Pacific Gas and Electric Company®

James M. Welsch
Site Vice President

Diablo Canyon Power Plant
Mail Code 104/6
P. O. Box 56
Avila Beach, CA 93424

805.545.3242
Internal: 691.3242
Fax: 805.545.4884

January 05, 2016

PG&E Letter DCL-16-002

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

EA-12-051
10 CFR 50.4

Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
Pacific Gas and Electric Company's Notification of Full Compliance with Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051) for Diablo Canyon Power Plant Units 1 and 2

Reference:

1. NRC Order Number EA-12-051, "Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," dated March 12, 2012

Dear Commissioners and Staff:

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued Reference 1 to Pacific Gas and Electric Company (PG&E) directing PG&E to have a reliable indication of the water level in Diablo Canyon Power Plant's (DCPP's) spent fuel pools (SFP). Specific requirements are outlined in Reference 1, Attachment 2.

Reference 1 requires full implementation of reliable SFP instrumentation no later than two refueling cycles after submittal of the Overall Integrated Plan or December 31, 2016, whichever comes first.

This letter provides notification that PG&E is in full compliance with Reference 1 for DCPP Units 1 and 2. Enclosure 1 to this letter provides a brief summary of the key elements associated with compliance to Order EA-12-051.

Enclosure 2 provides a summary response for each of the open and pending items being tracked by the NRC Staff with regard to the order.

Enclosure 3 provides the bridging document between vendor technical information and DCPP site specific considerations.

PG&E makes no new or revised regulatory commitments (as defined by NEI 99-04) in this letter.

If you have any questions, or require additional information, please contact Mr. Scott Maze at (805) 542-9591.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on January 05, 2016.

Sincerely,

James M. Welsch
Site Vice President

gwh2/50465912-6
Enclosures
cc: Diablo Distribution
cc:/enc: Tony Brown, NRC Project Manager
Marc L. Dapas, NRC Region IV Administrator
William M. Dean, NRC/NRR Director
Siva P. Lingam, NRR Project Manager
John P. Reynoso, Acting NRC Senior Resident Inspector

Pacific Gas and Electric Company's Summary of Compliance with NRC Order Regarding Reliable Spent Fuel Pool Instrumentation (SFPLI) (EA-12-051) for Diablo Canyon Power Plant Units 1 and 2

1. Introduction

Pacific Gas and Electric Company (PG&E) developed an overall integrated plan (OIP) (Reference 2), to achieve compliance with the requirements described in Nuclear Regulatory Commission (NRC) Order EA-12-051, "Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation" (Reference 1). The OIP for Diablo Canyon Power Plant (DCPP) was submitted to the NRC on February 27, 2013, and was supplemented by six-month status updates (References 5, 6, 7, 8, and 9) in accordance with Order EA-12-051.

PG&E achieved full compliance with Order EA-12-051 for DCPP Units 1 and 2 on November 6, 2015. This date corresponds to the end of the second refueling outage for Unit 1 after submittal of the OIP as required by Order EA-12-051.

Completion of the spent fuel pool (SFP) level instrumentation requirements, identified in this enclosure and References 2, 4, 5, 6, 7, 8, and 9, documents full compliance with Order EA-12-051 for DCPP Units 1 and 2.

2. Open Item Resolution – Complete

Issues from the NRC Interim Staff Evaluation (ISE) for SFP level instrumentation (Reference 10) and audit report (Reference 11) have been addressed by PG&E.

The issues identified as open and pending in the NRC tracking system are listed below:

- ISE Open Item (OI) – DCPP has no open or pending ISE OIs.
- ISE Confirmatory Items (CI) – DCPP has no open or pending ISE CIs.
- ISE Request for Additional Information (RAI) Items – Complete pending NRC closure.
- Licensee Identified OIs – PG&E has no open or pending licensee identified items.
- Audit Questions/Audit Report Open/Pending Items – Complete pending NRC closure.

PG&E's summary response to each of the open and pending issues is provided in Enclosure 2. The open and pending items do not affect PG&E's compliance with Reference 1 for DCPP Units 1 and 2.

3. Milestone Schedule – Items Complete

Milestone	Completion Date
Submit OIP	2/2013
Submit six-month updates	
Update 1	8/2013
Update 2	2/2014
Update 3	8/2014
Update 4	2/2015
Update 5	8/2015
July 3, 2013, RAI	
Submit response	7/22/13
Commence Unit 1 engineering and design	3/31/13
Commence Unit 2 engineering and design	3/31/13
Develop Unit 1 design	3/31/15
Develop Unit 2 design	3/31/15
Receipt of Unit 1 SFP instruments	6/30/15
Receipt of Unit 2 SFP instruments	6/30/15
Complete Unit 1 SFP instrumentation procedures and training	11/2/15
Complete Unit 2 SFP instrumentation procedures and training	11/2/15
Unit 1 SFP instruments operational	11/6/15
Unit 2 SFP instruments operational	11/6/15

4. Identification of Levels of Required Monitoring – Complete

PG&E has identified the three required levels for monitoring SFP level in compliance with Order EA-12-051. These levels have been integrated into the site processes for monitoring level during events and responding to a loss of SFP inventory.

5. Instrument Designed Features – Status: Complete

The design of the SFP level instrumentation system installed at DCPP Units 1 and 2 complies with the requirements specified in Order EA-12-051 and described in Nuclear Energy Institute (NEI) 12-02, "Industry Guidance for Compliance with NRC Order EA-12-051," Revision 1 (Reference 13). The instrumentation system has been installed in accordance with the DCPP design control process.

The instruments have been arranged to provide reasonable protection against missiles. They have been mounted to retain design configuration during and

following the maximum expected ground motion. The instruments will be reliable during expected environmental and radiological conditions when the SFP water is near or at boiling conditions for extended periods. They are independent of each other and have separate and diverse power supplies. The instruments will maintain their designed accuracy following a power interruption and are designed to allow for routine testing and calibration.

The instrument display is readily accessible during postulated events and allows for SFP level information to be promptly available to decision makers.

6. Program Features – Status: Complete

Training of personnel performing maintenance functions including calibration and surveillance associated with the SFP level instrumentation channels at DCPP has been completed in accordance with an accepted training process as recommended in NEI 12-02, Section 4.1.

Operating and maintenance procedures for the DCPP SFP level instrumentation channels have been developed and integrated with existing procedures, with training completed. These procedures have been verified and are available for use in accordance with the site procedure control program.

Site processes have been established to ensure the instruments are maintained at their design accuracy.

7. References

1. NRC Order Number EA-12-051, "Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," dated March 12, 2012

2. PG&E Letter DCL-13-011, "Pacific Gas and Electric Company's Overall Integrated Plan in Response to March 12, 2012, Commission Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)," dated February 27, 2013

3. NRC Letter, "Diablo Canyon Power Plant, Unit Nos. 1 and 2 – Request for Additional Information Regarding Overall Integrated Plan for Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051) (TAC NOS. MF0963 and MF0964)," dated July 3, 2013

4. PG&E Letter DCL-13-073, "Response to Request for Additional Information Regarding Overall Integrated Plan in Response to March 12, 2012, Commission Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)," dated July 18, 2013

5. PG&E Letter DCL-13-080, "Pacific Gas and Electric Company's First 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 22, 2013

6. PG&E Letter DCL-14-015, "Pacific Gas and Electric Company'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 26, 2014

7. PG&E Letter DCL-14-077, "Pacific Gas and Electric Company'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 21, 2014

8. PG&E Letter DCL-15-028, "Pacific Gas and Electric Company'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 23, 2015

9. PG&E Letter DCL-15-098, "Pacific Gas and Electric Company's Fifth Six-Month Status Report in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)," dated August 26, 2015

10. NRC Letter, "Diablo Canyon Power Plant, Unit Nos. 1 and 2 – Interim Staff Evaluation and Request for Additional Information Regarding the Overall Integrated Plan for Implementation of Order EA-12-051, Reliable Spent Fuel Pool Instrumentation (TAC NOS. MF0963 and MF0964)," dated November 25, 2013

11. NRC Letter, "Diablo Canyon Power Plant, Unit Nos. 1 and 2 – Report for the Onsite Audit Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Instrumentation Related to Orders EA-12-049 and EA-12-051 (TAC NOS. MF0958, MF0959, MF0963, and MF0964)," dated October 30, 2015

12. NRC Letter, "Nuclear Regulatory Commission Audits of Licensee Responses to Reliable Spent Fuel Pool Instrumentation Order EA-12-051," dated March 26, 2014

13. NEI 12-02, "Industry Guidance for Compliance with NRC Order EA-12-051, 'To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation,'" Revision 1

Pacific Gas and Electric Company's Response to Spent Fuel Pool Level Instrumentation Requests for Additional Information for Diablo Canyon Power Plant Units 1 and 2

The following requests for additional information were provided to Pacific Gas and Electric Company (PG&E) within the following:

NRC Letter, "Diablo Canyon Power Plant, Unit Nos. 1 and 2 – Interim Staff Evaluation and Request for Additional Information Regarding the Overall Integrated Plan for Implementation of Order EA-12-051, Reliable Spent Fuel Pool Instrumentation (TAC NOS. MF0963 and MF0964), dated November 25, 2013

Request for Additional Information (RAI)-1

Please provide the results of the calculation used to determine the water elevation necessary for the pump's required NPSH to confirm that Level 1 has been adequately identified.

PG&E Response to RAI-1

PG&E Calculation M-648, "Spent Fuel Pool Cooling Pump Hydraulic Performance Analysis," Revisions 1 and 2, performed an evaluation to determine the spent fuel pool (SFP) cooling system pump's required net positive suction head (NPSH) to operate without cavitation at saturated conditions. Using this calculation, and including reducing the inventory to the centerline of the SFP cooling system inlet pipe, there is a margin of approximately 4.6 feet of NPSH available to both Units 1 and 2 SFP pumps.

Nuclear Energy Institute (NEI) 12-02, "Industry Guidance for Compliance with NRC Order EA-12-051, 'To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation,'" Section 2.3.1, specifies Level 1 to represent the higher of the following two points:

(a) The level at which reliable suction loss occurs due to uncovering of the coolant inlet pipe, weir or vacuum breaker (depending on the design), or

(b) The level at which the water height, assuming saturated conditions, above the centerline of the cooling pump suction provides the required NPSH specified by the pump manufacturer or engineering analysis.

Level 1 for DCPP Units 1 and 2 is the level at which reliable suction loss occurs due to uncovering of the SFP cooling system inlet pipe as described in Enclosure 1 to PG&E Letter DCL-13-073, "Response to Request for Additional Information Regarding Overall Integrated Plan in Response to March 12, 2012, Commission Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)," dated July 13, 2013. This is consistent with NEI 12-02. Level 1 was revised to 134 feet

5 inches as documented in PGE Letter DCL-13-073, Enclosure 1. Additional information about the various SFP levels, including a figure, is contained in PG&E's response to RAI-1 in PG&E Letter DCL-13-073. Drawings 439503 (Unit 1) and 443467 (Unit 2) show the centerline of the 10-inch SFP cooling system inlet pipe is located at elevation 134 feet 0 inches. Thus the top of the pipe is located at elevation 134 feet 5 inches, which is Level 1.

PG&E Calculation M-648, Revision 2, page 23a, calculates the net positive suction head available (NPSHa) for the SFP Cooling System Pump 1-2 is 21.9 feet. The NPSHa is based on a static head of 35.1 feet (PG&E Calculation M-648, Revision 1, page 23) as the difference of the minimum SFP level (137 feet 4 inches as shown on page 6) and the SFP pump inlet elevation (102 feet 3 inches as shown on page 6). PG&E Calculation M-648, Revision 2, concludes that the NPSHa of 21.9 feet is well above the NPSH required of 14 feet. This is a margin of 7.9 feet.

Using Level 1 (elevation 134 feet 5 inches) as the elevation where the SFP cooling system inlet pipe will uncover instead of the minimum SFP level (137 feet 4 inches), the static head is reduced by 2 feet 11 inches, which reduces the NPSHa margin from 7.9 feet to approximately 5 feet. Therefore, sufficient NPSHa is available with a SFP water height at the Level 1 elevation of 134 feet 5 inches.

RAI-2

Please provide additional information describing how the proposed arrangement of the routing of the cabling between the sensor probes in the SFP to the sensor electronics panels and from there to the level displays meets the Order requirement to arrange the SFP level instrument channels 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.

PG&E Response to RAI-2

NRC Order EA-12-051, "Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," Attachment 2, Section 1.2, "Arrangement" states the following:

"The spent fuel pool 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 spent fuel pool. 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 spent fuel pool area, and to utilize inherent shielding from missiles provided by existing recesses and corners in the spent fuel pool structure."

As shown in drawing sketches DSK-5000044868 and DSK-5000044991, PG&E has diversely located the sensor probes of the primary and backup SFP level

instrumentation systems in the SFP area to maintain physical channel separation. The cabling is routed through separate areas of the fuel handling building and auxiliary building to the sensor electronic panels. The conduits in which the cable is routed are approximately 35 feet from each other. The sensor electronic panels and level displays are located within the seismically qualified concrete structure of the auxiliary building.

RAI-3

Please provide the results of the analyses used to verify the design criteria and methodology for seismic testing of the SFP instrumentation and the electronics units, including, design basis maximum seismic loads and the hydrodynamic loads that could result from pool sloshing or other effects that could accompany such seismic forces.

PG&E Response to RAI-3

Westinghouse Calculation CN-PEUS-14-27, Revision 1, "Seismic Analysis of the SFP Mounting Bracket at Diablo Canyon Power Plant Units 1 and 2," evaluates the structural integrity of the SFP mounting bracket for the SFP level instrumentation sensor probe. The bracket analyzed in this calculation represents the design of both the primary and backup mounting brackets for Units 1 and 2. The calculation applies a load consisting of self-weight, dead load of the instrumentation, seismic load, and the hydrodynamic load due to the seismic effect. The seismic load was determined using DCPP-specific design earthquake, double design earthquake (DDE), and Hosgri earthquake response spectra. The calculation concludes that the SFP level instrumentation system bracket is appropriately designed and that all members, welds, and bolts meet their respective acceptance criteria.

Westinghouse report EQ-QR-269, Revision 4, "Design Verification Testing Summary Report for the Spent Fuel Pool Instrumentation System," documents the results of the seismic qualification testing that was performed on the electronics enclosure, level sensor electronics housing, and coaxial connectors. The seismic qualification was accomplished by a combination of shake table testing and static pull testing. The report concludes that all components in the SFP instrumentation system will be capable of performing their design function.

PG&E Calculation FLEX-012, Revision 0, "Qualification and Mounting for Spent Fuel Pool Level Indicating Sensor in Support of Fukushima Response," evaluates the applicability of the Westinghouse analysis and testing to DCPP. PG&E Calculation FLEX-012 compares the DCPP enveloping response spectra to the spectra used in the Westinghouse calculations and analysis. PG&E Calculation FLEX-012 concludes that the response spectra used in the Westinghouse calculations and analysis bound the response spectra in DCPP's design basis. Therefore, the SFP instrumentation system is expected to maintain its functionality and accuracy following a seismic event.

PG&E Calculation FLEX-012 evaluates the Westinghouse seismic analysis and testing for the SFP level instrumentation equipment, located in Westinghouse Calculation CN-PEUS-14-27 and qualification report EQ-QR-269, to ensure it meets the DCPP seismic analysis design criteria.

As stated in PG&E Calculation FLEX-012, Revision 0, Section 8, "Results":
"As shown on the overlain graphs in Section 7.3, the Test Response Spectra (red line) for the Westinghouse level indication instrumentation bounds the spectra developed in this calculation for all frequencies. The level indicating sensor, sensor head unit, electronics enclosure and antenna are all mounted on rigid supports and have been shake table tested to meet the requirements of IEEE-344 2004. The requirements of IEEE-344 2004 exceed those of IEEE-344 1975 required by DCM T-10."

The electrical panels, level transmitters, and sensor head units mounting brackets (i.e., all SFP level instrumentation items located in the auxiliary building in Areas GE and J) have been designed to safety-related criteria, Design Class 1, and have been evaluated for all DCPP design bases seismic events (Reference: PG&E Calculation FLEX-012, Revision 0, and PG&E Calculation SG-41, Revision 1, "Generic Raceway Support Details for Hosgri and DDE Earthquakes").

All conduit supports installed for this design change were installed safety-related, Design Class 1 as specified in Design Change Notices (DCNs) 2000001450, Revision 0 and 2000001451, Revision 0, in accordance with PG&E drawing 050030 and notes. Safety-related conduit supports are also evaluated for all DCPP design bases seismic events.

RAI-4

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

PG&E Response to RAI-4

PG&E Calculation FLEX-012, Revision 0, evaluates the use of 5/8 inch diameter stainless steel anchor bolts for securing the SFP level instrumentation system mounting bracket to the concrete floor of the SFP deck, as specified by the Westinghouse design. It uses the maximum reaction forces determined in Westinghouse Calculation CN-PEUS-14-27, Revision 1, which provides the design of the mounting bracket. These reaction forces include self-weight, dead load of the instrumentation, seismic load, and the hydrodynamic load due to the seismic effect. PG&E Calculation FLEX-012 determines that the use of four 5/8 inch diameter stainless steel anchor bolts will adequately support the mounting bracket.

PG&E Calculation SG-41, Revision 0, generically evaluates the mounting of electrical panels to raceways using the Hosgri and DDE seismic loads. PG&E Calculation FLEX-012 determines that the mounting configuration of the electrical enclosures associated with the SFP level instrumentation system meets the requirements of the mounting configurations evaluated in PG&E Calculation SG-41 and are therefore qualified for use at the 100-foot elevation of the auxiliary building in Areas GE and J.

The SFP level equipment is mounted to the safety-related reinforced concrete floor slab and walls in the auxiliary building, which includes the fuel handling areas. The DCPP Q-List, Section 1.B.1, defines the auxiliary building and fuel handing areas as quality assurance (QA) Class "Q" and Design Class I. The design of the Class I auxiliary building is described in the Final Safety Analysis Report Update, Section 3.8.2, including the design loads and loading combinations. Safety-related seismic loads due to earthquakes are included in the design of the auxiliary building.

RAI-5

Please describe the augmented quality assurance process to be used to meet the augmented quality requirements of the Order.

PG&E Response to RAI-5

PG&E developed a new graded quality class "F", which implements the augmented quality requirements as stated in NRC Order EA-12-051 and NEI 12-02. The new graded quality program includes all requirements listed in NEI 12-02, Revision 1, Section A-1. The graded quality program is maintained in Interdepartmental Administrative Procedure OM5.ID6, "Quality Assurance Program for FLEX Equipment and Spent Fuel Pool Instruments."

Design Change Package (DCP) 1000025055, which installed the Unit 1 SFP level instrumentation, contains a Q-List Change Request (DCP Attachment G) that was incorporated into the Q-List following implementation of the DCP. The Q-List Change Request added the following to the above definition of QA Class "F":

"In addition, components associated with the Spent Fuel Pool wide range level instrumentation (level sensor, transmitter, and display panel) in accordance with NRC Order EA-12-051 dated March 12, 2012, and NEI 12-02 dated August 2012 for beyond-design-basis (BDB) are also included within this Diablo Canyon QA class."

Closure Order 68034945, Operation 390 provides the following clarification regarding the editorial change from class designator "P" to "F":

> DCP 1000025055, Revision 0 includes a Q-List Change Request as DCP Attachment G. This Q-List Change Request (and the DCP) identifies the FLEX Quality Classification as "P". Note that SAP Notification 50639851 includes the

approval of an editorial change to the FLEX QA Classification and included a Q-List Change Request modifying the FLEX QA Classification from "P" to "F".

When the Q-List Change Request included in DCP 1000025055, Revision 0 is incorporated into the Living Q-List, ensure that the correct FLEX QA Classification of "F" is reflected. This does not modify any QA requirements for the new SFP instrumentation as the change in the letter used is an editorial change.

DCP 1000025058 for the Unit 2 SFP level instrumentation states on page 19 that the Q-List was revised in accordance with the Unit 1 DCP.

RAI-6

Please provide analysis of the maximum expected radiological conditions (dose rate and total integrated dose) to which the transmitter electronics will be exposed. Also, provide documentation indicating the total integrated dose the electronics for this equipment is capable of withstanding. Discuss the time period over which the analyzed total integrated dose was applied.

PG&E Response to RAI-6

The primary instrument channel for DCPP Units 1 and 2 is located in the 100-foot elevation containment penetration areas. Radiological survey maps were reviewed and dose rates in the area where the transmitter electronics will be mounted were found to not exceed 2 millirem per hour (mrem/hr). Assuming the instruments are in operation through the current operating license and a 20 year period of extended operation (approximately 30 years), the total integrated dose will be 526 rads (2 mrem/hr x 8760 hr/yr x 30 years x 0.001 rad/mrem).

The secondary instrument channel for DCPP Units 1 and 2 are located in the 100-foot elevation fuel handling building ventilation area. Radiological survey maps were reviewed back to 2008 and dose rates in the area where the transmitter electronics are mounted were found to not exceed 0.2 mrem/hr and are therefore bounded by the primary instrument channel radiological conditions.

Westinghouse report WNA-TR-03149-GEN, Revision 2, "SFPIS Standard Product Final Summary Design Verification Report," Section 4.1.3, states in part that the transmitter electronics must be able to withstand a total integrated dose of up to 1E3 rads. The report concludes that, based on research and historical data, radiation is not considered an aging mechanism for equipment subject to a total integrated dose of less than 1E4 rads. Therefore, the transmitter electronics are not subject to aging.

Since the maximum expected total integrated dose for the transmitter electronics is 526 rads, which is less than the specification requirement of 1E3 rads, the expected radiological conditions that the transmitter electronics will be exposed to are acceptable.

During accident conditions with reduced level in the SFP, the maximum expected radiological conditions to which the transmitter electronics will be exposed are not expected to exceed normal dose rates and total integrated dose due to the location of the electronics.

The secondary instrument channel for DCPP Units 1 and 2 are located in the 100-foot elevation fuel handling building ventilation area. Radiological survey maps were reviewed back to 2008 and dose rates in the area where the transmitter electronics are mounted were found to not exceed 0.2 mrem/hr and are therefore bounded by the primary instrument channel radiological conditions. Assuming the secondary instruments are in operation through the current operating license and a 20 year period of extended operation (approximately 30 years), the total integrated dose will be 52.6 rads ((0.2 mrem/hr x 8760 hr/yr x 30 years x 0.001 rad/mrem).

RAI-7

Please provide information indicating a) the temperature ratings for all system electronics (including sensor electronics, system electronics, transmitter, receiver and display) and whether the ratings are continuous duty ratings; and, b) the maximum expected temperature and relative humidity conditions in the room(s) where the sensor electronics will be located under BDB conditions, and when there will be no ac power available to run Heating, Ventilation, and Air Conditioning (HVAC) systems.

PG&E Response to RAI-7

Westinghouse Report WNA-DS-02957-GEN, Revision 3, "Spent Fuel Pool Instrumentation System (SFPIS) Standard Product System Design Specification," Table 4.6-1, states that the beyond design basis environmental conditions in the SFP area are 212°F at 100 percent humidity (saturated steam) for a period of seven days. The SFP area will be vented to atmosphere and cooled by natural convection by opening doors in the fuel handling building in the case of a loss of SFP cooling which will preclude environmental conditions from exceeding 212°F.

The level sensor equipment (probe, coupler, and interconnecting cable) are the only SFP instrumentation system equipment located in the SFP area. Westinghouse Report WNA-TR-03149-GEN, Revision 2, Section 5.2.2, states in part that "the level sensor electronics with the coupler and the coaxial cable attached performs accurately when the probe, coupler, and coaxial cable are exposed to the temperature range 10°C to 100°C (50°F to 212°F) with 100 percent humidity." Therefore, the equipment at the SFPs is qualified for the worst expected conditions in the fuel handling building.

Westinghouse report EQ-QR-269, Revision 4, Section 5.2, documents the thermal aging test results. The test specimens (consisting of the coupler and coaxial cable) were thermally aged at a temperature of greater than 219°F for greater than 1818 hours to simulate a lifetime of 10 years at 140°F. Section 5.7 documents the steam test results in which the thermally-aged test specimens were immersed in saturated steam conditions at 212°F for seven days. A post-functional test was performed on the specimens, which confirmed that the instruments were still capable of meeting the performance criteria, as stated in Section 3.2.2, of maintaining an accuracy of plus or minus 3 inches.

The other components that make up the SFP level instrumentation system aside from the level sensor equipment are located in mild locations. Westinghouse Report WNA-DS-02957-GEN, Revision 3, Table 4.6-2, states that the assumed abnormal conditions outside the SFP area are 140°F at a maximum of 95 percent humidity (noncondensing) for a period of seven days. The normal conditions for the level sensor equipment outside the SFP area are in locations serviced by building ventilation and are at a temperature and humidity that will not adversely affect the equipment.

All electronics including the transmitter, receiver, display, and backup battery for both the primary and backup level instruments are in locations which are not exposed to the harsh SFP environment.

The primary instrument electronics are located in Area GE/GW, also referred to as the containment penetration area, on the 100-foot elevation of the auxiliary building. The secondary instrument electronics are located in the 100-foot elevation Area J near the fuel handling building ventilation equipment. Neither of these areas are expected to exceed 140°F as they do not contain steam filled piping, electrical equipment that will be operating during an extended loss of alternating current power (ELAP), or any other substantial heat sources. Both areas are entirely separate from the SFP area. Therefore, the equipment is not expected to experience greater than normal temperature or humidity levels.

The primary instrument electronics are located in Area GE/GW of the auxiliary building. The maximum temperature during normal operation in Area GE/GW is 104°F (Reference Design Criteria memorandum (DCM) T-20, "Environmental Qualification," Revision 11A of Environmental Conditions, Appendix A, Table A4.2-1, Page 32).

The secondary instrument electronics are located in Area J of the auxiliary building. The maximum temperature during normal operation Area J is 104°F (Reference DCM T-20, Revision 11A, Environmental Conditions, Appendix A, Table A4.2-1, Page 32).

DCP 1000025055, Revision 0, for the Unit 1 SFP level instrumentation and DCP 1000025058, Revision 0, for the Unit 2 SFP level instrumentation each contain an evaluation (see page 30 of each DCP) of the temperatures in the auxiliary building

locations where the SFP level electrical equipment is located following an ELAP. Under ELAP conditions, a total loss of auxiliary building heating, ventilation, and air conditioning (HVAC) is expected. The DCP evaluation concludes that the equipment will not experience temperatures in excess of 140°F in the event of a loss of HVAC.

RAI-8

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

PG&E Response to RAI-8

Refer to PG&E's response to RAI-7.

RAI-9

Please provide the following:

a) *Information describing the evaluation of the sensor electronics design, the shock test method, test results, and forces applied to the sensor electronics applicable to its successful tests demonstrating the testing provides an appropriate means to demonstrate reliability of the sensor electronics under the effects of severe shock.*

b) *Information describing the evaluation of the sensor electronics design, the vibration test method, test results, the forces and their frequency ranges and directions applied to the sensor applicable to its successful tests, demonstrating the testing provides an appropriate means to demonstrate reliability of the sensor electronics under the effects of high vibration.*

PG&E Response to RAI-9

As described in Westinghouse Report WNA-DS-02957-GEN, components of both the primary and backup measurement channels are permanently installed and fixed to rigid structural walls or floors of seismic category 1 structures, and are not subject to anticipated shock or vibration inputs. The level sensor electronics are enclosed in a NEMA-4X housing. The electronics panel utilizes a NEMA-4X rated stainless steel housing. These housings are mounted to a seismically qualified wall and aid in protecting the internal components from vibration induced damage. No additional vibration and shock testing is required.

As provided by the NRC order and the NEI guidance as clarified by the interim staff guidance, the probe, coaxial cable, and the mounting brackets are "inherently resistant to shock and vibration loadings."

RAI-10

Please provide analysis of the seismic testing results and show that SFP level instrument performance reliability, following exposure to simulated seismic conditions representative of the environment anticipated for the SFP structures at DCPP, Units 1 and 2, has been adequately demonstrated. Include information describing the design inputs and methodology used in any analyses of the mountings of electronic equipment onto plant structures, as requested in RAI #4 above.

PG&E Response to RAI-10

Refer to PG&E's response to RAIs 3 and 4.

RAI-11

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

PG&E Response to RAI-11

The normal power supply for each channel of the SFP level instrumentation system originates from separate non-vital 120 volt alternating current (VAC) panels that are powered by different nonvital buses. In DCPP Unit 1, one channel is powered by 120 VAC panel PY16 and the other channel is powered by 120 VAC panel PY130. In DCPP Unit 2, one channel is powered by 120 VAC panel PY26 and the other channel is powered by 120 VAC panel PY230.

The display enclosure for each channel contains an uninterruptible power supply and backup battery capable of powering the instruments for a minimum of 72 hours following a loss of AC power.

The display enclosure for each channel also includes a 120 VAC 5-15P power receptacle to allow for the connection of an emergency power supply, such as a FLEX portable diesel generator, providing continuous operation during an ELAP. FLEX Support Guideline FSG 49, "Align RCS Injection for Inventory/Boration," contains steps to repower the SFP level instruments using a FLEX generator prior to the depletion of the installed batteries. Single line drawings for each instrument are contained in DCPs 1000025055 and 1000025058 for the Unit 1 and Unit 2 SFP level instrumentation system, respectively.

RAI-12

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

PG&E Response to RAI-12

Refer to PG&E's response to ISE RAI-12 in PG&E Letter DCL-14-015, "Pacific Gas and Electric Company'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 26, 2014.

RAI-13

Please provide the following:

a) *An estimate of the expected instrument channel accuracy performance under both (a) normal SFP level conditions (approximately Level 1 or higher) and (b) at the BDB conditions (i.e., radiation, temperature, humidity, post-seismic and post-shock conditions) that would be present if the SFP level were at the Level 2 and Level 3 datum points.*

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

PG&E Response to RAI-13

a) The channel accuracy for each SFP instrumentation system instrument channel is plus or minus 3 inches for the full level measurement range. This covers the normal SFP surface level, or higher, to within 6 inches of the fuel assembly under both normal and beyond-design-basis conditions. More details regarding the requirements on measurement accuracy are defined in the Westinghouse Design Specification Document WNA-DS-02957-GEN, Revision 3 (Proprietary) and Westinghouse Channel Accuracy Calculation Document, WNA-CN-00301-GEN, Revision 1 (Proprietary).

b) The channel accuracy requirements are identified in WNA-DS-02957-GEN, Revision 3 (Proprietary) and demonstrated by the channel accuracy calculation, WNA-CN-00301-GEN Revision 1 (Proprietary), "Spent Fuel Pool Instrumentation Channel Accuracy Analysis." Both SFP primary and backup redundant sensor

electronics require periodic calibration verification to check that the channel's measurement performance is within the specified tolerance (plus or minus 3 inches). If the difference is larger than the allowable tolerance during the verification process, an electronic output verification/calibration will be required. If the electronic output verification/calibration does not restore the performance, a calibration adjustment will be required.

The electronic output verification/calibration will verify electronics are working properly using simulated probe signals.

The calibration adjustment is performed to restore level measurement accuracy within the acceptance criteria at 0, 25, 50, 75, and 100 percentage points of the full span.

The calibration acceptance criteria and procedures are defined in Westinghouse Procedure WNA-TP-04709-GEN, "Spent Fuel Pool Instrumentation System Calibration Procedure," Revision 4 (Proprietary). PG&E responses to RAI-14 and RAI-18 provide additional information for calibration.

RAI-14

Please provide the following:

a) *A description of the capability and provisions the proposed level sensing equipment will have to enable periodic testing and calibration, including how this capability enables the equipment to be tested in-situ.*

b) *A description of the way 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 SPF level instrumentation.*

c) *A description of the calibration tests and functional checks to be performed and the frequency at which they will be conducted. Discuss how these surveillances will be incorporated into the plant surveillance program.*

d) *A description of the preventive maintenance tasks are required to be performed during normal operation, and the planned maximum surveillance interval that is necessary to ensure the channels are fully conditioned to accurately and reliably perform their functions when needed.*

PG&E Response to RAI-14

(a) Westinghouse Report WNA-TP-04709-GEN, Revision 4, describes the methods available to perform testing and calibration on the SFP instrumentation system. The SFP level instrumentation system pool-mounted brackets installed at DCPP are of the fixed bracket type as described in WNA-TP-04709-GEN, Revision 4.

PG&E developed surveillance and maintenance procedures that provide the guidance needed to perform the calibration verification adjustments in accordance with WNA-TP-04709-GEN, Revision 4.

The verification of calibration is performed by attaching a sliding plate to the flat surface above the launch plate of the fixed bracket and placing a metal target against the probe cable above the water level. The verification also includes a visual waveform check to verify proper signal operation.

The electronic output verification uses the digital to analog converter trim function and the loop test function, which are integrated into the level sensor electronics, to verify the sensor electronics are outputting the correct signal and that the electronic loop is operating correctly.

The full-range calibration adjustment is performed by using a calibration test kit, which includes a replicate probe, coupler, launch plate, bracket, and moveable metal target. The calibration test kit enables the sensor electronics output display to be measured against the physical distance measured along the replicate probe to the moveable metal target. PG&E responses to RAI-13 and RAI-18 provide additional information for calibration.

(b) Surveillance Test Procedure (STP) I-1C, "Routine Weekly Checks Required by Licenses," previously directed operators to check SFP level using the scale printed on the interior of the pool once a week. STP I-1C has been revised to direct operators to perform a channel check on both primary and backup SFP level instrumentation system instruments by comparing them against each other and to the actual SFP level.

(c) The channel check will be completed every week to ensure functionality and gross accuracy of the SFP level instrumentation system. This frequency is based on the existing technical specification surveillance requirement of ensuring normal SFP level.

The calibration verification will be completed within 60 days of a planned refueling outage, considering normal testing scheduling allowances (e.g., 25 percent). NEI 12-02 does not require this check to be performed more than once per 12 months.

The electronic output and full-range calibrations would only be performed if the SFP instrumentation system fails either the channel check or the calibration verification by not meeting the calibration tolerance of plus or minus 3 inches. There is no set frequency as the calibration will only need to be performed if the equipment is found to be not within tolerance.

New equipment control guideline (ECG) 13.3, "Spent Fuel Pool Level Instrumentation System" has been developed to implement these surveillance requirements into the plant surveillance program. STP I-1C has been revised to contain the requirements of the surveillance test. Changes to ECGs and plant procedures are reviewed in accordance with 10 CFR 50.59 requirements.

(d) The following preventive maintenance tasks are required to be performed during normal operation:

1. The uninterruptible power supply batteries will be replaced on a 3-year frequency as specified in Westinghouse Report WNA-DS-02957-GEN, Revision 3.

2. The sensor electronics housing assembly will be replaced on a 7-year frequency as specified in Westinghouse Report WNA-DS-02957-GEN, Revision 3.

3. The coaxial cable assembly will be replaced on a 10-year frequency as specified in Westinghouse Report WNA-DS-02957-GEN, Revision 3.

RAI-15

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

PG&E Response to RAI-15

The earliest evaluated time for personnel to require access to the SFP level instrument displays is during the initial plant damage assessment, which occurs within the first 6 hours of the event. The displays will also need to be accessed periodically throughout the event in order to determine when SFP makeup needs to be started or terminated.

Both primary and secondary SFPIS channels have local displays near the sensor electronics in the auxiliary building and fueling handling building, respectively. The primary channel display is located in the 100-foot elevation penetration area of the

auxiliary building. The secondary channel display is located in the 100-foot elevation of the fuel handling building hallway near the ventilation rooms.

The paths that personnel might take were evaluated for potential radiological and environmental conditions. There were no radiological concerns identified along the paths taken from the control room to either local display with dose rates found not to exceed 5 mrem/hr and are not expected to be significantly higher following a beyond design basis external event (BDBEE). It was identified that the most direct route to the secondary channel display panel is through the room containing the turbine driven auxiliary feedwater pump. The steam-filled piping and steam traps in this room will cause local temperature and humidity to rise after a loss of AC power. However, doors to adjacent areas will be opened early in the event to reduce temperatures and personnel will only be in the area for approximately 30 seconds. Should the room be impassible, alternate routes through different areas of the building would be available.

Operations personnel are required to have a flashlight while on watch in accordance with Department Level Administrative Procedure OP1.DC10, "Conduct of Operations," Section 5.1.5. A supply of additional flashlights for emergency use is available in the control room and additional flashlights and head lamps are located onsite. These flashlights will assist personnel traveling in the auxiliary building and fuel handling building due to the loss of normal lighting after the failure of the emergency battery-operated lights. Additionally, radios and phones will be available for personnel locally checking SFP level to communicate with the control room.

The majority of the equipment in the auxiliary building is seismically qualified or seismically evaluated to not damage safety-related equipment following a seismic event and therefore is not expected to fail during a seismic event. In the event that a pathway is blocked due to debris, there are alternate paths through the auxiliary building that would not significantly increase the response time.

The auxiliary building and fueling handling building structures are seismically qualified structures and the routes from the control room to the display panels only pass through these structures. Therefore, building damage or collapse is not anticipated and will not impede the operators from reaching the display panels.

An initial walk down under optimal conditions (normal lighting and impediments) was performed and found that it took approximately 6 minutes to travel from the control room to the furthest local display panel (alternate channel), including an assumed 2 minutes for issuance of emergency dosimetry. Taking into account possible debris caused by a seismic event, little to no lighting aside from a flashlight or headlamp, and other unexpected conditions, it is conservatively estimated to take a maximum of 30 minutes for an operator to travel from the control room to a local display panel and then report the indicated level to the control room by radio or phone.

RAI-16

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

PG&E Response to RAI-16

The following updated list of procedures was revised for use and maintenance of the SFP instrumentation system:

(a) OP AP-22, "Spent Fuel Pool Abnormalities" - This procedure has been revised to use the SFP instrumentation system to diagnose SFP problems to aid operators in making accurate decisions when mitigating failures of the SFP cooling system or SFP integrity.

(b) STP I-1C – "Routine Weekly Checks Required by Licenses" - This procedure has been revised to require a weekly channel check of both primary and backup SFP instrumentation system instrument channels to ensure the equipment is functional and is accurate within its calibration tolerance of plus or minus 3 inches.

(c) STP I-13-L801, "Calibration of Spent Fuel Pool Level Channels" - This procedure has been developed to verify the sensor electronics are outputting the correct signal, to verify the instrument electronic loop is functioning, to provide calibration of the SFP instrumentation system instrument channels, and to provide guidance on how to perform the full-range calibration if the instrument is found to be out-of-tolerance. This procedure is based on calibration information provided by Westinghouse Report WNA-TR-04709-GEN, Revision 4.

(d) ECG 13.3 – "Spent Fuel Pool Level Instrumentation System" - This procedure provides the equipment availability and surveillance requirements for the SFP instrumentation system. The procedure includes the required actions if one or both SFP instrumentation system channels are not functional and provides suggested compensatory actions if the channel(s) cannot be restored within the allowed out-of-service times.

The following updated list of operating procedures was revised for operation of the SFP instrumentation system:

(a) OP O-13, "Transferring Equipment To/From Alternate Power Source"

(b) FSG 11, "Alternate SFP Makeup and Cooling," provides guidance for providing makeup to the SFP in order to maintain decay heat removal. FSG 11 uses the wide range SFP level indicators to provide guidance to operators for when SFP makeup should be terminated.

RAI-17

Please provide the following:

a) *Further information describing the maintenance and testing program the licensee will establish and implement to ensure that regular testing and calibration is performed and verified by inspection and audit to demonstrate conformance with design and system readiness requirements. Include a description of plans to ensure necessary channel checks, functional tests, periodic calibration, and maintenance will be conducted for the level measurement system and its supporting equipment.*

b) *A description of the guidance in NEI 12 02, Section 4.3, on compensatory actions for one or both nonfunctioning channels will be addressed.*

c) *A description of the planned compensatory actions to be taken in the event that one of the instrument channels cannot be restored to functional status within 90 days.*

PG&E Response to RAI-17

(a) Refer to PG&E's response to RAI-14.

(b) NEI 12-02, Section 4.3, states in part: "The primary or backup instrument channel can be out of service for testing, maintenance and/or calibration for up to 90 days provided the other channel is functional. Additionally, compensatory actions must be taken if the instrumentation channel is not expected to be restored or is not restored within 90 days. If both channels become nonfunctioning, then initiate actions within 24 hours to restore one of the channels of instrumentation and implement compensatory actions (e.g., use of alternate suitable equipment or supplemental personnel) within 72 hours." One SFP instrumentation system may be taken out of service for testing, maintenance and/or calibration for short durations, consistent with current maintenance practices. Upon discovery of a nonfunctioning SFP level instrument, the issue will be placed in the Corrective Action Program. Attempts will be made to restore the non-functioning SFP level instrument to service as soon as possible and within 90 days. No compensatory actions will be taken while the one channel is nonfunctioning as long as the remaining instrument channel is available and it is anticipated that the nonfunctioning channel will be restored within 90 days. If the

nonfunctional channel cannot be restored within 90 days, compensatory actions will be implemented, including, but not limited to, verification of narrow range SFP level instrumentation, increased visual monitoring of the SFP level, video cameras, or supplemental shift staffing. These requirements are contained in ECG 13.3.

(c) Refer to PG&E's response to RAI-17.b.

RAI-18

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

PG&E Response to RAI-18

The calibration verification is performed by simulating a change in SFP level through the use of a tool for the fixed-type pool side mounting bracket. If the difference is larger than the allowable tolerance during this verification, an electronic output verification/calibration is required. This electronic output verification/calibration verifies that the electronics are working properly using simulated probe signals.

If the electronic output verification/calibration does not restore the performance, a calibration adjustment will be required to restore and verify level measurement accuracy at five points along the full span of the probe. This adjustment is performed outside of the SFP area using a calibration kit and does not require removal of components from the SFP or SFP area.

The calibration verification, electronic output verification/calibration, and the calibration adjustment are defined in Westinghouse Procedure WNA-TP-04709-GEN, Revision 4 (Proprietary). PG&E responses to RAI-13 and RAI-14 provide additional information for calibration.

Bridging Document between Vendor Technical Information and Diablo Canyon Power Plant Site Specific Considerations

#	Topic	Parameter Summary	Vendor Document Reference #	Additional Comment	Test or Analysis Result	Licensee Evaluation
1	Design specification	Spent Fuel Pool Instrumentation System (SFPIS) derived from References 1, 2, and 3	WNA-DS-02957-GEN	Contains technical SFPIS requirements based on Nuclear Regulatory Commission (NRC) Order, Nuclear Energy Institute (NEI) guidance and the Interim Staff Guidance (ISG)	N/A	Acceptable
2	Test strategy	Per Requirements in References 1, 2, and 3	WNA-PT-00188-GEN	Strategy for performing the testing and verification of the SFPIS and pool-side bracket	N/A	Acceptable
3	Environmental qualification for electronics enclosure with display	50°F to 140°F, 0-95% Relative Humidity TID $\leq$ 1E03 R γ normal (outside spent fuel pool (SFP) area) TID $\leq$ 1E03 R γ abnormal (outside SFP area)	EQ-QR-269 and WNA-TR-03149-GEN for all conditions	Table 5.2-1	Passed	Acceptable

#	Topic	Parameter Summary	Vendor Document Reference #	Additional Comment	Test or Analysis Result	Licensee Evaluation
4	Environmental testing for level sensor components in SFP area-submerged portion of probe body	50°F to 212°F and 100% humidity	WNA-TR-03149-GEN	Table 5.3-1	Passed	Acceptable
		1E03 R γ normal (SFP area)	WNA-DS-02957-GEN	Table 4.6-1	Passed	Acceptable
		1E07 R γ beyond-design-basis (BDB) (SFP area)	WNA-DS-02957-GEN	Table 4.6-1	Passed	Acceptable
5	Environmental testing for level sensor electronics housing-probe head located above the SFP	140°F and 100% humidity (for outside SFP area)	WNA-TR-03149-GEN WNA-DS-02957-GEN	Abnormal conditions provided in Table 4.6-2	Passed	Acceptable
6	Thermal and radiation aging-organic components in SFP area	See Items 4 and 5 above	WNA-TR-03149-GEN	N/A	Passed	Acceptable
7	Basis for dose requirement	SFP normal conditions: 1E03 R γ TID (above pool) SFP beyond-design-basis external event (BDBEE) conditions: 1E07 R γ TID (above pool)	WNA-DS-02957-GEN	Table 4.6-1	Passed	Acceptable

#	Topic	Parameter Summary	Vendor Document Reference #	Additional Comment	Test or Analysis Result	Licensee Evaluation
8	Seismic qualification	Per spectra in WNA-DS-02957-GEN	WNA-TR-03149-GEN CN-PEUS-14-27	N/A	Passed	Acceptable. Pacific Gas and Electric Company (PG&E) calculation FLEX-012 compares DCPP enveloping response spectra to the spectra used in vendor calculations and analysis. FLEX-012 concludes the response spectra used in vendor calculations and analysis bound the response spectra in DCPP's design basis.
9	Sloshing	Water induced motion from seismic event does not cause equipment structural failure	WNA-TR-03149-GEN CN-PEUS-14-27	N/A	Passed	Acceptable. Sloshing is addressed in Section 7.2 of WNA-TR-03149-GEN. Additionally, CN-PEUS-14-27 demonstrates that the probe will not be sloshed out of the SFP.
10	SFPIS functionality	System must allow for routine in-situ functionality testing	WNA-GO-00127-GEN WNA-TP-04709-GEN	N/A	Passed	The system features on board electrical diagnostics. Full channel functional testing utilized comparison of actual pool level to that which is indicated. The level indication is calibrated in-situ.
11	Boron build-up	Per requirement in WNA-DS-02957-GEN	WNA-TR-03149-GEN	Boron build up demonstrated through integrated functional testing.	Passed	Acceptable
12	Pool-side bracket seismic analysis	Per Spectra in WNA-DS-02957-GEN	CN-PEUS-14-27	Also includes hydrodynamic forces, as appropriate.	Passed	Acceptable. See item 8.

#	Topic	Parameter Summary	Vendor Document Reference #	Additional Comment	Test or Analysis Result	Licensee Evaluation
13	Additional brackets (sensor electronics and electronics enclosure)	Seismic Class I	WNA-DS-02957-GEN	The electrical panels, level transmitters and sensor head units mounting brackets have been designed to safety related criteria, Design Class 1, and have been evaluated for all DCPP design bases seismic events (Reference calculations FLEX-012, Revision 0 and SG-41, Revision 1).	Passed	Acceptable
14	Shock and vibration	WNA-DS-02957-GEN	WNA-TR-03149-GEN	Documented in Section 7.1	Passed	Acceptable
15	Requirements traceability matrix	Maps requirements to documentation / evidence that requirement is met	WNA-TR-03149-GEN	This document maps the requirements of the NRC order, NEI guidance, ISG to the applicable technical requirements in the SFPIS design specification requirements to the documentation demonstrating the requirement is met.	Complete	Acceptable

#	Topic	Parameter Summary	Vendor Document Reference #	Additional Comment	Test or Analysis Result	Licensee Evaluation
16	Factory acceptance test	Integrated functional test requirements from WNA-DS-02957-GEN	WNA-TP-00189-GEN	N/A	Passed	Acceptable factory acceptance tests have been completed successfully.
17	Channel accuracy	+/- 3 inches	WNA-CN-00301-GEN EQ-QR-269	Channel accuracy from measurement to display.	Passed	Acceptable
18	Power consumption	3 day battery life (minimum)	WNA-CN-00300-GEN	N/A	Passed	Acceptable. The vendor document provides results showing a minimum 3-day battery life is met.
19	Technical manual	N/A	WNA-GO-00127-GEN	Information and instructions for operation, installation, use, etc. are included here.	N/A	The manuals have been provided by the vendor.
20	Calibration	Must allow for in-situ calibration	WNA-TP-04709-GEN	Routine testing/calibration verification and calibration method	N/A	Acceptable
21	Failure modes and effects analysis	System provides reliable indication of fuel pool level, consistent with the requirements of References 1 and 2.	WNA-AR-00377-GEN	N/A	SFPI system will meet requirements of References 1 and 2 when installed as required.	Acceptable. The failure modes and effects analysis provided adequately addresses failure modes and effects for the full instrument channel with credit taken for the use of two redundant channels provided the installation meets all requirements stipulated in References 1 and 2.
22	Emissions testing	Regulatory Guide 1.180, Revision 1	EQ-QR-269, Revision 4	Documented in Section 4.6.	Passed	Acceptable

References

1. NRC Order Number EA-12-051, "Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," dated March 12, 2012

2. NEI 12-02, "Industry Guidance for Compliance with NRC Order EA-12-051, 'To Modify Licenses with Regard to Reliable Spent Fuel Pool'", Revision 1

3. JLD-ISG-2012-03, "Compliance with Order EA-12-051, Reliable Spent Fuel Pool Instrumentation," Revision 1

4. Westinghouse Proprietary Document, WNA-DS-02957-GEN, "Spent Fuel Pool Instrumentation System (SFPIS) Standard Product System Design Specification," Revision 4

5. Westinghouse Proprietary Document, WNA-PT-00188-GEN, "Spent Fuel Pool Instrumentation System (SFPIS) Standard product Test Strategy," Revision 2

6. Westinghouse Proprietary Document, WNA-TR-03149-GEN, "SFPIS Standard Product Final Summary Design Verification Report," Revision 1

7. Not Used

8. Westinghouse Proprietary Document, WNA-TP-00189-GEN, "Spent Fuel Pool Instrumentation System Standard Product Integrated Functional Test Plan," Revision 2

9. Westinghouse Proprietary Document, WNA-CN-00301-GEN, "Spent Fuel Pool Instrumentation Channel Accuracy Analysis," Revision 1

10. Westinghouse Proprietary Document, WNA-CN-00300-GEN, "Spent Fuel Pool Instrumentation System Power Consumption Calculation," Revision 1

11. Westinghouse Proprietary Document, WNA-GO-00127-GEN, "Spent Fuel Pool Instrumentation System Standard Product Technical Manual," Revision 4

12. Westinghouse Proprietary Document, WNA-TP-04709-GEN, "Spent Fuel Pool Instrumentation System Calibration Procedure," Revision 4

13. Westinghouse Proprietary Document, WNA-AR-00377-GEN, "Spent Fuel Pool Instrumentation System Failure Modes and Effects Analysis," Revision 3

14. Westinghouse Proprietary Document, EQ-QR-269, "Design Verification Testing Summary Report for the Spent Fuel Pool Instrumentation System," Revision 4

15. Westinghouse Proprietary Document, CN-PEUS-14-27, "Seismic Analysis of the SFP Mounting Bracket at Diablo Canyon Power Plant Units 1 and 2," Revision 1