UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 25, 2013

Mr. Edward D. Halpin
Senior Vice President and Chief Nuclear Officer
Pacific Gas and Electric Company
Diablo Canyon Power Plant
P.O. Box 56, Mail Code 104/6
Avila Beach, CA 93424

SUBJECT: 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)

Dear Mr. Halpin:

On March 12, 2012, the U.S. Nuclear Regulatory Commission (NRC) issued Order EA-12-051, "Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12054A679), to all power reactor licensees and holders of construction permits in active or deferred status. This order requires the licensee to 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 spent fuel pool operating deck, and (3) level where fuel remains covered and actions to implement make-up water addition should no longer be deferred.

By letter dated February 27, 2013 (ADAMS Accession No. ML13059A500), Pacific Gas and Electric Company (the licensee) provided the Overall Integrated Plan (OIP) for Diablo Canyon Power Plant describing how it will achieve compliance with Attachment 2 of Order EA-12-051 by October 29, 2015, for Unit 1 and May 31, 2016, for Unit 2. By letter dated July 3, 2013 (ADAMS Accession No. ML13178A364), the NRC staff sent a request for additional information (RAI) to the licensee. The licensee provided supplemental information by letters dated July 18 and August 22, 2013 (ADAMS Accession Nos. ML13200A123 and ML13235A103, respectively).

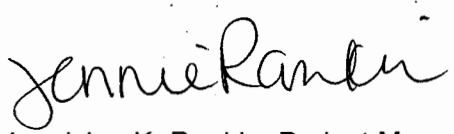
The NRC staff has reviewed these submittals with the understanding that the licensee will update its OIP as implementation of the Order progresses. With this in mind, the staff has included an interim staff evaluation with this letter to provide feedback on the OIP. The staff's findings in the interim staff evaluation are considered preliminary and will be revised as the OIP is updated. As such, none of the staff's conclusions are to be considered final. A final NRC staff evaluation will be issued after the licensee has provided the information requested.

The interim staff evaluation also includes RAIs, response to which the NRC staff needs to complete its review. The licensee should provide the information requested in the 6-month

status updates, as the information becomes available. However, the staff requests that all information be provided by April 30, 2015 to ensure that any issues are resolved prior to the date by which the licensee must complete full implementation of Order EA-12-051. The licensee should adjust its schedule for providing information to ensure that all this information is provided by the requested date.

If you have any questions, please contact me at 301-415-1530 or via e-mail at Jennivine.Rankin@nrc.gov.

Sincerely,



Jennivine K. Rankin, Project Manager
Plant Licensing IV-2 and Decommissioning
Transition Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-275 and 50-323

Enclosure:
Interim Staff Evaluation and RAI

cc w/encl: Distribution via Listserv

INTERIM STAFF EVALUATION AND REQUEST FOR ADDITIONAL INFORMATION

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE OVERALL INTEGRATED PLAN IN RESPONSE TO

ORDER EA-12-051, RELIABLE SPENT FUEL POOL INSTRUMENTATION

PACIFIC GAS AND ELECTRIC COMPANY

DIABLO CANYON POWER PLANT UNITS 1 AND 2

DOCKET NOS. 50-275 AND 50-323

1.0 INTRODUCTION

On March 12, 2012, the U.S. Nuclear Regulatory Commission (NRC) issued Order EA-12-051, "Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12054A679), to all power reactor licensees and holders of construction permits in active or deferred status. This order requires, in part, that all operating reactor sites have a reliable means of remotely monitoring wide-range spent fuel pool (SFP) levels to support effective prioritization of event mitigation and recovery actions in the event of a beyond-design-basis (BDB) external event. The order required all holders of operating licenses issued under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," to submit to the NRC an Overall Integrated Plan (OIP) by February 28, 2013.

By letter dated February 27, 2013 (ADAMS Accession No. ML13059A500), Pacific Gas and Electric Company (PG&E) (the licensee) provided the OIP for Diablo Canyon Power Plant (DCPP), Units 1 and 2, describing how it will achieve compliance with Attachment 2 of Order EA-12-051 by October 29, 2015, for Unit 1 and May 31, 2016, for Unit 2. By letter dated July 3, 2013 (ADAMS Accession No. ML13178A364), the NRC staff sent a request for additional information (RAI) to the licensee. The licensee provided supplemental information by letters dated July 18 and August 22, 2013 (ADAMS Accession Nos. ML13200A123 and ML13235A103, respectively).

2.0 REGULATORY EVALUATION

Order EA-12-051 requires all holders of operating licenses issued under 10 CFR Part 50, notwithstanding the provisions of any Commission regulation or license to the contrary, to comply with the requirements described in Attachment 2 to the Order except to the extent that a more stringent requirement is set forth in the license. Licensees shall promptly start implementation of the requirements in Attachment 2 to the Order and shall complete full implementation no later than two refueling cycles after submittal of the OIP or December 31, 2016, whichever comes first.

Enclosure

Order EA-12-051 required the licensee, by February 28, 2013, to submit to the Commission an OIP, including a description of how compliance with the requirements described in Attachment 2 of the Order will be achieved.

Attachment 2 of Order EA-12-051 requires the licensees to 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.

Attachment 2 of Order EA-12-051 states the SFP level instrumentation shall include the following design features:

1.1 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. Portable instruments shall have capabilities that enhance the ability of trained personnel to monitor spent fuel pool water level under conditions that restrict direct personnel access to the pool, such as partial structural damage, high radiation levels, or heat and humidity from a boiling pool.

1.2 Arrangement: 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.

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

1.4 Qualification: The primary and backup instrument channels shall be reliable at temperature, humidity, and radiation levels consistent with the spent fuel pool 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).

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

1.6 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 [alternating current (ac)] and [direct current (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.

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

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

1.9 Display: Trained personnel shall be able to monitor the spent fuel pool 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 spent fuel pool water level.

Attachment 2 of Order EA-12-051 states the SFP instrumentation shall be maintained available and reliable through appropriate development and implementation of the following programs:

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

2.2 Procedures: Procedures shall be established and maintained for the testing, calibration, and use of the primary and backup spent fuel pool instrument channels.

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

On August 29, 2012, the NRC issued an Interim Staff Guidance document (the ISG), JLD-ISG-2012-03, "Compliance with Order EA-12-051, Reliable Spent Fuel Pool Instrumentation" (ADAMS Accession No. ML12221A339), to describe methods acceptable to the NRC staff for complying with Order EA-12-051. The ISG endorses, with exceptions and clarifications, the methods described in the Nuclear Energy Institute (NEI) guidance document 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," dated August 2012 (ADAMS Accession No. ML12240A307). Specifically, the ISG states:

> The NRC staff considers the methodologies and guidance in conformance with the guidelines provided in NEI 12-02, Revision 1, subject to the clarifications and

exceptions in Attachment 1 to this ISG, are an acceptable means of meeting the requirements of Order EA-12-051.

3.0 TECHNICAL EVALUATION

3.1 Background and Schedule

DCPP, Units 1 and 2, each have identical but independent SFPs. The dimensions of each SFP are 35 feet (ft.) 0 inches (in.) long and approximately 46 ft. 3 in. wide.

The licensee submitted its OIP on February 27, 2013. The OIP states that installation of the SFP level instrumentation at DCPP will be completed by October 29, 2015, for Unit 1 and May 31, 2016, for Unit 2, based on the startup from the second refueling outage for each unit, after submittal of its OIP.

The NRC staff has reviewed the licensee's schedule for implementation of SFP level instrumentation provided in its OIP. If the licensee completes implementation in accordance with this schedule, it would appear to achieve compliance with Order EA-12-051 within two refueling cycles after submittal of the OIP and before December 31, 2016.

3.2 Spent Fuel Pool Water Levels

Attachment 2 of Order EA-12-051 states, in part, that

> All licensees identified in Attachment 1 to this Order 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 [Level 1], (2) level that is adequate to provide substantial radiation shielding for a person standing on the SFP operating deck [Level 2], and (3) level where fuel remains covered and actions to implement make-up water addition should no longer be deferred [Level 3].

NEI 12-02 states, in part, that

> Level 1 represents the HIGHER of the following two points:
>
> - 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
>
> - The level at which the water height, assuming saturated conditions, above the centerline of the cooling pump suction provides the required net positive suction head specified by the pump manufacturer or engineering analysis.

In its OIP, the licensee stated that Level 1 is the indicated level on either the primary or backup instrument channel of 23 ft. 9 in. above the top of the spent fuel storage racks. The licensee also stated that this aligns with the normal SFP level as described in the DCPP Updated Final Safety Analysis Report (UFSAR).

In its letter dated July 18, 2013, the licensee stated, in part, that

> As discussed in Pacific Gas and Electric Company (PG&E) Letter DCL-13-011, dated February 27, 2013, the normal operating level of the SFP is 137 ft 8 in., which is 23 ft 9 in. above the top of the fuel storage racks. PG&E conservatively designated this elevation as Level 1. PG&E has determined that operation of the SFP cooling system can be maintained down to the elevation of the SFP cooling system inlet pipe, assuming saturation conditions. PG&E is revising its definition of Level 1 to the level at which reliable suction loss occurs due to uncovering of the coolant inlet pipe, 134 ft 5 in. This is consistent with the guidance in NEI 12-02.

The NRC staff notes the licensee revised the elevation for Level 1 from 137 ft. 8 in. to 134 ft. 5 in. based on the elevation at which reliable suction loss occurs due to uncovering of the coolant inlet piping. However, as stated in NEI 12-02, Level 1 is to be established at the higher of two SFP elevations. At this time, the elevation necessary to provide the required Net Positive Suction Head (NPSH) specified by the pump manufacturer or engineering analysis is not available for staff review. The staff has identified this request as:

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.

NEI 12-02 states, in part, that

> Level 2 represents the range of water level where any necessary operations in the vicinity of the spent fuel pool can be completed without significant dose consequences from direct gamma radiation from the stored spent fuel. Level 2 is based on either of the following:
>
> - 10 feet (+/- 1 foot) above the highest point of any fuel rack seated in the spent fuel pools, or
>
> - a designated level that provides adequate radiation shielding to maintain personnel radiological dose levels within acceptable limits while performing local operations in the vicinity of the pool. This level shall be based on either plant-specific or appropriate generic shielding calculations, considering the emergency conditions that may apply at the time and the scope of necessary local operations, including installation of portable SFP instrument channel components.

In its OIP, the licensee stated that Level 2 is the indicated level on either the primary or backup instrument channel of greater than 10 ft. above the top of the fuel storage racks.

In its letter dated July 18, 2013, the licensee stated that Level 2 is identified at an elevation of 123 ft. 11 in., which is 10 ft. above the top of the fuel storage racks. In this letter, the licensee

provided a sketch showing the elevations identified as Levels 1, 2, and 3, the top of the fuel storage rack and SFP level sensor measurement range. The NRC staff reviewed this sketch and notes Level 2 at an elevation of 123 ft. 11 in., which is approximately 10 ft. above the top of the fuel rack. The staff also notes the licensee designated Level 2 using the first of the two options described in NEI 12-02 for Level 2.

NEI 12-02 states, in part, that

> Level 3 corresponds nominally (i.e., +/- 1 foot) to the highest point of any fuel rack seated in the spent fuel pool. Level 3 is defined in this manner to provide the maximum range of information to operators, decision makers and emergency response personnel.

In its OIP, the licensee stated that Level 3 is the indicated level on either the primary or backup instrument channel of greater than 1 ft. above the top of the fuel storage racks.

In its letter dated July 18, 2013, the licensee stated that Level 3 is identified at an elevation of 114 ft. 11 in., which is 1 ft. above the top of the fuel storage racks. In this letter, the licensee also provided a sketch showing the elevations identified as Levels 1, 2, and 3, the top of the fuel storage rack and SFP level sensor measurement range. The NRC staff reviewed this sketch and notes Level 3 at an elevation of 114 ft. 11 in., which is approximately 1 ft. above the top of the fuel rack. The NRC notes this elevation is above the highest point of any spent fuel storage rack seated in the spent fuel pool.

The licensee's proposed plan, with respect to identification of Levels 2 and 3, appears to be consistent with NEI 12-02, as endorsed by the ISG.

3.3 Design Features: Instruments

Attachment 2 of Order EA-12-051 states, in part, that

> 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. Portable instruments shall have capabilities that enhance the ability of trained personnel to monitor spent fuel pool water level under conditions that restrict direct personnel access to the pool, such as partial structural damage, high radiation levels, or heat and humidity from a boiling pool.

NEI 12-02 states, in part, that

> A spent fuel pool level instrument channel is considered reliable when the instrument channel satisfies the design elements listed in Section 3 [Instrumentation Design Features] of this guidance and the plant operator has fully implemented the programmatic features listed in Section 4 [Program Features].

In its OIP, the licensee stated that DCPP will use fixed primary and backup guided wave radar (GWR) sensors. The licensee also stated the primary and backup instrument channels will

provide continuous level indication from 12 in. above the top of the spent fuel storage racks at elevation 114 ft. 11 in. to the high SFP level at elevation 139 ft.

In its letter dated July 18, 2013, the licensee provided a sketch showing the elevations identified as Levels 1, 2, and 3, the top of the fuel storage rack and SFP level sensor measurement range. The NRC staff reviewed this sketch and notes this figure showed the sensor active measurement range is from 6 in. above the top of the spent fuel storage racks to a few inches above the normal water level.

The NRC staff notes the range specified for the licensee's instrumentation will cover Levels 1, 2, and 3 as described in Section 3.2 above. The licensee's proposed plan, with respect to the number of channels and the range of the instrumentation for both of its SFPs, appears to be consistent with the guidance.

3.4 Design Features: Arrangement

Attachment 2 of Order EA-12-051 states, in part, that

> 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 the 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.

NEI 12-02 states, in part, that

> The intent of the arrangement requirement is to specify reasonable separation and missile protection requirements for permanently installed instrumentation used to meet this order. Although additional missile barriers are not required to be installed, separation and shielding can help minimize the probability that damage due to an explosion or extreme natural phenomena (e.g., falling or wind-driven missiles) will render fixed channels of SFP instrumentation unavailable. Installation of the SFP instrument channels shall be consistent with the plant-specific SFP design requirements and should not impair normal SFP function.
>
> Channel separation should be maintained by locating the installed sensors in different places in the SFP area.

In its OIP, the licensee stated, in part, that

> A SFP walkdown identified preliminary locations for the primary and backup level sensing components. As shown in Figure 1, the preliminary location of the primary and backup instrument sensing components for Unit 1 is at the south and north ends of the Unit 1 SFP, respectively. As shown in Figure 1, the preliminary location of the primary and backup instrument sensing components for Unit 2 is

> at the north and south ends of the Unit 2 SFP, respectively. The design for installation will include physical separation of the two sensors, separate extension cables from the electronics to the sensors, routing all cables in separate conduit/trays, separate UPS [uninterruptible power supply] power supplied from different ac sources, and seismically-qualified mounting with physical separation of both the level sensing electronics and indications.
>
> The final location of the primary and backup system mounting brackets will be determined during the design phase with consideration of power availability and separation requirements to protect against missiles.

In its letter dated July 18, 2013, the licensee provided Figures 2 and 3. Figure 2 shows the area bounding the planned location of the two permanently mounted level probes within the SFP area. Figure 3 shows the planned cable routing to the instrument display to be located in the control room and near the auxiliary board. The NRC staff reviewed these figures and notes the figures did not identify the distance that separates the cable routing for each SFP level instrument. In this letter, the licensee stated the specific locations of the probes will be provided in the 6-month update following completion of detailed design. The staff has concerns regarding the location and cable routing of the two instrument channels in accordance with the guidance on channel separation as described in NEI 12-02. The staff has identified this request as:

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.

3.5 Design Features: Mounting

Attachment 2 of Order EA-12-051 states, in part, that

> Installed instrument channel equipment within the spent fuel pool shall be mounted to retain its design configuration during and following the maximum seismic ground motion considered in the design of the spent fuel pool structure.

NEI 12-02 states, in part, that

> The mounting shall be designed to be consistent with the highest seismic or safety classification of the SFP. An evaluation of other hardware stored in the SFP shall be conducted to ensure it will not create adverse interaction with the fixed instrument location(s).
>
> The basis for the seismic design for mountings in the SFP shall be the plant seismic design basis at the time of submittal of the Integrated Plan for implementing NRC Order EA-12-051.

In its OIP, the licensee stated the mounting of both the primary and backup system will be installed to maintain its integrity during and following a design-basis seismic event and that all locations will be reviewed for seismic interactions.

In its letter dated July 18, 2013, the licensee also stated, in part, that

> The bracket for the sensing probe will be seismically designed to the design basis earthquakes in the Diablo Canyon Power Plant (DCPP) Updated Final Safety Analysis Report, Section 2.5.3.9, "Design and Licensing Basis Earthquakes." Loads that will be considered in the evaluation of the bracket and its mounting are: (1) static loads including the dead weight of the mounting bracket in addition to the weight of the level sensing instruments and cabling; and (2) dynamic loads including the seismic load due to excitation of the dead weight of the system in addition to the hydrodynamic effects (if credible considering the geometry and the flexibility of the sensing probe and the water sloshing height) resulting from the excitation of the SFP water.
>
> A response spectra analysis will be performed for the seismic evaluation of the mounting bracket using a finite element analysis software and using the floor response spectrum at the 140-ft elevation in the fuel handling building (i.e. mounting floor elevation). The material properties that will be used for the bracket and its mounting will take into consideration the environmental conditions in the SFP area following a seismic event. Hydrodynamic effects on the mounting bracket will be evaluated using TID-7024, "Nuclear Reactors and Earthquakes," dated 1963. Plant acceptance criteria and applicable codes will be used for the design of the bracket and its anchorage.

In its letter dated July 18, 2013, the licensee provided Figure 4, depicting a top view of the SFP instrumentation pedestal and bracket. Further, Figure 4 shows a top view of the pedestal (stainless steel tube welded to the base plate and the channel shown in the figure) that will attach to the pool deck. According to the licensee, the pedestal will be attached to the pool deck using installed anchors that will be designed according to the existing plant specifications for design of concrete anchors. The pedestal will be adjusted to the height of the deck curb to ensure the bracket extends over the pool horizontally level. Additionally, in this letter, the licensee provided Figure 5, depicting a side view of the SFP instrumentation system bracket mounting details. Figure 5 details the vertical portion of the bracket where the probe will thread into the bracket. The licensee stated that all non-movable connections of parts will be welded during manufacturing and that Units 1 and 2 have similar configurations and components will have similar arrangements. The licensee also stated the probe will attach to the bracket via a 1½ in. national pipe thread threaded connection. In this letter, the licensee indicated the final dimensions of the pedestal and bracket will be provided in the 6-month update following completion of detailed design.

The NRC staff notes the proposed application of such seismic design criteria appears to be reasonable and addresses the staff-endorsed NEI 12-02 guidance stating the channel be designed to be consistent with the highest seismic or safety classification of the SFP. The licensee's proposed plan, with respect to the seismic design of the mounting, appears to be

consistent with NEI 12-02, as endorsed by the ISG. The staff plans to verify the results of the licensee's seismic testing and analysis report. The staff has identified these requests as:

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.

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.

3.6 Design Features: Qualification

Attachment 2 of Order EA-12-051 states, in part, that

> The primary and backup instrument channels shall be reliable at temperature, humidity, and radiation levels consistent with the spent fuel pool 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).

NEI 12-02 states, in part, that

> The instrument channel reliability shall be demonstrated via an appropriate combination of design, analyses, operating experience, and/or testing of channel components for the following sets of parameters, as described in the paragraphs below:
>
> - conditions in the area of instrument channel component use for all instrument components,
> - effects of shock and vibration on instrument channel components used during any applicable event for only installed components, and
> - seismic effects on instrument channel components used during and following a potential seismic event for only installed components...

The NRC staff assessment of the instrument qualification is discussed in the following subsections below: (3.6.1) Augmented Quality Process, (3.6.2) Post Event Conditions, (3.6.3) Shock and Vibration, and (3.6.4) Seismic Reliability.

3.6.1 Augmented Quality Process

Appendix A-1 of the guidance in NEI 12-02 describes a quality assurance process for non-safety systems and equipment that is not already covered by existing quality assurance requirements. Within the ISG, the NRC staff found the use of this quality assurance process to be an acceptable means of meeting the augmented quality requirements of Order EA-12-051.

The NRC staff has concerns that the licensee has not described what manner of augmented quality assurance process will be used. The staff has identified this request as:

RAI #5

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

3.6.2 Post Event Conditions

NEI 12-02 states, in part, that

> The temperature, humidity and radiation levels consistent with conditions in the vicinity of the [SFP] and the area of use considering normal operational, event and post-event conditions for no fewer than seven days post-event or until off-site resources can be deployed by the mitigating strategies resulting from Order EA-12-049 should be considered. Examples of post-event (beyond-design-basis) conditions to be considered are:
>
> - radiological conditions for a normal refueling quantity of freshly discharged (100 hours) fuel with the SFP water level 3 as described in this order,
> - temperatures of 212 degrees F and 100% relative humidity environment,
> - boiling water and/or steam environment
> - a concentrated borated water environment, and...

In its OIP, the licensee stated, consistent with NEI 12-02, in part, that

> The normal operational, event, and post-event conditions for temperature, humidity, and radiation, will be addressed for no fewer than 7 days post-event or until offsite resources can be deployed by the mitigating strategies resulting from NRC Order EA-12-049, "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated March 12, 2012 (Reference 7). Examples of post-event (beyond-design-basis) conditions to be considered are:
>
> (1) radiological conditions for a normal refueling quantity of freshly discharged (100 hours) fuel with the SFP water level 3 (Section III, Item 3) as described in Reference 1,

(2) temperatures of 212°F [degrees Fahrenheit] and 100 percent relative humidity environment,

(3) boiling water and/or steam environment,

(4) a concentrated borated water environment,

(5) impact of FLEX mitigating strategies.

Related to radiological conditions, in its letter dated July 18, 2013, the licensee stated, in part, that

> Components subject to significant radiation under BDB conditions will be those in the SFP area. These include the sensor probe, bracket, coupler and interconnecting cable. The sensor probe and bracket will be stainless steel and will not be affected by the anticipated radiation. The coupler and interconnecting cable will be selected by design for the BDB radiation service. Supplemental radiation testing of the interconnecting cable will be completed to demonstrate operation for more than 1 week with SFP water at Level 3.

The NRC staff has concerns with the lack of information regarding the expected radiological conditions in the vicinity where the transmitter electronics equipment will be located under normal and BDB conditions. The staff has identified this request as:

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.

While addressing post-event temperature and humidity conditions, the licensee stated in its letter dated July 18, 2013, in part, that

> SFP instrumentation system materials and components located in the vicinity of the SFP will be selected and specified by design to meet or exceed the temperature and humidity requirements of 212°F and 100 percent humidity. Sensor and system electronics in other locations will be selected and specified by design to meet or exceed the design basis conditions for those locations.

In addition, in its letter dated July 18, 2013, the licensee also provided information regarding the SFP instrumentation components and the basis for validating the design of these components. In this letter, the licensee explained the sensor probe and sensor bracket are inherently tolerant to the effects of the specified temperature and humidity and this will be demonstrated by design and analysis. The sensor coupler is specifically designed by the manufacturer for high temperature and humidity applications. The coaxial cable will be selected by design for conditions and tested for performance at 212 °F, saturated steam. The sensor electronics

design temperature exceeds the requirements for the mounting locations. The components of system electronics and display design temperature exceeds requirements for equipment mounting locations and will be tested for performance under conditions of temperature and humidity cycling.

The NRC staff has concerns with the lack of information regarding whether the sensor electronics is capable of continuously performing its required functions under this expected temperature and humidity condition. The staff has identified these requests as:

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.

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.

3.6.3 Shock and Vibration

NEI 12-02 states, in part, that

> Applicable components of the instrument channels are rated by the manufacturer (or otherwise tested) for shock and vibration at levels commensurate with those of postulated design basis event conditions in the area of instrument channel component use using one or more of the following methods:
>
> - instrument channel components use known operating principles, are supplied by manufacturers with commercial quality programs (such as ISO9001) with shock and vibration requirements included in the purchase specification and/or instrument design, and commercial design and testing for operation in environments where significant shock and vibration loadings are common, such as for portable hand-held devices or transportation applications;
>
> - substantial history of operational reliability in environments with significant shock and vibration loading, such as transportation applications, or
>
> - use of components inherently resistant to shock and vibration loadings or are seismically reliable such as cables.

In its OIP, the licensee stated the demonstration of shock and vibration adequacy will be consistent with the guidelines in Reference 2 [NEI 12-02] and Reference 3 [NRC JLD-ISG-2012-03].

Passive components located within the SFP area

In its letter dated July 18, 2013, the licensee stated, in part, that

> All SFP instrumentation system components located within the SFP will be passive components, inherently resistant to shock and vibration loadings. These include the stainless steel sensor cable probe, sensor bracket, coupler and interconnecting cable.

Active components located outside the SFP area

In its letter dated July 18, 2013, the licensee also stated, in part, that

> Active electronic components, located outside the SFP area will be permanently and rigidly attached to seismic racks or structural walls and are not subject to shock and vibration loadings. However, assurance of reliability under conditions of shock and vibration will be supported by manufacturer operating experience, which will include use of components in high vibration installations, such as compressed air systems and transportation industries.

The NRC staff notes that while the passive components may inherently be resistant to shock and vibration loadings, the actual resistance depends on the component material property, structure, and the final installation. The staff has concerns with the licensee's lack of information on the tests, applied forces and their directions, frequency ranges, and the operability of the sensor after shock and vibration tests are completed. The staff has identified this request as:

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.**

3.6.4 Seismic Reliability

The ISG recommends the use of Sections 7, 8, 9, and 10 of Institute of Electrical and Electronics Engineers (IEEE) 344-2004 for seismic qualification of the SFP level instrumentation.

In its OIP, the licensee stated, in part, that

> Demonstration of seismic adequacy will be achieved using one or more of the following methods:
>
> (1) demonstration of seismic motion consistent with that of existing design basis loads at the installed location;
>
> (2) substantial history of operational reliability in environments with significant vibration, such as for portable hand-held devices or transportation applications. Such a vibration design envelope shall be inclusive of the effects of seismic motion imparted to the components proposed at the location of the proposed installation;
>
> (3) adequacy of seismic design and installation is demonstrated based on the guidance in Sections 7, 8, 9, and 10 of IEEE Standard 344-2004, "IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations" (Reference 8), or a substantially similar industrial standard;
>
> (4) demonstration that proposed devices are substantially similar in design to models that have been previously tested for seismic effects in excess of the plant design basis at the location where the instrument is to be installed (g-levels and frequency ranges); or
>
> (5) seismic qualification using seismic motion consistent with that of existing design basis loading at the installation location.

Passive components located within the SFP area

In its letter dated July 18, 2013, the licensee stated, in part, that

> The sensor cable probe and supporting bracket are functionally passive components. Analysis will be used to demonstrate they will maintain their structural integrity and design configuration and to establish their reliability. The coupler and interconnecting cable are also passive components; however, they will be included in the seismic testing of the sensor electronics.
>
> All components except for the stainless steel sensor cable probe and the stainless steel bracket will be seismically tested in a rigidly-mounted condition equivalent to their as-installed condition. The cable probe and bracket are

passive components for which maintenance of structural or physical integrity is the only requirement.

Active components located outside the SFP area

In its letter dated July 18, 2013, the licensee stated, in part, that

> All active system components, including sensor electronics, system electronics, batteries, display and enclosures will be seismically tested based on rigid mounting conditions. Testing will be tri-axial, using random multi-frequency inputs, in accordance with IEEE 344-2004. Analyses and testing will envelope the conditions at equipment mounting locations resulting from the design basis maximum ground motion.
>
> The active components of the SFP instrumentation system will be functionally tested before and after seismic simulation to assure that the components will remain functional following a seismic event. Water level inputs to the system will be simulated by grounding the system probe at selected, repeatable positions. Comparison of system output will be made both to pre-test results and to the measured position of the cable probe input.

The NRC staff notes the licensee will demonstrate the reliability of the seismic design and installation in accordance with NEI 12-02, as endorsed by the ISG. The licensee's planned approach with respect to the seismic reliability of the instrumentation appears to be consistent NEI 12-02, as endorsed by the ISG. The staff plans to verify the results of the licensee's seismic test when it is completed. The staff has identified this request as:

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.

3.6.5 Qualification Evaluation Summary

Upon acceptable resolution of the RAIs in Section 3.6, the NRC staff will be able to make a conclusion regarding the instrument qualification.

3.7 Design Features: Independence

Attachment 2 of Order EA-12-051 states, in part, that

> The primary instrument channel shall be independent of the backup instrument channel.

NEI 12-02 states, in part, that

> Independence of permanently installed instrumentation, and primary and backup channels, is obtained by physical and power separation commensurate with the hazard and electrical isolation needs. If plant AC or DC power sources are used then the power sources shall be from different buses and preferably different divisions/channels depending on available sources of power.

In its OIP, the licensee stated the backup instrument system will be redundant to and independent of the primary instrument system. The licensee also stated that independence of the two systems includes location, mounting, power sources, power and signal wiring, and indications, to prevent any failure of one system from affecting the other system.

In its letter dated July 18, 2013, the licensee stated, in part, that

> Within the SFP area, the brackets will be mounted on the South (primary sensor) and North (back-up sensor) sides of the pool for Unit 1 and the North (primary sensor) and South (back-up sensor) sides of the pool for Unit 2, as permanent plant structures allow. Placing the brackets and probes on opposite sides allows for natural protection from a single event or missile from disabling both systems. The cabling within the SFP area will be routed in separate hard-pipe conduit. All conduit routing and location of system components will be designed such that there will be no adverse seismic interactions.
>
> Each system will be installed using completely independent cabling structures, including routing of the interconnecting cable within the SFP area in separate hard-pipe conduits. Power sources will be routed to the electronics enclosures from electrically separated sources ensuring the loss of one train or bus will not disable both channels. The system displays will be installed in separate qualified National Electrical Manufacturers Association 4X or better enclosures, with the primary and back-up display in the control room. Primary and backup systems will be completely independent of each other, having no shared components.

The NRC staff notes that with this arrangement, the loss of one backup power supply will not affect the operation of the independent channel under BDB event conditions. The implementation of such design provisions appears to be consistent with NEI 12-02, as endorsed by the ISG, and the electrical functional performance of each level measurement channel would be considered independent of the other channel. However, the NRC staff plans to verify the final electrical power supply design information when it is provided. The NRC staff has identified this request as:

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.

3.8 Design Features: Power Supplies

Attachment 2 of Order EA-12-051 states in part, that

> 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.

NEI 12-02 states, in part, that

> The normal electrical power supply for each channel shall be provided by different sources such that the loss of one of the channels primary power supply will not result in a loss of power supply function to both channels of SFP level instrumentation.
>
> All channels of SFP level instrumentation shall provide the capability of connecting the channel to a source of power (e.g., portable generators or replaceable batteries) independent of the normal plant AC and DC power systems. For fixed channels this alternate capability shall include the ability to isolate the installed channel from its normal power supply or supplies. The portable power sources for the portable and installed channels shall be stored at separate locations, consistent with the reasonable protection requirements associated with NEI 12-06 (Order EA-12-049). The portable generator or replaceable batteries should be accessible and have sufficient capacity to support reliable instrument channel operation until off-site resources can be deployed by the mitigating strategies resulting from Order EA-12-049.
>
> If adequate power supply for either an installed or portable level instrument credits intermittent operation, then the provisions shall be made for quickly and reliably taking the channel out of service and restoring it to service. For example, a switch on the power supply to the channel is adequate provided the power can be periodically interrupted without significantly affecting the accuracy and reliability of the instrument reading. Continuous indication of SFP level is acceptable only if the power for such indication is demonstrably adequate for the time duration specified in section 3.1[.]

In its OIP, the licensee stated, in part, that

> An ac source will be selected for each system's 24-Vdc UPS, with power cables routed separately through existing or new tray/conduit and penetrations.
>
> Both channels will be powered by independent batteries following a loss-of-ac power. The minimum battery life will be 72 hours. The 72-hour battery life is a sufficient amount of time for an alternate source of power to be provided by the

> plant-specific procedures to address Reference 7. Each channel will include an externally accessible bulkhead connector and transfer switch for connection of an alternate power source.

In its letter dated July 18, 2013, the licensee stated, in part, that

> Under normal operating conditions, the primary and backup channels will each be powered by a different, single, non-vital bus, 120 volt (V), 60 hertz feed. Current draw for each of the primary and backup channels will be a maximum of 5 amperes (A). There will be a 6 A, 2-pole, 240-V alternating current (ac) circuit breaker installed in each of the enclosures.
>
> Battery sizing will be in accordance with standard IEEE 485-2010. Design criterion applied is continuous system operation for 72 hours following loss of ac power. Calculation of system power consumption will be based on the specified values listed in component manufacturer specifications. A 10 percent capacity margin will be added to battery sizing calculations, following guidelines of IEEE 485-2010, Section 6.2.2. The 72-hour operating design basis is conservative, in that it exceeds the expected time for restoration of FLEX ac power.

The NRC staff notes the proposed criteria for sizing of the battery backup appears to be consistent with NEI 12-02, as endorsed by the ISG. However, the staff notes the licensee has not completed the battery calculations. The staff plans to verify the results of the licensee's calculation for required duty cycle given the final design load of the instrument channel for its installed configuration. The staff has identified these requests as:

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.

3.9 Design Features: Accuracy

Attachment 2 of Order EA-12-051 states, in part, that

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

NEI 12-02 states, in part, that

> Accuracy should consider operations while under SFP conditions, e.g., saturated water, steam environment, or concentrated borated water. Additionally, instrument accuracy should be sufficient to allow trained personnel to determine when the actual level exceeds the specified lower level of each indicating range (levels 1, 2 and 3) without conflicting or ambiguous indication.

In its OIP, the licensee stated in part, that

> Instrument channels will be designed such that they will maintain their specified accuracy without recalibration following a power interruption or change in power source.

In its letter dated July 18, 2013, the licensee stated, in part, that

> The instrument channel accuracy will be established during the design verification phase. An estimate of the expected instrument channel accuracy under normal and BDB conditions will be provided in the 6-month update following completion of detailed design.
>
> The calibration procedure, and the methodology and basis for establishing both the criteria indicating the need for recalibration, and the acceptance criterion to be used with the procedure, will be established during the design verification phase. The methodology for defining these criteria will be provided in the 6-month update following completion of detailed design.

The NRC staff notes the information on the accuracy of the SFP level instrumentation is not currently available for review. In its letter dated July 18, 2013, the licensee indicated the information will be provided to the staff in the 6-month update following completion of the detailed design. The staff has identified this request as:

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.**

(This information was previously requested as RAI-7 in the NRC letter dated July 3, 2013)

3.10 Design Features: Testing

Attachment 2 of Order EA-12-051 states, in part, that

> The instrument channel design shall provide for routine testing and calibration.

NEI 12-02 states, in part, that

> Static or non-active installed (fixed) sensors can be used and should be designed such that testing and/or calibration can be performed in-situ. For microprocessor based channels the instrument channel design shall be capable of testing while mounted in the pool.

In its OIP, the licensee stated the instrument channel design will provide for routine testing and calibration consistent with Reference 2 and Reference 3.

In its letter dated July 18, 2013, the licensee stated, in part, that

> Details of the capabilities and provisions of the level instrumentation for periodic calibration and testing will be established during the detailed design phase. A description of these features and the way they will support in-situ testing will be provided in the 6-month update following completion of detailed design.
>
> A description of how the instrument channel design provides for routine in-situ testing and calibration will be provided in the 6-month update following completion of detailed design.
>
> Details of functional checks and instrument channel calibrations will be determined during the detailed design phase. A description of how functional checks and calibration tests will be performed, and the frequency at which they will be conducted, will be provided in the 6-month update following completion of detailed design. An explanation of how these surveillances will be incorporated into the plant surveillance program will be included.
>
> The preventative maintenance tasks required to be performed during normal operation, and the planned surveillance intervals will be determined during the detailed design phase. A description of these tasks and intervals will be provided in the 6-month update following completion of detailed design.

The NRC staff notes the information on the design of the SFP level instrumentation to provide for routine testing and calibration is not currently available for review. In its letter dated July 18, 2013, the licensee indicated the information will be provided to the staff in the 6-month update following completion of the detailed design. The staff has identified this request as:

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.

(This information was previously requested as RAI-8 in the NRC letter dated July 3, 2013)

3.11 Design Features: Display

Attachment 2 of Order EA-12-051 states, in part, that

> Trained personnel shall be able to monitor the spent fuel pool 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 spent fuel pool water level.

NEI 12-02 states, in part, that

> The intent of this guidance is to ensure that information on SFP level is reasonably available to the plant staff and decision makers. Ideally there will be an indication from at least one channel of instrumentation in the control room. While it is generally recognized (as demonstrated by the events at Fukushima Daiichi) that SFP level will not change rapidly during a loss of spent fuel pool cooling scenario more rapid SFP drain down cannot be entirely discounted. Therefore, the fact that plant personnel are able to determine the SFP level will satisfy this requirement, provided the personnel are available and trained in the use of the SFP level instrumentation (see Section 4.1) and that they can accomplish the task when required without unreasonable delay.
>
> SFP level indication from the installed channel shall be displayed in the control room, at the alternate shutdown panel, or another appropriate and accessible location (reference NEI 12-06). An appropriate and accessible location shall have the following characteristics:
>
> - occupied or promptly accessible to the appropriate plant staff giving appropriate consideration to various drain down scenarios,
> - outside of the area surrounding the SFP floor, e.g., an appropriate distance from the radiological sources resulting from an event impacting the SFP,

- inside a structure providing protection against adverse weather, and
- outside of any very high radiation areas or LOCKED HIGH RAD AREA during normal operation.

If multiple display locations beyond the required "appropriate and accessible location" are desired, then the instrument channel shall be designed with the capability to drive the multiple display locations without impacting the primary "appropriate and accessible" display.

In its OIP, the licensee stated the primary system indicator will be located in the vicinity of the control room and the backup system indicator will be located in an accessible location.

In its July 18, 2013 letter, the licensee stated, in part, that

> The primary instrument channel display for each Unit will be located in the main control room. The alternate channel instrument display for each Unit will be located on the 85-ft elevation in the auxiliary building, near the auxiliary board control room.
>
> The alternate instrument display, located near the auxiliary board control room on the 85-ft elevation in the auxiliary building, will be promptly accessible from the control room via stairway and hallway since this area is in a seismic structure.
>
> This location would be habitable during an extended loss of ac power event. Communications from this location will be made via portable radios.
>
> The primary instrument displays in the control room are promptly accessible since the control room is continuously manned and will be accessible following a beyond-design-basis external event (BDBEE). The alternate instrument displays near the auxiliary board control room are promptly accessible following a BDBEE via stairway and hallway since this area is in a seismic structure.

The NRC staff notes the NEI guidance for "Display" specifically mentions the control room as an acceptable location for SFP instrumentation displays as it is occupied or promptly accessible, outside the area surrounding the SFP, inside a structure providing protection against adverse weather and outside of any very high radiation areas or LOCKED HIGH RAD AREA during normal operation. The licensee's proposed location for the primary SFP instrumentation display, inside the control room envelope, appears to be consistent with NEI 12-02, as endorsed by the ISG.

The NRC staff has concerns with the licensee's lack of information on the accessibility, habitability, availability of personnel and communications related to the location of the alternate display in the 85 ft. elevation of the auxiliary building. The staff has identified this request as:

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.

3.12 Programmatic Controls: Training

Attachment 2 of Order EA-12-051 states, in part, that

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

NEI 12-02 states, in part, that

> The personnel performing functions associated with these SFP level instrumentation channels shall be trained to perform the job specific functions necessary for their assigned tasks (maintenance, calibration, surveillance, etc.). SFP instrumentation should be installed via the normal modification processes. In some cases, utilities may choose to utilize portable instrumentation as a portion of their SFP instrumentation response. In either case utilities should use the Systematic Approach to Training (SAT) to identify the population to be trained. The SAT process should also determine both the initial and continuing elements of the required training.

In its OIP, the licensee stated, in part, that

> The Systematic Approach to Training (SAT) will be used to identify the population to be trained and to determine both the initial and continuing elements of the required training. Training will be completed prior to placing the instrumentation in service.

The licensee's proposed plan to train personnel in the use and the provision of alternate power to the primary and backup instrument channels, including the approach to identify the population to be trained appears to be consistent with NEI 12-02, as endorsed by the ISG.

3.13 Programmatic Controls: Procedures

Attachment 2 of Order EA-12-051 states, in part, that

> Procedures shall be established and maintained for the testing, calibration, and use of the primary and backup spent fuel pool instrument channels.

NEI 12-02 states, in part, that

> Procedures will be developed using guidelines and vendor instructions to address the maintenance, operation and abnormal response issues associated with the new SFP instrumentation.

In its OIP, the licensee stated that procedures will be developed using guidelines and vendor instructions to address the maintenance, operation, and abnormal response issues associated with the new SFP instrumentation.

In its letter dated July 18, 2013, the licensee stated, in part, that

> As stated in PG&E Letter DCL-13-011, dated February 27, 2013, site procedures will be developed using guidance in NEI 12-02 to address the maintenance, operation, and abnormal response issues associated with the new SFP instrumentation.
>
> These procedures will meet the guidance described in NEI 12-02, Revision 1, Section 4.2, Procedures, and Section 4.3, Testing and Calibration, and will be developed in accordance with the DCPP procedure control process. A list of the operating (both normal and abnormal response) procedures, calibration/test procedures, maintenance procedures, and inspection procedures will be provided in the 6-month update following completion of detailed design.
>
> PG&E's design for SFP instrumentation does not use portable SFP monitoring components. Specific technical objectives to be achieved by procedures will be to maintain the instrument channel functionality, to maintain the instrument channels at the design accuracy, and to ensure compensatory actions are taken as required by NEI 12-02.

The NRC staff has concerns with the licensee's lack of information on the procedures for testing, calibration, and use of the primary and backup spent fuel pool instrument channels. The staff has identified this request as:

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.

(This information was previously requested as RAI-10 in NRC letter dated July 3, 2013. However, based on feedback from the licensees, it has been revised as above.)

3.14 Programmatic Controls: Testing and Calibration

Attachment 2 of Order EA-12-051 states, in part, that

> Processes shall be established and maintained for scheduling and implementing necessary testing and calibration of the primary and backup spent fuel pool level instrument channels to maintain the instrument channels at the design accuracy.

NEI 12-02 states, in part, that

> 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. The testing and calibration of the instrumentation shall be consistent with vendor recommendations or other documented basis.

In its OIP, the licensee stated, in part, that

> Processes will 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. Testing and calibration of the instrumentation will be consistent with vendor recommendations and any other documented basis.

In its letter dated July 18, 2013, the licensee stated, in part, that

> PG&E will provide a description of the maintenance and testing program, and a description of the plans for ensuring that necessary channel checks, functional tests, periodic calibration, and maintenance will be conducted for the level measurement system and its supporting equipment. The descriptions will be provided in the 6-month update following completion of detailed design.
>
> PG&E will implement measures to minimize the possibility of either the primary or backup channel being out of service for an extended period. Sufficient spares, components, and materials will be maintained to be able to repair or replace defective components in a short time. Descriptions of these measures will be provided in the 6-month update following completion of detailed design.
>
> PG&E will follow the NEI 12-02 guidance with regard to time during which one or more channels may be out of service, including compensatory actions. A description of the compensatory actions will be provided in the 6-month update following completion of detailed design.

The NRC staff notes the information regarding testing and calibration of the SFP level instrumentation is not currently available for review. In its letter dated July 18, 2013, the

licensee indicated the information will be provided to the staff in the 6-month update following completion of the detailed design. The staff has identified this request as:

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 non-functioning 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.**

(This information was previously requested as RAI-11 in the NRC letter dated July 3, 2013)

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.

3.15 Instrument Reliability

NEI 12-02 states, in part, that

> A spent fuel pool level instrument channel is considered reliable when the instrument channel satisfies the design elements listed in Section 3 [Instrument Design Features] of this guidance and the plant operator has fully implemented the programmatic features listed in Section 4 [Program Features].

In its OIP, the licensee stated that reliability of the primary and backup instrument channels will be assured by conformance with the guidelines of References 2 [NEI 12-02] and 3 [NRC JLD-ISG-2012-03], Section 3.4, Qualification, and Section 4.3, Testing and Calibration.

Upon acceptable resolution of the RAIs noted above, the NRC staff will be able to make a conclusion regarding the reliability of the SFP instrumentation.

4.0 CONCLUSION

The NRC staff is unable to complete its evaluation regarding the acceptability of the licensee's plans for implementing the requirements of Order EA-12-051 due to the need for additional information as described above. The staff will issue an evaluation with its conclusion after the licensee has provided the requested information.

The interim staff evaluation also includes RAIs, response to which the NRC staff needs to complete its review. The licensee should provide the information requested in the 6-month status updates, as the information becomes available. However, the staff requests that all information be provided by April 30, 2015 to ensure that any issues are resolved prior to the date by which the licensee must complete full implementation of Order EA-12-051. The licensee should adjust its schedule for providing information to ensure that all this information is provided by the requested date.

If you have any questions, please contact me at 301-415-1530 or via e-mail at Jennivine.Rankin@nrc.gov.

Sincerely,

/RA/

Jennivine K. Rankin, Project Manager
Plant Licensing IV-2 and Decommissioning
Transition Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-275 and 50-323

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