qualified as all Interaction Ratios (IR) are less than one (1.0). Reference 30 will be available on e-portal for review.
13	Additional Brackets (Sensor Electronics and Electronics Enclosure)	Seismic Class I (References 1, 2, 3, & 14)	Reference 9	See Topic #8	Seismic Class I	Calculations C15.0.3625, C15.0.3626, C15.0.3627, C15.0.3628, C15.0.3639, and C15.0.3640 (References 30, 31, 32, 33, 34, & 35) were prepared in accordance with EN-DC-126 (Reference 15) and account for seismic accelerations. The calculations conclude that the mounting configurations for electronics, enclosures, and display panels meet the seismic design criteria. In addition, the safety related block walls are adequate for the additional loads from the new equipment. References 30, 31, 32, 33, 34, & 35 will be available on e-portal for review.

#	Topic	Parameter Summary	Vendor Reference Document #	Additional Comment	Test or Analysis Results	Licensee Evaluation
14	Shock & Vibration	(References 1, 2, 3) MIL-STD-167-1 (Reference 23) for vibration and MIL-STD-901D (Reference 24) for shock	References 8, 12, & 38		IEC 60068-2-27 (2008-02) (Reference 19) IEC 60068-2-6 (2007-12) (Reference 20)	The NRC Audit Report for MOHR (Reference 40) 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 38) 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 resistant to shock and vibration. The probes and repairable head are evaluated to be adequately designed for resilience against shock and vibration (Reference 38). 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

#	Topic	Parameter Summary	Vendor Reference Document #	Additional Comment	Test or Analysis Results	Licensee Evaluation
						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 are not a credible threat; all equipment in the control room 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.
15	Requirements Traceability Matrix	Software Traceability Matrix Required for Software Evaluation of Equipment	Reference 28			The instrument software Verification and Validation was performed by MOHR per Revision 2 of MOHR Report 1-0410-11 (Reference 28).
16	Factory Acceptance Test	Must demonstrate functionality of full EFP-IL and SFP-1	MOHR FAT Procedure			Acceptable loop factory acceptance tests have been completed successfully.
17	Channel Accuracy	+- 1 foot (Reference 2)	References 25 & 37		3.0 in max, not including boric acid deposition or boiling effects	Appendix A of Reference 25 states that the absolute accuracy is 76.2 mm or 3.0 in, not including boric acid deposition effects. This error complies with the limit of ±1 foot set by NEI 12-02 (Reference 2). See Topic # 11 for boric acid deposition effects. Additionally, the probe is designed to produce accurate level indication in

#	Topic	Parameter Summary	Vendor Reference Document #	Additional Comment	Test or Analysis Results	Licensee Evaluation
						boiling and frothing (multiphase) environments according to MOHR Report 1-0410-15 (Reference 37).
18	Power Consumption	120 VAC, 60 Hz (Reference 14)	References 10 & 13		85-264 VAC 47-63 HZ 11.48 W (average) 18.83 W (maximum)	The NRC Audit Report for MOHR (Reference 40) 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 distribution panels that will provide normal AC power to the units. Additionally, the SFP level instrumentation also comes with a battery backup in a separate enclosure. 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 10		7 day battery life @ 15 samples per hour rate	The NRC Audit Report for MOHR (Reference 40) 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 26 & 27			Technical manuals have been submitted by the vendor (References 26 & 27) for use, although it is possible these could be amended in the future based on installation experience.
20	Calibration	Must allow for in-situ calibration	References 25, 26, & 27	System is calibrated using CT-100 device		Technical manuals have been submitted by the vendor (References 25, 26, & 27) for use, although it is possible these could be amended in the future based on installation experience.

#	Topic	Parameter Summary	Vendor Reference Document #	Additional Comment	Test or Analysis Results	Licensee Evaluation
				and processing of scan files by vendor. Dry scan from original installation must be maintained.		Previous Topic #10 already discusses maintenance / preventative maintenance requirements being established in consideration of vendor recommendations. Overall calibration or loop functional testing methodology is expected to be based on vendor stated accuracy and to incorporate a comparison of SFPI loops to actual pool level as well as a SFPI cross loop 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 39		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 loop with credit taken for the use of two redundant loops provided the installation meets all requirements stipulated in References 1 & 2.
22	Emissions Testing	EPRI TR-102323, Rev 3 (Reference 22)	References 6 & 7		EPRI TR-102323, Rev 3 (Reference 22)	Acceptable, MOHR Reports 1-0410-4 (Reference 6) 1-0410-4-S1 (Reference 7) demonstrate the new SFPI satisfies the EMI/RFI compliance guidelines of Revision 3 of EPRI TR-102323 (Reference 22) in accordance with Entergy Engineering Standard EN-IC-S-004-MULTI (Reference 21).As demonstrated in the MOHR System EMC Test Report and Supplemental Information (References 6 7), the SFPI system passed the High Frequency Radiated and Conducted Emissions testing.

#	Topic	Parameter Summary	Vendor Reference Document #	Additional Comment	Test or Analysis Results	Licensee Evaluation
						FLEX Strategy Guidelines (FSG) governing the use of the SFPI is 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. 1-0410-4-S1 "MOHR EFP-IL SFPI System Supplemental EMC Information"
8. 1-0410-5 "MOHR EFP-IL SFPI System Shock and Vibration Test Report"
9. 1-0410-6 "MOHR EFP-IL SFPI System Seismic Test Report"
10. 1-0410-7 "MOHR EFP-IL SFPI System Battery Life Report"
11. 1-0410-8 "MOHR EFP-IL SFPI System Boric Acid Deposition Report"
12. 1-0410-9 "MOHR SFP-1 Level Probe Assembly Seismic Analysis Report"
13. 1-0410-10 "MOHR EFP-IL SFPI System Power Interruption Report"
14. UFSAR, Rev 21 "Pilgrim Update Final Safety Analysis Report"
15. EN-DC-126, Rev 5, "Engineering Calculation Process"
16. S&SA202, Rev 0, "Spent Fuel Pool Instrumentation Shielding Calculation"
17. NAI-1725-003, Rev 0 "GOTHIC Verification and Sensitivity Studies for Predicting Hydrodynamic Response to Acceleration in Rectangular Shaped Pools"
18. NAI-1725-004, Rev 3 "Seismic Induced Hydraulic Response in the CGS Spent Fuel Pool"
19. IEC 60068-2-27 (2008-02), "Environmental Testing-Part 2-27: Tests-Test EA and Guidance: Shock"
20. IEC 60068-2-6 (2007-12), "Environmental Testing-Part 2-6: Tests-Test Fc: Vibration (sinusoidal)"
21. EN-IC-S-004-MULTI, Rev 1, "EMI/RFI Design Considerations"
22. EPRI TR-102323, Rev 3, "Guidelines for Electromagnetic Interference of Power Plant Equipment"

23. MIL-STD-167-1, "Mechanical Vibrations of Shipboard Equipment (Type 1-Environmentally and Type II-Internally Excited)", May 1, 1974
24. MIL-S-901D, "Shock Tests H.I.(High Impact) shipboard Machinery, Equipment, and Systems, Requirements for"
25. 1-0410-12 "EFP-IL Signal Processor Operator's Manual "
26. 1-0410-13 "EFP-IL Signal Processor Technical Manual"
27. 1-0410-14 "SFP-1 Level Probe Assembly Technical Manual"
28. 1-0410-11 "MOHR EFP-IL SFPI System Software Verification and Validation"
29. M1382, Rev 0, "MCR Heatup for Extended Loss of Offsite Power (FLEX)"
30. C15.0.3625, Rev 0, "Probe Mounting in SFP"
31. C15.0.3626, Rev 0, "J-Box Mounting"
32. C15.0.3627, Rev 0, "Mounting to the Control Room Wall"
33. C15.0.3628, Rev 0, "Reevaluation of Blockwall 195.14"
34. C15.0.3639, Rev 0, "Reevaluation of Blockwall 65.10"
35. C15.0.3640, Rev 0, "Reevaluation of Blockwall 65.21"
36. EC45088, Rev 0, "Fukushima – Spent Fuel Pool Level Instrumentation"
37. 1-0410-15 "MOHR EFP-IL SFPI System Uncertainty Analysis"
38. 1-0410-16, "MOHR SFP-1 Level Probe Assembly Shock and Vibration Test Report
39. EVAL-194-4812-01 "MOHR EFP-IL Liquid Level Measurement System Failure Modes and Effects Analysis (FMEA)"
40. 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)
41. M1382, Rev. 0, "Pilgrim Nuclear Power Station MCR Heatup for Extended Loss of AC Power (FLEX)

Attachment 3 to Letter 2.15.051

NRC Audit Questions and Status

Audit item no.	Original Document Reference	Item	Status
D.		**Order 051-SFPI ISE RAIs**	
1-D	SFPLI RAI 1	Provide plan view of SFP area showing SFP inside dimensions, planned locations/placement of primary and backup SFP level sensor, and proposed routing of cables that will extend from these sensors toward location of display device.	CLOSED Attachment 4 provides a plan view of the proposed locations of the probes. The SFPI conduit is routed to exit the Refuel Floor, elevation 117 ft. as soon as possible to minimize the possibility of physical damage to both loops from damage due to potential debris during a beyond design basis external event. The Channel A conduit will be installed on or very close to the floor at the west wall until it exits the refueling floor. The Channel B conduit will be installed at a higher elevation above the refueling floor in the southeast corner until it exits the refueling floor. NRC Staff performed tour of site on October 2014 and verified there is adequate separation between the cables and the cables are protected against internal missiles. See Attachment 5 to this letter for a drawing showing the layout.
2-D	SFPLI RAI 2	Provide the analysis verifying the seismic testing of the level probes, the mounting brackets, and the electronic units, and analysis of combined maximum seismic and hydrodynamic forces on the cantilevered portion of the assembly exposed to sloshing effects. Show the SFP instrument design configuration will be maintained during and following the maximum seismic ground motion considered in design of SFP structure.	CLOSED Calculation C15.0.3626, Revision 0, " Junction Box Mounting Evaluation", C15.0.3627 "LI-4816A and B Mounting Evaluation", and C15.0.3625 "LE-4816A and B Mounting bracket Evaluation" provide documentation of the seismic evaluations of the equipment mounting. Document 1-0410-6, Revision 1, "MOHR EFP-IL SFPI System Seismic Test report," and 1-0410-9, Revision 1, "MOHR SFP-1 Level Probe Assembly

Audit item no.	Original Document Reference	Item	Status
			Seismic Analysis Report," provides seismic analysis of the probes.
3-D	SFPLI RAI 3	For each of the mounting attachment required to attach SFP level equipment to plant structures, describe the design inputs and methodology that was used to qualify the structural integrity of the affected equipment and structures.	CLOSED Calculation C15.0.3626, Revision 0, " Junction Box Mounting Evaluation", C15.0.3627 "LI-4816A and B Mounting Evaluation", and C15.0.3625 "LE-4816A and B Mounting bracket Evaluation" provide documentation of the seismic evaluations of the equipment mounting. Document 1-0410-6, Revision 1, "MOHR EFP-IL SFPI System Seismic Test report," and 1-0410-9, Revision 1, "MOHR SFP-1 Level Probe Assembly Seismic Analysis Report," provides seismic analysis of the probes.
4-D	SFPLI RAI 4	Provide analysis of the maximum expected radiological conditions, dose rate and total integrated dose, to which the sensor electronics will be exposed. Provide documentation indicating what is 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.	CLOSED By letter dated February 28, 2014, Entergy provided its six month status report for Order EA-12-051. In this response, Entergy stated that Channel A and B displays containing the system electronics, will be located in the Control Room. Radiation levels are not impacted by a reduction in SFP water level. No analysis is necessary to evaluate the system electronics for radiation exposure.

Audit item no.	Original Document Reference	Item	Status
5-D	SFPLI RAI 5	Provide information indicating what will be the maximum expected ambient temperature in the room in which the sensor electronics will be located under beyond design basis conditions in which there is no AC power available to run HVAC systems, and whether the sensor electronics are capable of continuously performing required functions under this expected temperature condition.	CLOSED The entire PNPS SFP instrument loop (equipment from the SFP to the Control Room) is designed and qualified to PNPS environmental extremes applicable for the area of interest (e.g., SFP, Control Room). The SFP area environmental extremes are in accordance with NEI 12-02 Revision 1 SFP example conditions. The SFP instrumentation loops have been designated as Augmented Quality per Entergy processes covering procurement, design, and installation. As such, the SFP instrument loops have demonstrated reliability through establishment of Augmented Quality processes at applicable environmental extremes
6-D	SFPLI RAI 6	Provide information indicating the maximum expected relative humidity in the room in which the sensor electronics will be located under beyond design basis conditions in which there is no AC power available to run HVAC systems, and whether the sensor electronics are capable of continuously performing required functions under this expected humidity condition.	CLOSED The entire PNPS SFP instrument loop (equipment from the SFP to the Control Room) is designed and qualified to PNPS environmental extremes applicable for the area of interest (e.g., SFP, Control Room). The SFP area environmental extremes are in accordance with NEI 12-02 Revision 1 SFP example conditions. The SFP instrumentation loops have been designated as Augmented Quality per Entergy processes covering procurement, design, and installation. As such, the SFP instrument loops have demonstrated reliability through establishment of Augmented Quality processes at applicable environmental extremes.

Audit item no.	Original Document Reference	Item	Status
7-D	SFPLI RAI 7	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 beyond design basis shock and vibration conditions. Identify the specific commercial and/or military standards that will be used to establish the testing requirements and the specific acceleration levels and frequencies that will be simulated.	CLOSED 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 MOHR Report 1-0410-16 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. IEC 60068-2-27 (2008-02) and IEC 60068-2-6 (2007-12)
8-D	SFPLI RAI 8	Regarding RAI Number 7 above, provide the results for the selected methods, tests, and analysis used to demonstrate the qualification and reliability of the installed equipment in accordance with the Order requirements.	CLOSED See answer to 7-D and the following documents. 1-0410-9 "MOHR SFP-1 Level Probe Assembly Seismic Analysis Report"

Audit item no.	Original Document Reference	Item	Status
			1-0410-16, "MOHR SFP-1 Level Probe Assembly Shock and Vibration Test Report
9-D	SFPLI RAI 9	Provide analysis of the vendor analysis and seismic testing results and show that the instrument performance reliability, following exposure to simulated seismic conditions representative of the environment anticipated for the SFP structures at Pilgrim, has been adequately demonstrated.	Acceptable, MOHR has prepared a series of seismic qualification reports for the SFP level instrument. The qualification reports envelop all components of the new SFP level instrumentation required to be operational during a BDBEE and post-event. These documents are MOHR Reports 1-0410-6 and 1-0410-9. Calculation C15.0.3625 was prepared in accordance with EN-DC-126 and accounts for seismic loads. It shows that the SFPI Probe Mounting Bracket is structurally adequate and seismically qualified as all Interaction Ratios (IR) are less than one (1.0). Acceptable, the MOHR seismic qualification reports in combination with NAI Report # NAI-1725-003 NAI Report # NAI-1725-004 and NAI-1725-003 adequately bound for the hydrodynamic loads associated with sloshing for PNPS. Calculation C15.0.3625 was prepared in accordance with EN-DC-126 and accounts for hydrodynamic loads and sloshing loads. It 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 document is used as input to the bracket design.

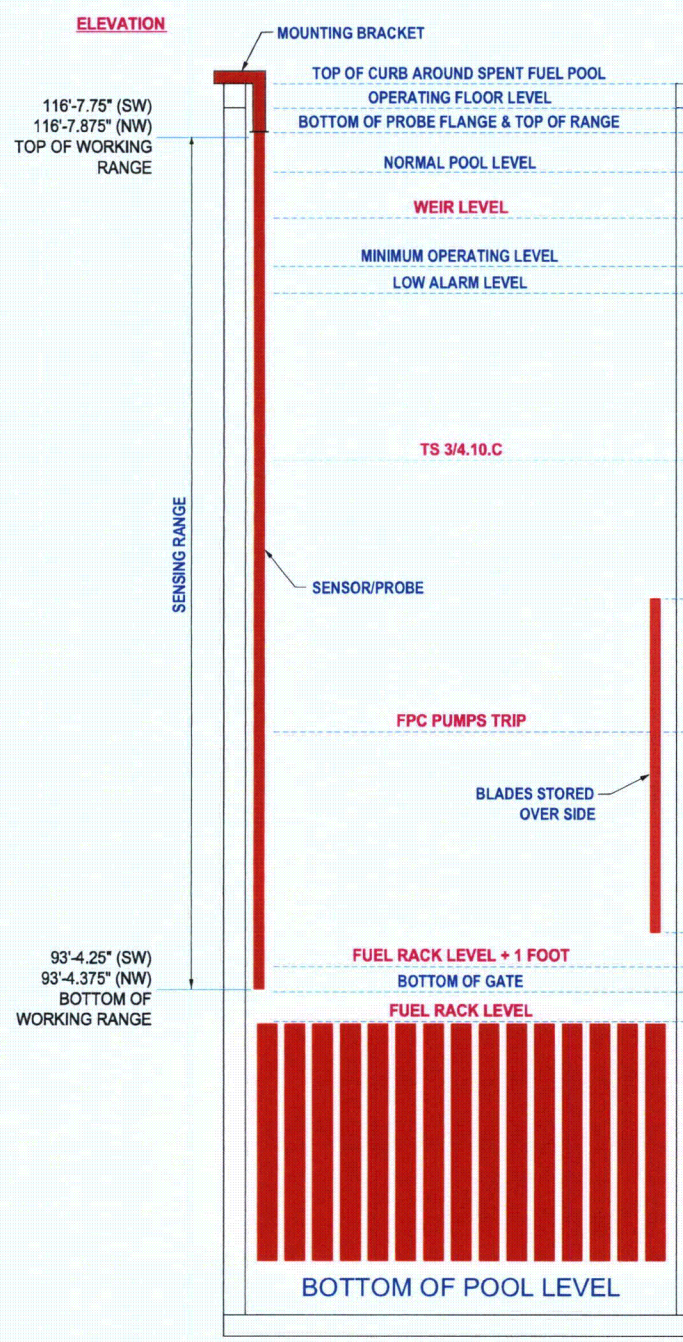
Audit item no.	Original Document Reference	Item	Status
10-D	SFPLI RAI 10	Provide the NRC staff with the final configuration of the power supply source for each channel so that the staff may conclude that the two channels are independent from a power supply assignment perspective.	CLOSED See Attachment 1 Item # 1.f to this letter.
11-D	SFPLI RAI 11	Provide the results of the calculation depicting the battery backup duty cycle requirements and compatibility with the duration required for the plant mitigating strategy for assuring SFP level filling/cooling.	CLOSED The NRC closed this item based on information reviewed during their audit of MOHR.
12-D	SFPLI RAI 12	Provide the analysis verifying that the proposed instrument performance is consistent with these estimated accuracy is normal and beyond design bases values. Please demonstrate that the channels will retain these accuracy performance values following a loss of power and subsequent restoration of power.	CLOSED The NRC closed this item based on information reviewed during their audit of MOHR.
13-D	SFPLI RAI 13	Provide a description of the methodology that will be used for determining the maximum allowed deviation from the instrument channel design accuracy that will be employed under normal operating conditions as an acceptable criterion for a calibration procedure to flag operators and to technicians that the channel requires adjustment to within the normal condition design accuracy.	CLOSED The NRC closed this item based on information reviewed during their audit of MOHR.
14-D	SFPLI RAI 14	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.	CLOSED The NRC closed this item based on information reviewed during their audit of MOHR.

Audit item no.	Original Document Reference	Item	Status
15-D	SFPLI RAI 15	Provide a list of the procedure addressing operation (both normal and abnormal response), calibration, test, maintenance, and inspection procedures that will be developed for use of the SFP instrumentation. The licensee is requested to include a brief description of the specific technical objectives to be achieved within each procedure.	CLOSED Document 1-0410-7, "MOHR EFP-IL SFPI System Battery Life Report," contains battery testing and calibration.
16-D	SFPLI RAI 16	Provide further information describing the maintenance and testing program the licensee will establish and implement to ensure that regular testing and calibration is performed and verified by inspection and audit to demonstrate conformance with design and system readiness requirements. Include a description of your plans for ensuring that necessary channel checks, functional tests, periodic calibration, and maintenance will be conducted for the level measurement system and its supporting equipment.	CLOSED 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 vendor recommendations. This will ensure that appropriate regular testing, channel checks, functional tests, periodic calibration, and maintenance is performed (and available for inspection and audit).
E.		**Combined SE Template technical review gaps**	
5-E	RAI SE No. 1	Electromagnetic compatibility. RAI as a result of vendor audit.	CLOSED Pilgrim Nuclear Power Station Procedure 2.2.85, "Fuel Pool Cooling and Filtering System," Attachment 13 prohibits the use of cell phones or radio transmissions within the area of the spent fuel pool display units in the Control Room.

Attachment 4 to Letter 2.15.051

Drawing C2900

REVISIONS					
REV	DESCRIPTION	DATE	BY	CHK'D	APP'D
0	INITIAL ISSUE BY EC45088	7/15	AEG	NRE	JK



ELEVATION		
117'-4"		M263 SH 199B, REV. 1, INSTALLATION - SPENT FUEL STORAGE POOL LEVEL SWITCHES C175, REV. 2 REACTOR BUILDING SPENT FUEL STORAGE POOL WALL ELEVATIONS & DETAILS C177, REV. 5, REACTOR BUILDING REACTOR WELL PLAN & SECTION & DETAILS
117'-0"		M-39, REV. 1 REACTOR BUILDING - AREA 1 & 3 - PLAN ABOVE EL. 117'-0" C-109, REV. 4 SPENT FUEL POOL WELL, DRYER, AND STORAGE SEPARATOR POOLS SECTIONS
116'-8.25" (SW), 116'-8.375" (NW)		
116'-0"		M23, REV. 8 EQUIPMENT LOCATIONS C179, REV. 4 - SPENT FUEL POOL SECTIONS & DETAILS
115'-8"	SFPI LEVEL 1	FUEL POOL OVERFLOW IS AT THE WEIR PLATES EL. 115'-7.625" (C179, REV. 4 AND CALCULATION C15.0.2594 REV. 0).
115'-3"		1" ABOVE MININUM ANALYTICAL LEVEL (V2191 MOHR DRAWING 1-0430-19.20A/B)
115'-0"		M263 SH. 199A, REV. 2 (28" BELOW 117'-4")
111'-3"	SFPI LEVEL 2	TS 3/4.10.C WATER LEVEL - SPENT FUEL POOL (NEI 12-02 LEVEL 2) (SE-2818)
108'-0"		TOP OF BLADES (FRN94-26-02)
102'-5"		FPCP TRIP IS ON LOW-LOW LEVEL IN THE SKIMMER SURGE TANK AT EL. 102'-5". (19.5 INCHES DECREASING FROM SKIMMER SURGE TANK BOTTOM - M22-5-7BC, REV. 4 AND SM422, SH. 1 REV. 7)
94'-0"		BOTTOM OF BLADES (NOMINAL)
93'-10"	SFPI LEVEL 3	
93'-3.75"		C180, REV. 4 REACTOR BUILDING - SPENT FUEL POOL
92'-10"		C1398, REV. 0, RACK CONSTRUCTION - SPENT FUEL STORAGE RACK C1400, REV. 0, SUPPORT DETAIL SPENT FUEL STORAGE RACKS N3 AND N4
78'-3"		C173, REV. 9 - REACTOR BUILDING - SPENT FUEL POOL GENERAL ARRANGEMENT

REFERENCES

Q
Non Q

PILGRIM NUCLEAR POWER STATION

SPENT FUEL POOL
LEVELS AND REFERENCES

Entergy

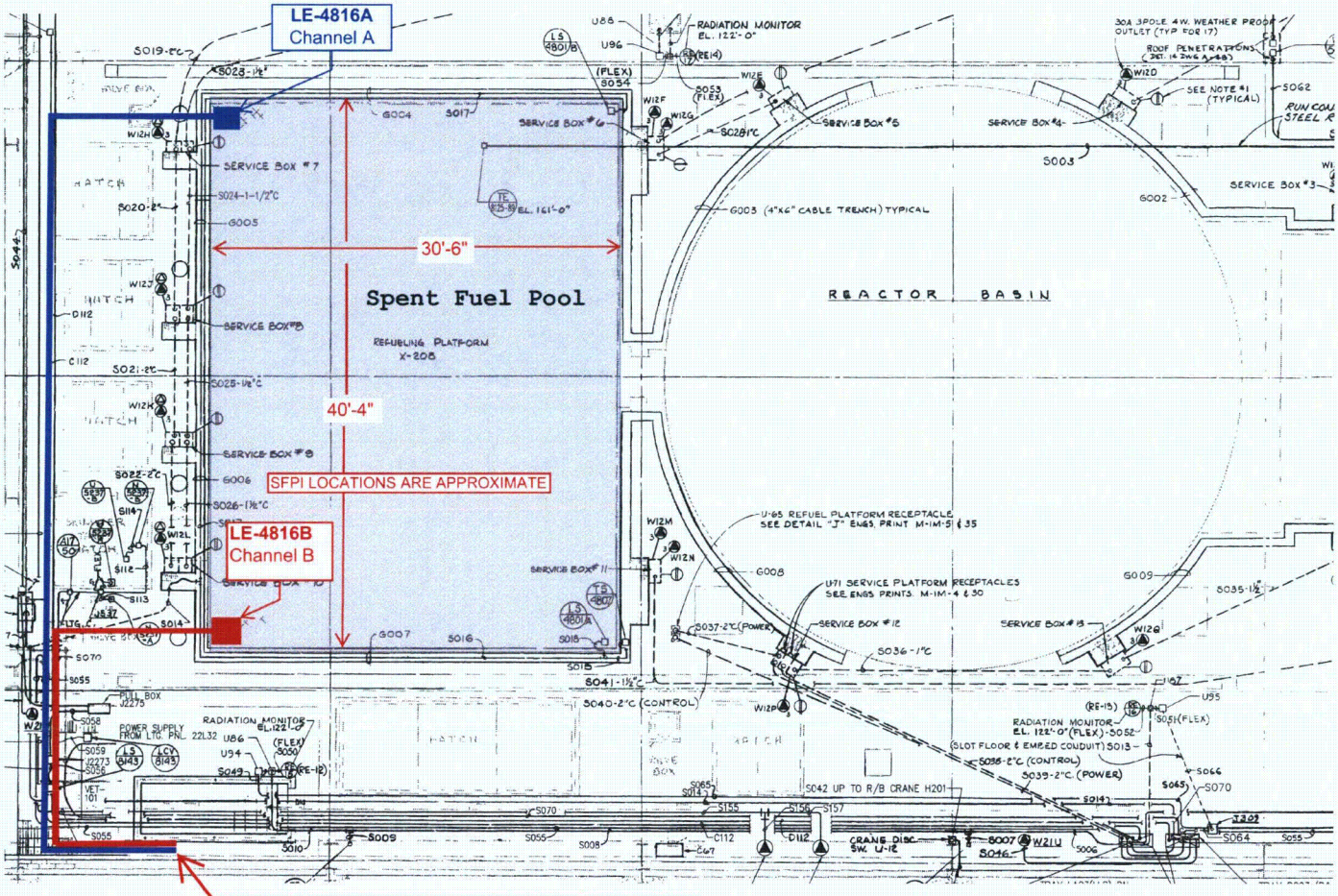
DWG. NO. C2900 REV. 0

SCALE N.T.S. SHEET

AMA\CIVIL\C2900.DWG

Attachment 5 to Letter 2.15.051

Drawing E304 (partial)



Down to 91' (Ref.: E303)
continues to Main Control Room - LI-4816A and LI-4816B
(Ref.: E298, E301, E303, and E313)

Reference: E304 (EC45088)