Nuclear Operating Company
South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

June 25, 2013
NOC-AE-13003008
File No.: G25
10 CFR 2.202

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

South Texas Project
Unit 1 & 2
Docket Nos. STN 50-498, STN 50-499
Response to Request for Additional Information
Regarding the Overall Integrated Plan in Response to Order EA-12-051,
"Reliable Spent Fuel Pool Instrumentation" (TAC Nos. MF0827 and MF0828)

References:

1. Letter, Eric Leeds to E. D. Halpin, "Issuance of Order to Modify Licenses with Regard to Requirements for Reliable Spent Fuel Pool Instrumentation," March 12, 2012 (EA-12-051) (ST-AE-NOC-12002271) (ML12054A679)

2. Letter, D. L. Koehl to NRC Document Control Desk, "Overall Integrated Plan Regarding Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)," dated February 28, 2013 (NOC-AE-13002959) (ML13070A006)

3. NRC letter dated June 7, 2013, "South Texas Project, Units 1 and 2 – Request for Additional Information RE: Overall Integrated Plan in Response to Order EA-12-051, "Reliable Spent Fuel Pool Instrumentation" (TAC Nos. MF0827 and MF0828) (ST-AE-NOC-13002439) (ML131149A09)

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued an Order (Reference 1) modifying licenses with regard to requirements for reliable spent fuel pool instrumentation. On February 28, 2013, STP Nuclear Operating Company (STPNOC) submitted an Overall Integrated Plan (OIP) (Reference 2) in response to the NRC Order. By a letter (Reference 3) dated June 7, 2013, the NRC staff determined that additional information is needed to complete their review of the OIP. The STPNOC response to Reference 3 is provided in the attachment to this letter.

There are no regulatory commitments in this letter.

A001
NRR

STI: 33704694

If there are any questions, please contact Ken Taplett at 361-972-8416.

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

Executed on: June 25, 2013

G. T. Powell
Site Vice President

Attachment: Response to Request for Additional Information Regarding Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)

kjt

cc:

(paper copy)

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Response to Request for Additional Information Regarding Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)

References:

1. Letter, D. L. Koehl to NRC Document Control Desk, "Overall Integrated Plan Regarding Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)," dated February 28, 2013 (NOC-AE-13002959) (ML13070A006)
2. Letter, Eric Leeds to E. D. Halpin, "Issuance of Order to Modify Licenses with Regard to Requirements for Reliable Spent Fuel Pool Instrumentation," March 12, 2012 (EA-12-051) (ST-AE-NOC-12002271) (ML12054A679)
3. NRC Japan Lessons-Learned Project Directorate Interim Staff Guidance JLD-ISG-2012-03, "Compliance with Order EA-12-051, Reliable Spent Fuel Pool Instrumentation, Revision 0, August 29, 2012 (ML12221A339)
4. 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 (ML122400399)

Reference 1 provided the Overall Integrated Plan (OIP) which the STP Nuclear Operating Company ("STPNOC") will implement for Units 1 and 2 to comply with the requirements of NRC Order EA-12-051, "Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation" (Reference 2), NRC Interim Staff Guidance JLD-ISG-2012-003, Revision 0, (Reference 3) and NEI Report 12-02, Revision 1 (Reference 4).

As discussed in Reference 1, any changes to the requirements in NRC JLD-ISG-2012-003 or NEI 12-02 may require relief from the requirements and schedule documented in the OIP.

As provided in the OIP, the Milestones for completing the design and engineering work for Unit 1 are September 2014 and for Unit 2 is December 2013.

The following responses to the request for additional information are based on information developed to date. Any changes to the following information that occur after completing and approving the final design for reliable spent fuel pool instrumentation will be provided in the periodic 6-month status reports submitted to the NRC required by Order EA-12-051.

REQUEST FOR ADDITIONAL INFORMATION

OVERALL INTEGRATED PLAN IN RESPONSE TO

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

STP NUCLEAR OPERATING COMPANY

SOUTH TEXAS PROJECT, UNITS 1 AND 2

DOCKET NOS. 50-498 AND 50-499

1.0 Introduction

By letter dated February 28, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13070A006), STP Nuclear Operating Company (STPNOC, the licensee), 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 South Texas Project (STP), Units 1 and 2. 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 SFP 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. Please provide the response to the following RAIs.

2.0 Levels of Required Monitoring

The OIP states, in part, that

> **LEVEL 1: Level adequate to support operation of the normal fuel pool cooling system.**
>
> Plant El. 64 ft. 2 in or 24 ft. 4 in. water level above the top of the SFP fuel storage rack.
>
> **LEVEL 2: Level adequate to provide substantial radiation shielding for a person standing on the SFP operating deck.**
>
> Plant El 49 ft. 10 in. or 10 ft. water level above the top of the SFP fuel storage rack.
>
> **LEVEL 3: Level where the fuel remains covered**.
>
> Plant El 40 ft. 4 in. or 6 in. water level above the top of the SFP fuel storage rack.
>
> ...The installation of the SFPLI [spent fuel pool level instrumentation] sensor will be such that it will measure as close as possible to the top of the SFP fuel rack. Indicated level on either the Primary or Backup Instrument Channel of greater than ½ ft. above the top of SFP fuel storage racks based upon the design accuracy of the instrument channel per NEI 12-02 [Rev.1], for both the Primary and Backup Instrument Channels, satisfies the NEI 12-02 [Rev.2] requirement of ±1 ft. from the top of the fuel rack. This monitoring level ensures there is adequate water level above the stored fuel seated in the SFP fuel storage rack.

NRC RAI-1a

Please provide the following:

a) **For Level 1, please specify how the identified location represents the HIGHER of the two points described in the NEI 12-02 guidance for this level.**

STPNOC Response

LEVEL 1 represents the HIGHER of either the level at which reliable suction loss to the spent fuel pool (SFP) cooling pump occurs, or the required net positive suction head (NPSH) of the SFP cooling pump

Required NPSH.

The SFP cooling pumps were analyzed for the conservative worst case operation of the SFP cooling pumps. Maximum values for line resistance, fluid temperature, suction flow

and static head were used to calculate NPSH parameters for both required and available NPSH ($NPSH_R$ and $NPSH_A$). It was determined that for the worst case scenario, the $NPSH_A$ was significantly higher than $NPSH_R$. The $NPSH_A$ was calculated to be 42.67 feet (ft) and $NPSH_R$ was calculated to be 18.75 ft.

Therefore, $NPSH_R$ is not the determining value to be used for LEVEL 1.

Loss of reliable suction to SFP cooling pumps.

For the purposes of the OIP, this level is conservatively placed at Plant elevation (El.) 64 ft, 2 inches (in). This level provides for more than one foot of water above the top of the SFP cooling pump suction inlet flange (the centerline of the 14 inch suction line flange to the pump is at Plant El. 62 ft. 6 in.) which will be sufficient for NPSH.

A vortex calculation shows 0.134% air entrainment at an elevation one foot above the suction pipe centerline. Level 1 at 64 ft. 2 in. is adequate for normal SFP cooling system operation. Therefore, Level 1 represents the HIGHER of the two points described in the NEI 12-02 guidance.

NRC RAI-1b

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). Please 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.

STPNOC Response

See Figures 1 and 2 of this Attachment.

3.0 Instrumentation and Design Features

3.1 Instruments and Arrangement

The OIP states, in part, that

> Both the Primary and Backup Instrument Channels will utilize permanently-installed instruments....
>
> The Primary Instrument Channel level sensing components will be located in the northeast corner of the Spent Fuel Pool, as shown in Attachment 1....

The Backup Instrument Channel level sensing components will be located in the northwest corner of the Spent Fuel Pool, as shown in Attachment 1....

The current Plan is to mount the supporting electronic instruments outside of the spent fuel pool area, to provide a more benign radiation and environmental conditions, and also provide for reasonable and accessible locations for operators.

SFP Primary and Backup Channel Level Instruments are currently planned to be located in Radwaste Control Room of the Mechanical Auxiliary Building (MAB); however, STPNOC is still evaluating other possible locations (i.e. relay room).

NRC RAI-2

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.

STPNOC Response

See Figure 3 of this Attachment.

3.2 Mounting

The OIP states, in part, that

> Consideration will be given to the maximum seismic ground motion that occurs at the installation location for the permanently installed equipment which is documented in the UFSAR [Updated Final Safety Analysis Report] Section 3.7. The mountings shall be designed consistent with the highest safety or seismic classification of the SFP. The level sensors will be mounted on seismically qualified brackets.

NRC RAI-3a

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. Please 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.**

STPNOC Response

See Figure 2 of this Attachment. The VEGAPuls 62ER Through Air Radar components manufactured by VEGA Americas, Inc. that will be mounted at the pool edge are comprised of a horn antenna, waveguide assembly and mounting bracket. The radar horn antenna is positioned above the SFP water surface. The loading on the mounting bracket includes the static weight loads and dynamic loads of the horn antenna, waveguide assembly and attached waveguide pipe up to the nearest pipe support. The dynamic loads on the mounting bracket consist of design basis maximum seismic loads on the bracket and the mounted components, along with hydrodynamic loads produced by impinging surface waves caused by seismically-induced pool sloshing.

The methodology for ensuring that the mounting bracket and attached equipment can withstand the seismic dynamic forces will be by analysis of the combined maximum seismic and hydrodynamic forces on the cantilevered portion of the waveguide assembly and horn antenna exposed to potential seismically induced wave action. In addition, seismic qualification testing will be performed to seismic response spectra that envelope the maximum seismic ground motion for the installed location.

NRC RAI-3b

Please provide the following:

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. Please indicate in a schematic the portions of the level sensor that will serve as points of attachment for mechanical/mounting or electrical connections.

STPNOC Response

See Figure 2 of this Attachment.

The Through Air Radar horn antenna and waveguide assembly is attached to a waveguide assembly mounting bracket. The schematic in Figure 2 provides a visual representation of the pool edge mounting configuration. The Through Air Radar level sensor does not contact the SFP water or connect to the pool liner. The horn antenna is cantilevered over the edge of the pool and firmly fixed in a direction perpendicular to the pool water surface. The horn assembly mounting bolts can be loosened and the horn rotated away from over the pool surface for instrument calibration (see response to RAI-8a). The bracket provides the attachment point for the horn and waveguide assembly to the refueling floor. Four bolts at the base of the bracket fasten the bracket to the refueling floor. For mounting to a concrete floor, the bolts may be anchor bolts in a range of sizes from 3/8 to 3/4 inch. The distance of the two nearest bolts to the pool edge will be determined by the specific requirements of the anchor bolt size used. For mounting to a metal floor, the bracket base may be fastened to the floor by welding. The horn can be away from or next to the pool liner without impacting the functionality of the level measurement.

NRC RAI-3c

Please provide the following:

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.

STPNOC Response

See Figure 4 of this Attachment.

Figure 4 provides a standard conceptual arrangement of the elements of the Through Air Radar system. The Order requires status updates at six (6) month intervals following submittal of the OIP to delineate progress made in implementing the requirements of the Order. A site specific arrangement will be provided in a later 6 month update to the NRC. The waveguide piping that is connected between the waveguide assembly at the pool edge and the remotely located sensor is attached to building structures using site pipe mounting specifications. Spacing of the pipe supports will comply with site standards and qualification restrictions for the waveguide pipe.

The radar sensor is mounted on a mounting bracket that is fastened to seismically qualified mounting points, either building structural steel or a concrete wall. Four bolts at the base of the bracket fasten the bracket to the building structure. The fastening method described for the pool edge mounting bracket applies to the sensor mounting bracket. Electrical connections to the sensor are made using flexible conduit into one of two available 1/2 inch National pipe thread (NPT) threaded openings in the sensor housing.

3.3 Qualification

The OIP states, in part, that

> Both channels will be reliable at temperature, humidity and radiation levels consistent with the SFP water at saturation conditions for no fewer than seven (7) days post-event. Level equipment installed in the SFP and areas in the Fuel Handling Building (FHB) will be designed and tested to remain functional when subjected to the following expected post-event conditions:
>
> - Water Radiological conditions for a normal refueling quantity of freshly discharged (100 hours) fuel with SFP water at LEVEL 3 as described in the ORDER
> - Temperatures of 212 °F and 100% relative humidity environment
> - Boiling and/or steam environment
> - Concentrated borated water environment

7.3.1 Seismic Reliability:

The reliability of the permanently installed instrument channel components will be demonstrated through an appropriate combination of design, analysis, operating experience and/or testing of components to meet the seismic conditions in the area of the SFP that are applicable at the time of submittal of this Plan and will meet the seismic reliability requirements of NEI 12-02 [Rev.1] and the ISG. If changes in the seismic design basis occur, they will be processed in accordance with existing plant procedures.

The reliability of seismic design and installation will be demonstrated in accordance with the guidance in Sections 7, 8, 9, and 10 of [Institute of Electric and Electronics Engineer] IEEE Standard 344-2004 (Ref. 7) or a substantially similar industrial standard. The instruments will meet the shock and vibration requirements of NEI 12-02 [Rev.1] and the ISG.

NRC RAI-4a

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 Beyond-Design-Basis (BDB) ambient temperature, humidity, shock, vibration, and radiation conditions.**

STPNOC Response

Ambient Temperature

The postulated temperature in the SFP room that results from a boiling pool is 100°C (212°F). The electronics in the sensor are rated for a maximum temperature of 80°C (176°F). The sensor will be located outside of the spent fuel pool room in an area where the temperature will not exceed the rated temperature of the electronics.

Humidity

The maximum humidity postulated for the SFP room is 100% relative humidity, essentially a saturated steam environment. The VEGA electronics will be located outside of the spent fuel pool room in an area away from the steam atmosphere. The waveguide tube in the FHB can withstand condensation formed on the inside walls provided there is no pooling of the condensate in the waveguide tube. This is ensured by installing a weep hole(s) at the low spots in the wave guide pipe.

The ability of the radar to "see through" the steam has been demonstrated by test. In addition to testing, the VEGA Through Air Radar instrument has been used in numerous applications that involve measuring the level of boiling liquids.

Shock and Vibration

The VEGAPuls 62ER Through Air Radar sensor is similar in form, fit and function to the VEGAPuls 66 that was shock and vibration tested in accordance with MIL-S-901D. This shock and vibration testing only applies to the sensor. The waveguide piping is not shock or vibration sensitive.

The AREVA power and control panel contains components that are part of the standard VEGA Mobile Remote Display. In addition, the readout portion of the display panel, the PLICSCOM, was installed with the sensor during the shock and vibration testing. The Mobile Remote Display is designed for mobile applications subject to shock and vibration from normal handling, transportation and setup on the job. Per NEI 12-02, designing instruments for operation in environments where significant shock and vibration loadings are common, such as for portable hand-held devices or transportation applications, is an acceptable measure for verifying that the design is adequate to withstand shock and vibration. The Mobile Remote Display is therefore considered to have an acceptable resistance to shock and vibration. There are three components in the AREVA power and control panel that are not included with the VEGA Mobile Remote Display that are similar in construction and are tested for shock and vibration and/or mounted on vibration dampeners. The AREVA power and control panel will be subjected to seismic tests per the requirements of IEEE 344-2004, "Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations".

Radiation

The area above and around the pool will be subject to large amounts of radiation in the event that the fuel becomes uncovered. The only parts of the measurement channel in the pool radiation environment are the metallic waveguide and horn, which are not susceptible to the expected levels of radiation. The remote display electronics will be located in an area outside the FHB that does not exceed the $1x10^3$ RAD analyzed limit for the electronics.

NRC RAI-4b

Please provide the following:

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. Please 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 re-transmitting devices that will be employed to convey the level information from the level sensor to the plant operators or emergency responders.

STPNOC Response

A seismic shake test will be performed to the requirements of IEEE 344-2004 for elements of the VEGAPuls 62ER Through Air Radar instrument to levels anticipated to envelop most if not all plants in the United States. The equipment to be tested includes the sensor, readout and power control panel, horn end of the waveguide, pool end and sensor end mounting brackets, and waveguide piping. The items will be tested to the Required Response Spectra (RRS) contained in EPRI TR-107330, "Generic Requirements Specification for Qualifying a Commercially Available PLC for Safety-Related Applications in Nuclear Power Plants", to account for the potentially high seismic motion that could occur to cabinet-mounted readout and power control panel. This RRS will also envelop the seismic ground motion for items mounted to the building structure, pool edge, etc.

NRC RAI-4c

Please provide the following:

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.**

STPNOC Response

The seismic testing described in response to RAI-4b will include testing the VEGAPuls 62ER Through Air Radar instrument for functionality prior to and during post seismic testing, which includes verification of the instrument's accuracy.

3.4 Independence

The OIP states, in part, that

> AC [alternating current] or DC [direct current] power sources utilized for the Primary and Backup Channels will be from different buses such that no one single failure will interrupt power to both SFPLI channels.

RAI-5a

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.**

STPNOC Response

The design of the electrical power supply to the proposed level measurement system is not complete. Current plans call for powering the channel display panels from 120VAC lighting panels. The lighting panels (LP) are powered independently from different 13.8kV busses. At this stage of the design planning, the two panels selected are LP 13B and LP 13P. LP 13B is powered from motor control center (MCC) 1S1 (2S1) which in turn is powered from 13.8kV bus 1H (2H). LP 13P is powered from MCC 1L3 (2L3) which in turn is powered from 13.8 kV bus 1G (2G). Thus, a failure of one large bus will not cause the loss of both display panels.

RAI-5b

Please provide the following:

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.

STPNOC Response

See Figure 3 of this Attachment. The horn antenna for each level instrument will be installed on separate corners of the Spent Fuel Pool. The stainless steel waveguide piping (one for each instrument) will be attached to the north wall of the Fuel Handling Building, physically separated from each other (distance to be determined in the design process), until the piping terminates at the independent sensor electronics panels mounted on the MAB wall. An electronic signal is sent from the sensor electronic panels via separate independent wiring for each channel to the readout display panels located at different locations in the Radwaste Control Room in the MAB. Signals are sent from the readout display panels to the Main Control Room via the Integrated Computer System. Independent power sources are addressed in the response to RAI-5a.

3.5 Power Supplies

The OIP states, in part, that

For Unit 1 and Unit 2, the power supplies for the Primary and Backup Instrument Channels will be provided from different power buses to assure that the loss of one bus will not result in the loss of both channels. In addition, each instrument channel shall have a backup battery power supply for uninterrupted operation after loss of power. Power will be of sufficient capacity to maintain level indication until offsite resources become available.

NRC RAI-6

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 BDB event for the minimum duration needed, consistent with the plant FLEX Program plans.

STPNOC Response

The sizing of the battery back-up for the VEGAPuls 62ER Through Air Radar instrument is based on ability of the sensor to supply full load (20mA) for the duration specified in the plant FLEX program with built-in safety margin. The sizing of the battery will be verified by calculation and/or test prior to installation. The battery back-up will be dedicated to the VEGAPuls 62ER instrument. Currently installed station batteries will not be used for this battery back-up.

3.6 Accuracy

The OIP states, in part, that

> The minimum accuracy for the channel will be maintained following a loss of power, without calibration and will consider the effect of environmental conditions on the accuracy. Minimum accuracy requirements shall meet the requirements of NEI 12-02. 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.

NRC RAI-7a

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 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.**

STPNOC Response

The reference accuracy for the instrument attaching a waveguide to the instrument for transmitting the signal and using water as a target at normal SFP level conditions has been demonstrated to be ±1 inch based on testing. This is the design accuracy value that will be used for the SFPLI channels. This value is subject to change dependent on the actual performance with the installed waveguide.

The accuracy of the instrument channel is little affected under BDB conditions (i.e., radiation, temperature, humidity, post-seismic and post-shock conditions). The stainless steel horn antenna and waveguide pipe that are exposed to BDB conditions are largely unaffected by radiation, temperature and humidity other than a minor effect of condensation forming on the waveguide inner walls which will have a slight delay effect on the radar pulse velocity. Condensation is prevented from pooling in the waveguide and thus blocking the radar signal by placement of weep holes at low points in the waveguide pipe. A minor effect on the length of the overall measurement path can occur due to temperature related expansion of the waveguide pipe. The waveguide pipe permits the sensor receiver to be located in mild environment conditions (i.e. the MAB) so that the effect of elevated temperature on sensor receiver accuracy is also limited. Based on the VEGA Operating Instruction Manual for the VEGAPuls 62ER instrument, a small correction factor is applied on the radar beam velocity to account for the impact of saturated steam at atmospheric pressure. Testing performed in saturated steam and saturated steam combined with smoke environments indicates that the overall effect on the instrument accuracy is minimal. The overall accuracy due at BDB conditions is conservatively estimated to not exceed ± 3 inches, which is within the required ±1 ft. described in NEI 12-02.

NRC RAI-7b

Please provide the following:

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.

STPNOC Response

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 will be based upon the difference between readings from the Primary and Backup level instruments. The estimated design accuracy for each instrument is ±1 in. The maximum deviation between the two instrument channels for determining that instrument calibration is needed will be ±2 inches based on a still water level in the pool. This maximum deviation is subject to change if design accuracy discussed in the response to RAI-7a above changes.

3.7 Testing

OIP states, in part, that

> Testing of the installed instrument channels will be consistent with the guidelines of NEI 12-02 [Rev.1] and the ISG. Specific test procedures will be implemented for functional testing of the installed instrument systems, from the sensor through the display, as defined in Section 11.0.

NRC RAI-8a

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.

STPNOC Response

Multi-point testing is enabled by the capability to rotate the radar horn antenna away from pointing to the SFP water surface and instead aimed at a movable metal target that is positioned at known distances from the horn. This allows checking for correct readings of all indicators along a measurement range and validates the functionality of the installed system.

NRC RAI-8b

Please provide the following:

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.

STPNOC Response

The Primary and Backup instrument channels will have indicators that can be compared against each other and against any other permanently-installed SFP level instrumentation. This comparison can be performed at suitable times and frequencies. The results of the comparison between the SFPLI channels can be compared with the criteria described in response to RAI-7b to determine if recalibration or troubleshooting is needed. As the specifics regarding testing, calibrating and channel checks are developed, the information will be provided in 6 month updates to the NRC.

NRC RAI-8c

Please provide the following:

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. Please provide a discussion as to how these surveillances will be incorporated into the plant surveillance program.**

STPNOC Response

Functional checks will be performed periodically. Functional checks will include visual inspection, verification of the instrument display reading, and testing of the battery backup on simulated loss of normal power. Calibration tests will be performed but the frequency has not been established. The multi-point test method is described in the response to RAI-8a above. It has not been determined how the checks and testing will be incorporated into current processes or how frequent the checks and testing will be performed. As this information is developed, it will be provided in 6 month updates to the NRC.

NRC RAI-8d

Please provide the following:

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.**

STPNOC Response

The maintenance and testing program for the SFPLI will meet the requirements in NEI 12-02. Tasks will verify that the readings for the Primary and Backup channels are consistent with the actual SFP level. The periodicity for performing preventative maintenance tasks has not been determined.

The Through Air Radar instrument requires no regular preventative maintenance except for routine replacement of the backup lithium battery cells in the power control panel.

3.8 Display

The OIP states, in part, that

> The Primary and Backup Instrument Channel display(s) are located in the Radwaste Control Room, which is an accessible location following a Large Scale External Event (LSEE); however, other locations are still being considered.
>
> The two displays will be sufficiently separated by the distance required for independent channels. The location selected for these displays will be such that damage resulting from a LSEE will not damage both displays.
>
> SFP Primary and Backup Channel Level Instruments are currently planned to be located in Radwaste Control Room of the MAB; however, STPNOC is still evaluating other possible locations (i.e. relay room).
>
> In addition, the Primary and Backup Channel Instruments will drive remote indication located in the Main Control Room.

NRC RAI-9a

Please provide the following:

a) **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.**

STPNOC Response

The displays will be located in the Radwaste Control Room. The Radwaste Control Room is located in an area that is accessible to the MAB Plant Operator from two different paths from outside the MAB. One path is from the Electrical Auxiliary Building (EAB) and the other path is from outside entrance to the MAB. The MAB is a seismic Class 1 safety related structure and the Radwaste Control Room, inside the MAB, is a considerable distance from the FHB and SFP. Adequate Operations resources are available on shift to periodically monitor the SFP level at this location primarily because of its central location with respect to their other duties. Communications between the control room and the plant operators is provided by a variety of means including radios and sound-powered phones. Habitability is discussed in the response to RAI-9b.

NRC RAI-9b

Please provide the following:

b) 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.

STPNOC Response

The Radwaste Control Room is located on the 41 foot level of the MAB and will not receive a significant increase in background radiation levels in the event the Spent Fuel Pool (SFP) water level reduces to Level 3. The concrete walls around the SFP are 5 feet thick. The building walls between the FHB and the MAB are 5 feet 6 inches thick. An additional 2 foot thick wall separates the Radwaste Control Room and the penetration area next to the FHB. The distance from the nearest SFP boundary to the FHB/MAB boundary is approximately 49 feet. The distance from the FHB/MAB boundary to the nearest Radwaste Control Room wall is approximately 65 feet with an elevation change from 68 feet (the SFP operating deck level) to 41 feet. As stated above in the response to RAI-9a, the Radwaste Control Room is located in a seismic Class 1 safety related structure. Thus, the Radwaste Control Room will be habitable during SFP drain down scenarios and external events. Access to the Radwaste Control Room is achieved on the east side of the MAB and EAB whereas the FHB and SFP are on the west side of the MAB. As such, the Radwaste Control Room should be promptly accessible for any event in the FHB.

4.0 Program Features

4.1 Procedures

The OIP states, in part, that

> Procedures for the maintenance and testing, and the training of the required personnel on these procedures will be completed prior to the required date for completion of these modifications per Section 3.0.

NRC RAI-10

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

STPNOC Response

The standards, guidelines and/or criteria that will be utilized to develop procedures for activities described in the RAI associated with the SFP level instrumentation, as well as storage and installation of portable instruments, have not been determined. However, information such as the following is being considered:

- INPO AP-913 and Maintenance Rule,
- RG 1.33, Quality Assurance Program Requirements (Operation), Revision 2, and
- ANSI 18.7-1976, Administrative Controls and Quality Assurance for Operational Phase of Nuclear Power Plants.

Information regarding the utilization of standards, guidelines and/or criteria to develop these procedures will be provided in 6 month updates to the NRC.

4.2 Testing and Calibration

The OIP states, in part, that

> Specific test procedures will be implemented for functional testing of the installed instrument systems, from the sensor through the display, as defined in Section 11.0.

NRC RAI-11

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. Please 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.**

STPNOC Response

The maintenance and testing program as well as compensatory actions for non-functioning channels have not been developed. As these procedures are developed, information will be provided in 6 month updates to the NRC.

Figure 1
Elevation View Orientation of Monitored Levels

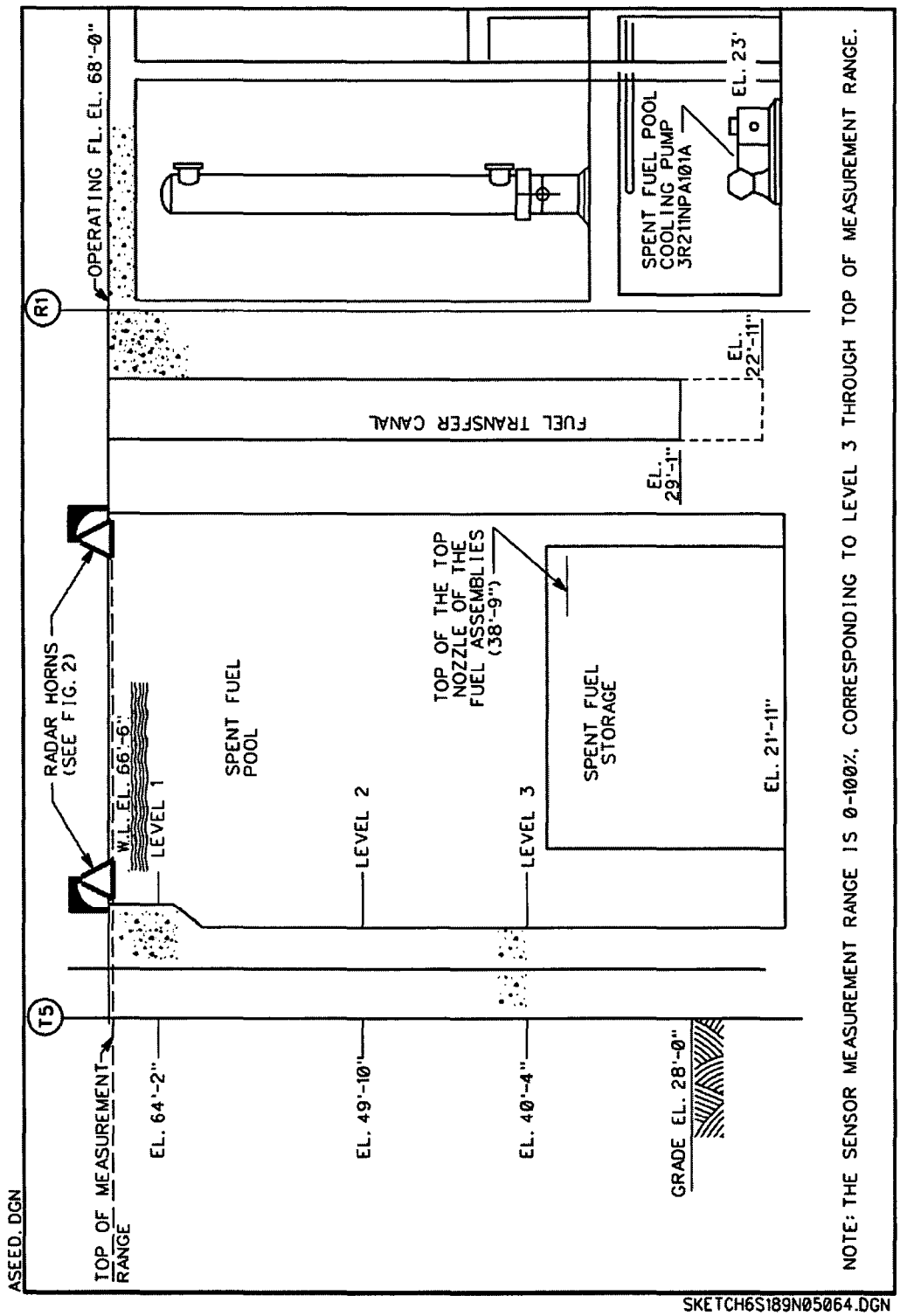

Figure 2
Proposed Mounting Arrangement

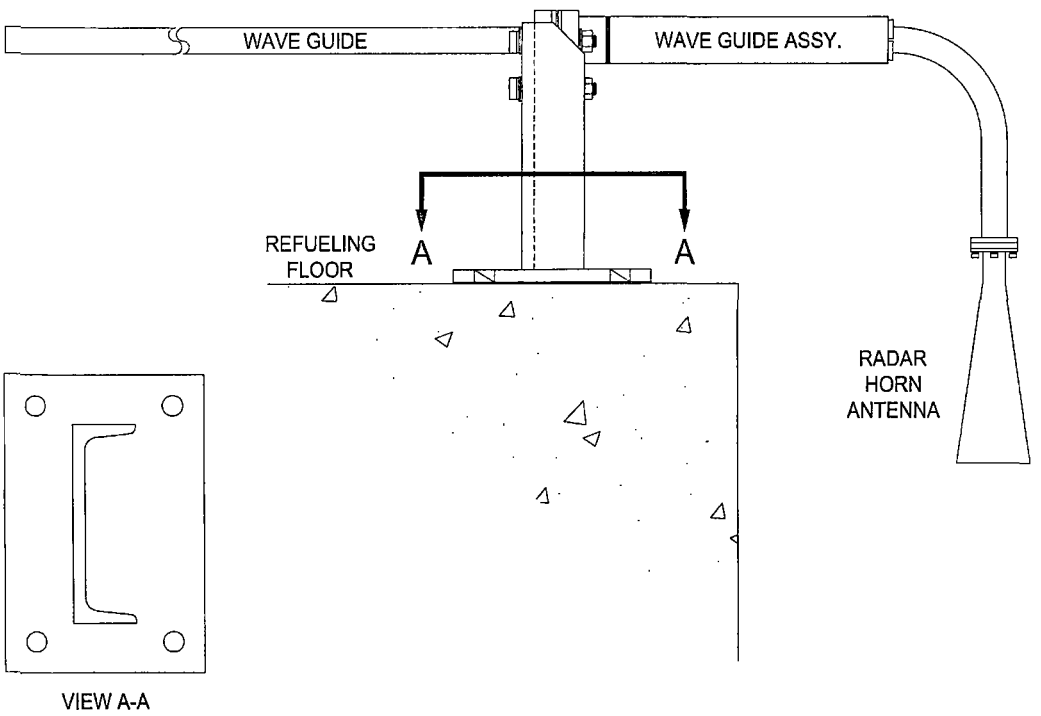

Figure 3
Spent Fuel Pool Level Instrumentation Routing

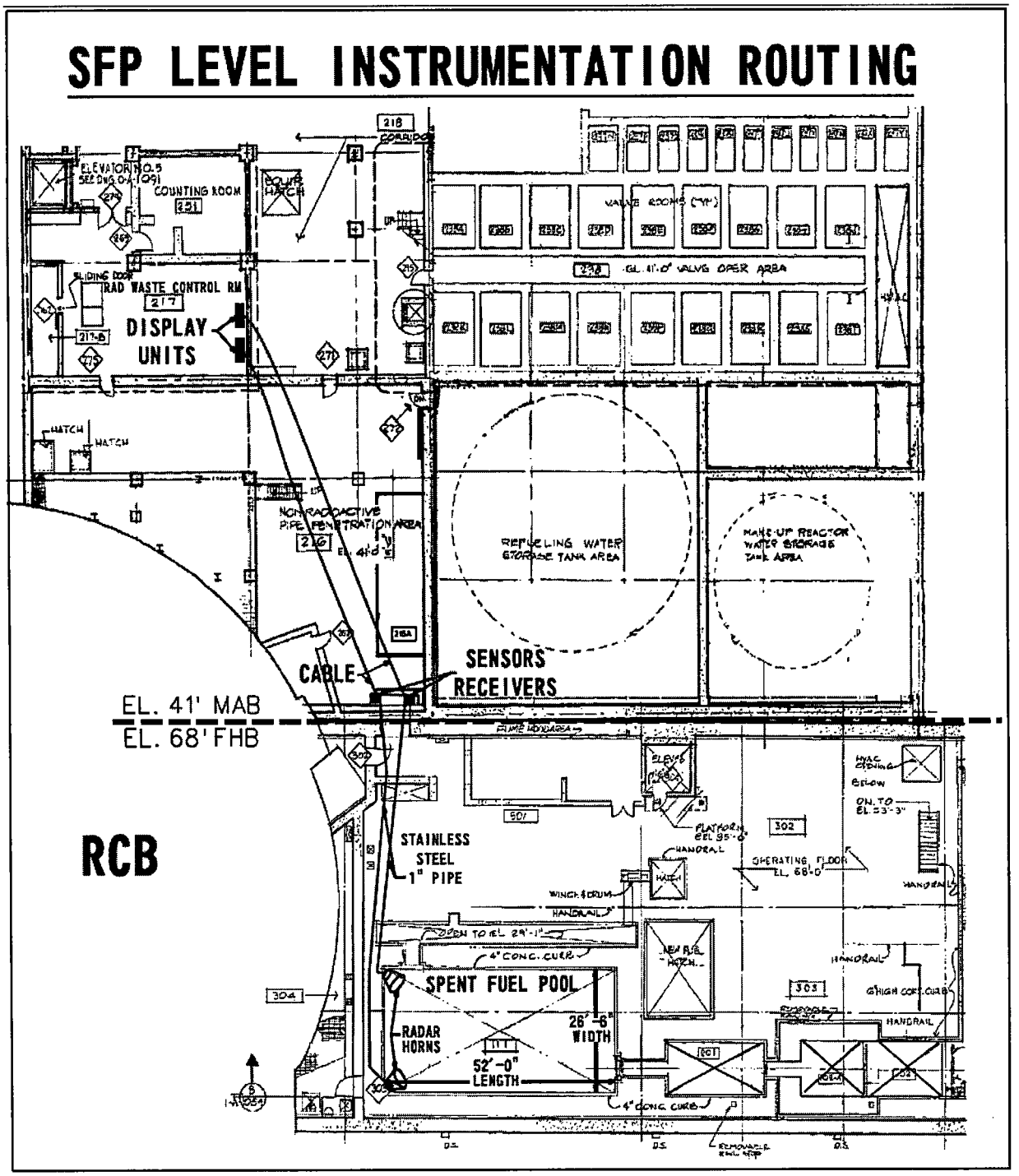

Figure 4
Level Instrumentation Attachments