Dominion Nuclear Connecticut, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
Web Address: www.dom.com

Dominion®

10 CFR 2.202
EA-12-051

July 26, 2013

Attention: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Serial No.: 13-385
NL&OS/ETS: R3
Docket Nos.: 50-336/423
License Nos.: DPR-65
NPF-49

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNITS 2 AND 3
MARCH 12, 2012 COMMISSION ORDER MODIFYING LICENSES WITH REGARD TO REQUIREMENTS FOR RELIABLE SPENT FUEL POOL INSTRUMENTATION (ORDER NUMBER EA-12-051)
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI)

References:

1. NRC Order Number EA-12-051, Order Modifying Licenses with Regard to Requirements for Reliable Spent Fuel Pool Instrumentation, dated March 12, 2012 (ML12073A202)

2. NRC Interim Staff Guidance JLD-ISG-2012-03, Compliance with Order EA-12-051, Order Modifying Licenses with Regard to Requirements for Reliable Spent Fuel Pool Instrumentation, Revision 0, dated August 29, 2012 (ML12221A339)

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued Order EA-12-051 (Reference 1) to Dominion Nuclear Connecticut, Inc. (DNC). DNC responded to the Order by letter dated March 26, 2012 (Serial No. 12-165) and provided an Initial Status Report on October 25, 2012 (Serial No. 12-165A), consistent with Reference 2. DNC also submitted an Overall Integrated Plan, as required by Section IV, Condition C.1.a of the Order, in a letter dated February 28, 2013 (Serial No. 12-165B).

The NRC issued an RAI to DNC on June 26, 2013. DNC's response to the RAI is provided in the attachment to this letter.

A051
NRC

If you have any questions, please contact Margaret A. Earle at (804) 273-2768.

Sincerely,

Dan Stoddard

Daniel G. Stoddard
Senior Vice President – Nuclear Operations

Attachment

Response to Request for Additional Information - Reliable Spent Fuel Pool Instrumentation

Commitments made in this letter: None

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me today, in and for the County and Commonwealth aforesaid, by Daniel G. Stoddard who is Senior Vice President – Nuclear Operations for Dominion Nuclear Connecticut, Inc. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of the Company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 26th day of July, 2013.

My Commission Expires: December 31, 2016.

CRAIG D SLY
Notary Public
Commonwealth of Virginia
Reg. # 7518653
My Commission Expires December 31, 2016

Craig D Sly
Notary Public

(SEAL)

cc: Director of Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
One White Flint North
Mail Stop 13H16M
11555 Rockville Pike
Rockville, MD 20852-2738

U. S. Nuclear Regulatory Commission, Region I
Regional Administrator
2100 Renaissance Blvd.
Suite 100
King of Prussia, PA 19406-2713

David H. Jaffe
U. S. Nuclear Regulatory Commission
Two White Flint North
Mail Stop T6 D23
11545 Rockville Pike
Rockville, MD 20852-2738

James S. Kim
NRC Project Manager Millstone Units 2 and 3
U. S. Nuclear Regulatory Commission
One White Flint North
Mail Stop O8 C 2A
11555 Rockville Pike
Rockville, MD 20852-2738

NRC Senior Resident Inspector
Millstone Power Station

ATTACHMENT

Response to Request for Additional Information
Reliable Spent Fuel Pool Instrumentation

Millstone Power Station Units 2 & 3
Dominion Nuclear Connecticut, Inc. (DNC)

Response to Request for Additional Information
Reliable Spent Fuel Pool Instrumentation

Background

By letter dated February 28, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No, ML13063A012), Dominion Nuclear Connecticut, Inc., (DNC) submitted an Overall Integrated Plan (OIP) in response to the March 12, 2012, U.S. Nuclear Regulatory Commission (NRC), Commission Order modifying licenses with regard to requirements for Reliable Spent Fuel Pool (SFP) Instrumentation (Order Number EA-12-051; ADAMS Accession No. ML12054A679) for Millstone Power Station Units 2 and 3. The NRC staff endorsed 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," Revision 1, dated August 2012 (ADAMS Accession No. ML12240A307), with exceptions as documented in Interim Staff Guidance (ISG) 2012-03, "Compliance with Order EA-12-051, Reliable SFP Instrumentation," Revision 0, dated August 29, 2012 (ADAMS Accession No. ML12221A339).

The NRC staff has reviewed the February 28, 2013, response by the licensee and determined that the following Request for Additional Information (RAI) is needed to complete its Technical Review. If any part of this information is not available within 30 days of this request, please provide the date this information will be submitted.

NRC RAI No.1

The OIP states, in part, that

a) Level 1 - This is indicated level on either the primary or back-up instrument channel of greater than approximate elevation 36'-0" plus the accuracy of the SFP level instrument channel, which is to be determined. This level is based on the elevation at which the top of the upper SFP cooling pump suction line penetrates the pool wall (Reference 4, Section 9.5.2.1).

b) Level 2 - This is indicated level on either the primary or back-up instrument channel of greater than approximate elevation 22'-5" plus the accuracy of the SFP level instrument channel, which is to be determined. This elevation is sufficient depth to provide radiation shielding for personnel to respond to Beyond-Design-Basis External Events and to initiate SFP makeup strategies.

c) Level 3 - This is indicated level on either the primary or back-up instrument channel of greater than approximate elevation 12'-5" plus

the accuracy of the SFP level instrument channel, which is to be determined. This monitoring level assures that the fuel remains covered.

Please provide the following:

a) The specific functional reasons for identification of the elevations within the SFP as levels 1, 2 and 3. For level 1, specify how the identified location represents the HIGHER of the two points described in the NEI 12-02 guidance for this level.

b) A clearly labeled sketch depicting the elevation view of the proposed typical mounting arrangement for the portions of instrument channel consisting of permanent measurement channel equipment (e.g., fixed level sensors and/or stilling wells, and mounting brackets). Indicate on this sketch the datum values representing Level 1, Level 2, and Level 3 as well as the top of the fuel. Indicate on this sketch the portion of the level sensor measurement range that is sensitive to measurement of the fuel pool level, with respect to the Level 1, Level 2, and Level 3 datum points.

DNC Response: (MPS2)

a) The Level 2 OIP response for Millstone Power Station Unit 2 (MPS2) above is quoted in part. For completeness, the OIP Level 2 statement reads in its entirety as follows:

"Level 2 -This is indicated level on either the primary or back-up instrument channel of greater than approximate elevation 22'-5" plus the accuracy of the SFP level instrument channel, which is to be determined. This elevation is approximately 10' above the top of the fuel racks and ensures a minimum level of 10' above the top of the fuel (Reference 4). This water level ensures there is sufficient depth to provide radiation shielding for personnel to respond to Beyond Design-Basis External Events and to initiate SFP makeup strategies."

As stated in the OIP, the specific functional reasons for identification of the elevations within the SFP as Levels 2 and 3 are: Level 2, elevation of sufficient depth to provide radiation shielding for personnel to respond to BDB events and initiate makeup strategies; and Level 3, elevation at which fuel is still covered. Level 1 is the elevation at which the top of the upper SFP cooling pump suction line penetrates the pool wall.

A calculation is being performed to verify that adequate water level is available to support net positive suction head (NPSH). Results of the

calculation, including justification for the Level 1 value specified in the OIP, will be provided in the February 2014 six month status update.

b) The table below provides an elevation view of the MPS2 SFP showing the proposed Level 1, 2, and 3 values and elevations of the fuel racks and cooling system. The final determination of Level 3 will take into account the weight located on the bottom end of the probe (refer to RAI Response 3b). The final mounting arrangement (e.g., fixed level sensors and mounting brackets) will be available upon completion of the final design, scheduled for December 2013, and will be forwarded to the NRC during the subsequent scheduled status update.

MPS2 SFP Elevations

Location	**Absolute Elevation above MSL (ft.)**		
Top of SFP Wall	38.5		
Top of Instrument Span	37.0		
Nominal Level	36.5		Instrument Span 24.5 feet.
LEVEL 1* - Top of Cooling Suction Inlet Pipe	35.8		
LEVEL 2	22.5		
Top of Fuel Racks + 10 feet	22.5		
LEVEL 3 - Bottom of Instrument Span	12.5	10 ft.	
Top of Fuel Racks	12.5		
Bottom of Pool	-2.0	14.5 ft.	
Centerline of cooling pumps	-3.3		

* Required level to provide adequate NPSH at saturated conditions will be verified by formal calculation and results provided in the February 2014 six month status update.

DNC Response: (MPS3)

Per email from James Kim (NRC) dated June 24, 2013, RAI-1 for Millstone Power Station Unit 3 (MPS3) is similar to the Unit 2 RAI-1. The background information provided with RAI-1 addressed only the Unit 2 elevations; however, the corresponding MPS3 elevations are used in this response.

a) The Level 2 OIP response for Unit 2 above is quoted in part. The complete Level 2 OIP response is provided below with the only difference being that the Unit 3, Level 2 OIP details are indicated in parenthesis:,

> "Level 2 -This is indicated level on either the primary or back-up instrument channel of greater than approximate elevation 22'-5" (35'-4") plus the accuracy of the SFP level instrument channel, which is to be determined. This elevation is approximately 10' above the top of the fuel racks and ensures a minimum level of 10' above the top of the fuel (Reference 4). This water level ensures there is sufficient depth to provide radiation shielding for personnel to respond to Beyond Design-Basis External Events and to initiate SFP makeup strategies."

As stated in the OIP, the specific functional reasons for identification of the elevations within the SFP as Levels 2 and 3 are: Level 2, elevation of sufficient depth to provide radiation shielding for personnel to respond to BDB events and initiate makeup strategies; and Level 3, elevation at which fuel is still covered. Level 1 is the elevation at which the top of the upper SFP cooling pump suction line penetrates the pool wall.

A calculation is being performed to verify that adequate water level is available to support net positive suction head (NPSH). Results of the calculation, including justification for the Level 1 value specified in the OIP, will be provided in the February 2014 six month status update.

b) The table below provides an elevation view of the MPS3 SFP showing the proposed Level 1, 2, and 3 values and elevations of the fuel racks and cooling system. The final determination of Level 3 will take into account the weight located on the bottom end of the probe (refer to RAI Response 3b). The final mounting arrangement (e.g., fixed level sensors and mounting brackets) will be available upon completion of the final design, scheduled for December 2013, and will be forwarded to the NRC during the subsequent scheduled status update.

MPS3 SFP Elevations

Location	Absolute Elevation above MSL (ft.)		
Top of SFP Wall	52.3		
Top of Instrument Span	50.3		
Nominal Level	49.8		Instrument Span 25.0 feet.
LEVEL 1 * - Top of Cooling Suction Inlet Pipe	46.8		
LEVEL 2	35.3		
Top of Fuel Racks + 10 feet	35.1		
Centerline of cooling pumps	26.6	10 ft.	
LEVEL 3 - Bottom of Instrument Span	25.3		
Top of Fuel Racks	25.1		
		13.8 ft.	
Bottom of Pool	11.3		

* Required level to provide adequate NPSH at saturated conditions will be verified by formal calculation and results provided in the February 2014 six month status update.

NRC RAI No. 2

The OIP states, in part, that

> The MPS2 SFP Primary and Back-up instrument channels will use Guided Wave Radar (GWR) based level measurement technology. GWR level measurement instruments work based on the Time Domain Reflectometry (TDR) principal. The device transmits low-intensity electromagnetic pulses along a rigid or flexible conductor where pulses move at the speed of light. When the pulses reach the surface of the medium to be measured, a portion of the signal is reflected back to the electronics. The instrument measures the time from when the pulse is transmitted to when it is received; half of the measured time will be equivalent to the distance from the reference point of the device to the surface of the measured process. The time value will be representative of the measured level and converted for use in displaying level information.
>
> Attributes of a GWR/TDR system include:
>
> - A sensor probe that is submerged in the process medium.
> - Device performance that is not affected by dust, foam, agitated surfaces, boiling surfaces, changes in pressure, changes in temperature, changes in dielectric constant, or changes in density.
> - The requirement to locate sensitive electronic equipment outside of the SFP area.
> - Low power consumption.
> - No mechanical moving parts which simplifies the installation and reduces maintenance.
> - The ability to detect level with accuracy that meets the requirements of NEI 12-02.
>
> The primary and back-up channels will use a fixed instrument providing continuous level measurement over the entire range. The measured range will be from approximately elevation 37'-0" to elevation 12'-5" - for a total indicated range of approximately 24'-7" (295 inches). SFP level is verified daily in accordance with existing procedures.
>
> Primary instrument channel level sensing components will be located on the east wall of the SFP. Back-up instrument channel level sensing components will be located in the northwest corner of the SFP.

Please provide a clearly labeled sketch or marked-up plant drawing of the plan view of the SFP area, depicting the SFP inside dimensions, the planned locations/ placement of the primary and back-up SFP level sensor, and the proposed routing of the cables that will extend from the sensors toward the location of the read-out/display device.

DNC Response: (MPS2 and MPS3)

The final locations for the level sensors, electronics and display units have not yet been determined. As discussed in the response to RAI No. 5, the conceptual design places the sensors in the Fuel Building, and the transmitters in the Auxiliary Building. Per the response to RAI No. 9, the location of the read-out/displays are in the Auxiliary Building for both MPS2 and MPS3.

The final system component locations will be available upon completion of the final design, scheduled for December 2013, and will be forwarded to the NRC during the subsequent scheduled status update.

NRC RAI No. 3

The OIP states, in part, that

> Both the primary and backup systems will be installed as Seismic Category I to meet the NRC ISG JLD-ISG-2012-03 and NEI 12-02 guidance requirements.

Please provide the following:

a) The design criteria that will be used to estimate the total loading on the mounting device(s), including static weight loads and dynamic loads. Describe the methodology that will be used to estimate the total loading, inclusive of design basis maximum seismic loads and the hydrodynamic loads that could result from pool sloshing or other effects that could accompany such seismic forces.

b) A description of the manner in which the level sensor (and stilling well, if appropriate) will be attached to the refueling floor and/or other support structures for each planned point of attachment of the probe assembly. Indicate in a schematic the portions of the level sensor that will serve as points of attachment for mechanical/mounting or electrical connections.

c) A description of the manner by which the mechanical connections will attach the level instrument to permanent SFP structures so as to support the level sensor assembly.

DNC Response: (MPS2 and MPS3)

a) The design criteria to be used to estimate the total loading on the mounting devices is an item to be supplied by the vendor per the DNC procurement specification. The vendor has provided the following:

"The flexible probe will have excursions that will result in some impacts to the liner. However, the flexible nature of the probe results in a self-relaxing response to static and hydrodynamic loading that will dramatically limit the inertia and energy that the probe can impart to the liner."

Further details of the hydrodynamic/seismic evaluation will be provided by the vendor in accordance with the final procurement specification. The full qualification will be available upon completion of the final design, scheduled for December 2013, and will be forwarded to the NRC during the subsequent scheduled status update.

b) Because of the lightweight and flexible design of the Guided Wave Radar (GWR) probe, a stilling well is not required. The lack of probe mass and the probe's reaction to seismic loading permit the pool mount to be very simple, lightweight, and require little space for attachment. It can be attached on the curb's horizontal surface or curb face in most pool situations. Attachment on the curb face results in the cable conduit from the mount to the transmitter enclosure being the only protrusion above the curb. The transmitter enclosures will be located in the Auxiliary Building.

The space used on the SFP deck and over the pool is minimal. Weight is minimal, and recognizing the self-damping characteristics of the flexible probe, seismic issues are easily manageable conditions. The probe is comprised of a flexible stainless steel cable secured at the top by a connector and flange. The bottom of the probe has a uniquely designed weight. The probe is designed to hang in close proximity to the liner without touching it. During an event, preliminary analysis shows that the probe will contact the liner, but the weight of the probe, the bumper material, the self-relaxing characteristics of the cable and the dampening effects of the pool inventory result in very little energy being imparted to the pool liner. Therefore, there are no points of attachment on the SFP liner.

The final mounting details will be available upon completion of the final design, scheduled for December 2013, and will be forwarded to the NRC during the subsequent scheduled status update.

c) As discussed above, the flexible GWR probe will be mounted either on the SFP curb horizontal surface or the curb face. Because of the design, no attachment to the pool liner is required.

NRC RAI No. 4

The OIP states, in part, that

> Instrument channel reliability will be demonstrated via a combination of design, analyses, operating experience, and/or testing of channel components for the following sets of parameters:
>
> - Conditions in the area of instrument channel components,
> - Effects of shock and vibration on the instrument channel components, and
> - Seismic effects on instrument channel components used during and following a potential seismic event.
>
> Augmented quality requirements consistent with NEI 12-02, Appendix A-1 will be applied to this project.
>
> For seismic effects on the installed instrument channel components, the following measures will be used to verify that the design and installation is adequate. Applicable components of the instrument channels are rated by the manufacturer (or otherwise tested) for seismic effects at levels commensurate with those of postulated design basis event conditions at the location of the instrument channel component using one or more of the following methods:
>
> - 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 will be inclusive of the effects of seismic motion imparted to the components proposed at the location of the proposed installation;
> - 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 7) or a substantially similar industrial standard; or
> - 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).
>
> These requirements will be used as design input for the detailed design, vendor selection, and final implementation."

Please provide the following:

a) A description of the specific method or combination of methods you intend to apply to demonstrate the reliability of the permanently installed equipment under BDB ambient temperature, humidity, shock, vibration, and radiation conditions.

b) A description of the testing and/or analyses that will be conducted to provide assurance that the equipment will perform reliably under the worst-case credible design basis loading at the location where the equipment will be mounted. Include a discussion of this seismic reliability demonstration as it applies to (a) the level sensor mounted in the SFP area, and (b) any control boxes, electronics, or read-out and retransmitting devices that will be employed to convey the level information from the level sensor to the plant operators or emergency responders.

c) A description of the specific method or combination of methods that will be used to confirm the reliability of the permanently installed equipment during and following seismic conditions to maintain its required accuracy.

DNC Response: (MPS2 and MPS3)

a) Reliability of the permanently installed equipment under beyond-design-basis (BDB) ambient temperature, humidity, shock, vibration, and radiation conditions will be demonstrated through the equipment design, testing, or analysis.

The installed equipment will be tested and analyzed to meet the Seismic Qualification Reporting & Testing Standardization (SQURTS) seismic envelope for plants in the United States. The equipment mounts will be seismically configured for the specific conditions and locations determined by the final design. Site specific analysis will be performed to certify the mount's performance at the selected location.

Equipment that will be located in the spent fuel pool will be certified for use in post-event conditions including temperatures in excess of 100° Centigrade, 100 percent condensing atmosphere, submerged operation at elevated chemical concentrations, and exposure to postulated radiation levels with the fuel storage rack uncovered for an extended period of time. The remaining equipment will be installed in the Auxiliary Building and qualified for use at temperatures up to 60° Centigrade, 100 percent condensing atmosphere, and $1x10^4$ rads integrated dose. The inherent shielding of the structures along the line of sight between the fuel and the equipment will result in negligible doses to the equipment, even for uncovered fuel.

b) The new SFP level instrumentation system will be tested and analyzed to meet the SQURTS seismic envelope for plants in the United States. The equipment mounts will be seismically configured for the specific conditions and locations determined by the final design. Site specific analysis will be performed to certify the mount's performance at the selected location. The transmitter and display are currently planned to be located in the Auxiliary Building, which is a Seismic Class I Structure.

c) The new SFP level instrumentation system will be tested and analyzed to meet the SQURTS seismic envelope for plants in the United States. Testing will confirm that the system maintains its design accuracy after a seismic event.

Further details of the qualification and test program used to confirm the reliability of the permanently installed equipment during and following seismic conditions will be available upon completion of the final design, scheduled for December 2013, and will be forwarded to the NRC during the subsequent scheduled status update.

NRC RAI No. 5

The OIP states, in part, that

> The primary instrument channel will be redundant to and independent of the back-up instrument channel. Both the primary and back-up instrument channels will be of the same technology, manufacturer, and model.
>
> Independence will be achieved through physical separation of the final installed instruments. The two (2) permanently installed instrument sensors will be separated by a distance comparable to the shortest length of a side of the pool, to the extent practical, based on the existing SFP geometry and construction. The cables associated with each channel will follow separate and independent routes from the instruments to each electronics enclosure and from the enclosures to the displays. The normal AC or DC power source for each channel will be provided from independent and separate sources.

Please provide the following:

a) A description of how the two channels of the proposed level measurement system meet this requirement so that the potential for a common cause event to adversely affect both channels is precluded.

b) Further information on how each level measurement system, consisting of level sensor electronics, cabling, and readout devices will be designed and installed to address independence through the application and selection of independent power sources, the use of physical and spatial separation, independence of signals sent to the location(s) of the readout devices, and the

independence of the displays.

DNC Response: (MPS2 and MPS3)

The following response addresses both parts (a and b) of the requested information.

The MPS2 and MPS3 SFP level instrumentation systems are designed to be a complete integrated solution that meets the requirements set forth in EA-12-051, NEI 12-02 Rev. 1, and JLD-ISG-2012-03. Each system provides two completely independent channels of level instrumentation. Each channel is comprised of the GWR flexible probe, the probe mount, the transmitter, the instrument enclosure containing the DC power source and charger, sensor conditioning and communication circuitry, and local indication and is equipped with appropriate enclosure connections to remote displays and alternate power sources.

The MPS2 sensors will be located on opposite sides of the SFP and the Unit 3 sensors will be located on opposite ends of the longest side of the spent fuel pool. The transmitters and the instrument enclosures for both MPS2 and MPS3 (including display) will be located in the Auxiliary Building. DNC's standard separation criteria for safety related instrument cable at Millstone Power Station (MPS) will be applied.

Each level channel is powered from its own dedicated 24-volt DC sealed batteries with a charging source connected to AC power. For MPS2, the AC charging source is supplied by two independent distribution panels. For MPS3, the AC charging source is from different breakers on the same distribution panel and each channel is protected from ground faults and surges from the common AC supply. In addition to the normal DC power supply to each channel, a back-up power source will also be provided to each channel in the form of a portable back-up battery and connections to alternate power sources independent of the normal AC or DC power sources.

NRC RAI No. 6

The OIP states, in part, that

> "The normal power supply for each channel will be provided by different power sources such that loss of one power source will not result in the loss of both channels. In addition to the normal plant AC and/or DC power supply to each channel, a back-up power source will also be provided to each channel in the form of a back-up battery independent of the normal AC or DC power sources."

Please provide the following:

If the level measurement channels are to be powered through a battery system

(either directly or through an Uninterruptible Power Supply (UPS), please provide the design criteria that will be applied to size the battery in a manner that ensures, with margin, that the channel will be available to run reliably and continuously following the onset of the Beyond-Design-Basis (BDB) event for the minimum duration needed, consistent with the plant FLEX Program plans.

DNC Response: (MPS2 and MPS3)

Each level channel is powered from its own dedicated 24-volt DC sealed batteries with a charging source connected to AC power. The seismically qualified batteries are designed to supply power for the entire level monitoring channel for at least seven days after a station black out (SBO). The enclosure and associated electronics are qualified for continuous operation in an operating environment of 0-50° Centigrade and 95 percent humidity, non-condensing atmosphere without the need for cooling fans.

Since the system is designed to support continuous operation over a seven-day or longer SBO period, there is sufficient time to either restore or provide a back-up source of AC power to recharge the 24-volt batteries. Deployment of an AC power source to recharge the level monitoring channel batteries will be included in the FLEX implementing procedures. As such, each channel will be available to run reliably and continuously following the onset of a BDB event for the minimum duration needed.

NRC RAI No. 7

The OIP states, in part, that

> The instrument channels will maintain their design accuracy following a power interruption or change in power source without requiring recalibration. Since the instrumentation is generally commercial off-the-shelf supplied components, the vendor published instrument accuracies will be verified as acceptable and will be used as a basis for final configuration and calibration procedures.
>
> Accuracy requirements will consider SFP conditions, e.g., saturated water, steam environment, and concentrated borated water. Additionally, instrument accuracy will 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. The GWR/TDR equipment selected will have accuracy within the resolution requirements of NEI 12-02, Figure 1.
>
> Specific details regarding accuracy will be obtained from the supplier during the detailed design phase.

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 that will be employed under normal operating conditions as an acceptance criterion for a calibration procedure to flag to operators and to technicians that the channel requires adjustment to within the normal condition design accuracy.

DNC Response: (MPS2 and MPS3)

a) The selected MPS2 and MPS3 SFP level instrumentation systems are expected to have a design accuracy of +/- 2 inches and maintain this accuracy over the full range of operating conditions, including BDB conditions. Design accuracy is also expected to be maintained following a power interruption without the need for recalibration. The final design accuracy will be available upon completion of the final design, scheduled for December 2013, and will be forwarded to the NRC during the subsequent scheduled status update.

b) Calibration of the SFP level system is performed in-situ. Channel check and calibration tolerances will be developed as part of the detailed design. The final calibration methodology will be available upon completion of the final design, scheduled for December 2013, and will be forwarded to the NRC during the subsequent scheduled status update.

NRC RAI No. 8

OIP states, in part, that

> Instrument channel design will provide for routine testing and calibration consistent with Order EA-12-051 and the guidance in NEI 12-02. The installed sensors will be designed to allow testing and/or calibration via in-situ methods while mounted in the pool. Removal of the sensor from the pool will not be required for calibration or testing.
>
> Specific details regarding testing procedures and calibration requirements will be reviewed and determined with the supplier during the detailed design phase..

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 how such testing and calibration will enable the conduct of regular channel checks of each independent channel against the other, and against any other permanently-installed SFP level instrumentation.

c) A description of how functional checks will be performed, and the frequency at which they will be conducted. Describe how calibration tests will be performed, and the frequency at which they will be conducted. Provide a discussion as to how these surveillances will be incorporated into the plant surveillance program.

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

DNC Response: (MPS2 and MPS3)

a) The SFP level instrumentation system is capable of individual channel in-situ calibration and cross-calibration of the two independent level indications channels. In-situ calibration is performed at the transmitter enclosure using internal displays. The GWR determines pool depth by measuring the time of flight of a pulse from the transmitter to the water interface and back to the transmitter's receiver. A calibration device, provided by the manufacturer, incorporates time of flight delays equal to various pool levels. The device is connected to the transmitter and is exercised for each level. Following calibration, the depth indications for both pool level sensors will be compared as a final functional check of the level measurement.

b) The two independent channels of the SFP level instrumentation system will be cross-checked against each other. Since the two wide range level channels are independent, a channel check tolerance based on the design accuracy of each channel will be applied for cross comparison between the two channels. The tolerance is determined as the square root of the sum of the squares of the expected design accuracy value, which is +/- 2 inches (reference the response to RAI-7). Therefore, the channel check tolerance would then be 2.8 inches.

The wide range instruments may also be cross checked against the existing narrow range pool level measurement channels where available (MPS3 only). If deemed

necessary, tolerances for this cross check will be developed as part of the final design.

c) The responses to Items a) and b) above provide a description of the functional checks to ensure proper operation of the SFP level instrumentation system. Specific details of the functional and calibration test program, including frequencies, will be developed in accordance with the vendor's recommendations as part of the final instrument design, scheduled for December 2013, and will be forwarded to the NRC during the subsequent scheduled status update.

d) Specific details of the preventive maintenance program, including frequencies, will be developed in accordance with the vendor's recommendations as part of the final instrument design, scheduled for December 2013, and will be forwarded to the NRC during the subsequent scheduled status update.

NRC RAI No. 9

The OIP states, in part, that

> The conceptual design locates the electronic enclosure and primary display in the Auxiliary Building [Main Control Room]. Specific details regarding the display and display location(s) will be finalized during the detailed design phase.

Please provide the following:

a) The specific planned location for the primary and backup instrument channel displays.

b) If location is other than the main control room, then provide justification for prompt accessibility to displays including primary and alternate route evaluation, habitability at display location(s), continual resource availability for personnel responsible to promptly read displays, and provisions for communications with decision makers for the various SFP drain down scenarios and external events.

c) The reasons justifying why the locations selected enable the information from these instruments to be considered "promptly accessible" to various drain-down scenarios and external events.

DNC Response: (MPS2 and MPS3)

The following response addresses each part of the requested information.

The current design places the instrument channel display units for both channels of MPS2 and MPS3 in a Seismic Category 1 portion of the Auxiliary Building structure which will be accessible from the Main Control Room from primary and alternate routes. The final design will verify that the habitability of the access routes and locations in the Auxiliary Building structure where the instrument channel display units are planned will be located outside of any very high radiation areas or locked high radiation area during normal operation or various drain-down conditions. Communications with the Main Control Room and/or Technical Support Centers will be maintained via two-way radio. Staffing and communications capabilities for both units will be verified by the FLEX Strategy validation commitments made in response to Order EA-12-049.

Final design details for the instrument channel display units are scheduled to be completed by December 2013. Upon completion of the final design, justification for prompt accessibility from the Main Control Room and habitability will be forwarded to the NRC during the subsequent scheduled status update.

NRC RAI No. 10

The OIP 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.
>
> Procedures will address a strategy to ensure SFP water level addition is initiated at an appropriate time consistent with implementation of NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide (Reference 8).

Please provide a description of the standards, guidelines and/or criteria that will be used to develop procedures for inspection, maintenance, repair, operation, abnormal response, and administrative controls associated with the SFP level instrumentation.

DNC Response: (MPS2 and MPS3)

Procedures for inspection, maintenance, repair, operation, abnormal response, and administrative controls associated with the SFP level instrumentation will be developed in accordance with existing controlled station administrative and technical procedures that govern procedure development. These procedures ensure standardization of

format and terminology and ease of use along with assurance of a consistent level of quality.

NRC RAI No. 11

The OIP states, in part, that

> Processes will be established and maintained for scheduling and implementing necessary testing and calibration of the primary and back-up 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. Calibration will be specific to the mounted instrument and the monitor.

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 your plans for ensuring that necessary channel checks, functional tests, periodic calibration, and maintenance will be conducted for the level measurement system and its supporting equipment.

b) A description of how the guidance in NEI 12-02 section 4.3 regarding compensatory actions for one or both non-functioning channels will be addressed.

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

DNC Response: (MPS2 and MPS3)

a) The maintenance and testing of the SFP level instrumentation systems will be incorporated into the normal station surveillance and work control processes based on vendor recommendations for maintenance and periodic testing. The calibration and maintenance program will include surveillances or testing to validate the functionality of each instrument channel within 60 days of a planned refueling outage considering normal testing scheduling allowances (e.g., 25%).

The preventive maintenance, test and calibration program will be developed consistent with the vendor's recommendations. This information will be available following completion of the final design, scheduled for December 2013, and will be forwarded to the NRC during the subsequent scheduled status update.

b) The guidance in NEI 12-02, Rev. 1, states:

> The primary or back-up 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 non-functioning 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.

In the event a channel of SPF level instrumentation is out of service for any reason, an administrative action statement will be entered to restore the channel to service within 90 days. Functionality of the other channel associated with the same SFP as the out of service channel will be confirmed via appropriate surveillance measures until the non-functioning channel is returned to service. As with item a) above, the frequency of these actions will be developed consistent with vendor recommendations.

c) In the event that a channel cannot be restored to service within the 90 day period, expedited actions to restore the channel would be initiated and tracked via DNC's Corrective Action System. If both channels associated with the same SFP are determined to be non-functional, DNC will initiate appropriate compensatory actions within 24 hours.

The appropriate compensatory actions have not yet been specified. The determination of these actions is part of the overall effort to develop the BDB Program administrative and implementation procedures. The BDB Program will incorporate the guidance of NEI 12-02, including the requirements associated with out of service time and is scheduled for completion in September 2014. A description of compensatory actions will be forwarded to the NRC during the subsequent scheduled status update.