



EA-12-051

MARIA L. LACAL  
Vice President,  
Regulatory & Oversight

**Palo Verde**  
**Nuclear Generating Station**  
P.O. Box 52034  
Phoenix, AZ 85072  
Mail Station 7605  
Tel 623 393 6491

102-07092-MLL/TNW/PJH  
August 14, 2015

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
11555 Rockville Pike  
Rockville, MD 20852

Dear Sirs:

Subject: **Palo Verde Nuclear Generating Station (PVNGS)  
Units 1, 2, and 3  
Docket Nos. STN 50-528, 50-529, and 50-530  
APS Fifth 6-Month Status Report on the PVNGS Overall  
Integrated Plan with Regard to Reliable Spent Fuel Pool Level  
Instrumentation (Order Number EA-12-051)**

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued an order (Reference 1) to Arizona Public Service Company (APS). Reference 1 was immediately effective and directed that PVNGS must 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 external event. Specific requirements are outlined in Attachment 2 of Reference 1.

Reference 1 required submission of an initial status report 60 days following issuance of the final interim staff guidance and an overall integrated plan (OIP) pursuant to Section IV, Condition C. Reference 2 provided the APS initial status report regarding reliable SFP level instrumentation. In Reference 3, APS provided the PVNGS OIP.

After reviewing the PVNGS OIP for SFP level instrumentation, the NRC issued a request for additional information (RAI) to APS (Reference 4). On July 11, 2013, APS provided a response to the NRC RAI regarding the PVNGS OIP for SFP level instrumentation (Reference 5).

Reference 1 also required submission of a status report at 6-month intervals following submittal of the OIP. 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, provides direction regarding the content of the status reports.

Reference 6 provided the APS first 6-Month status report on the PVNGS OIP for SFP Level Instrumentation pursuant to Section IV, Condition C.2, of Reference 1. References 8 and 9 provided the APS second and third 6-Month status reports,

A001  
NRR

102-07092-DCM/TNW/PJH  
ATTN: Document Control Desk  
U.S. Nuclear Regulatory Commission  
APS Fifth 6-Month Status Report on the PVNGS Overall Integrated Plan  
with Regard to Reliable Spent Fuel Pool Level Instrumentation  
Page 2

respectively. Reference 10 provided the APS Notification of Full Compliance with NRC Orders EA-12-049 and EA-12-051 for PVNGS Unit 1.

The NRC issued the Interim Staff Evaluation and RAI on the PVNGS OIP on October 29, 2013 (Reference 7). Each RAI has been addressed as described in the enclosure.

References 11 provided the APS fourth 6-Month status report. Reference 12 provided the APS Notification of Full Compliance with NRC Orders EA-12-049 and EA-12-051 for PVNGS Unit 3.

The enclosure to this letter provides the fifth 6-Month status report on the PVNGS OIP for SFP level instrumentation.


No commitments are being made to the NRC by this letter.

Should you need further information regarding this letter, please contact Thomas Weber, Department Leader, Regulatory Affairs, at (623) 393-5764.

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

Executed on 8/19/2015  
(Date)

Sincerely,

 FOR MARIA LACA

MLL/TNW/PJH/af

Enclosure: APS Fifth 6-Month Status Report on the Overall Integrated Plan for Spent Fuel Pool Level Instrumentation

cc: W. M. Dean NRC Director Office of Nuclear Reactor Regulation  
M. L. Dapas NRC Region IV Regional Administrator  
M. M. Watford NRC NRR Project Manager  
C. A. Peabody NRC Senior Resident Inspector PVNGS  
L. M. Regner NRC NRR/JLD/JPMB Project Manager

References: 1. NRC Order Number EA-12-051, *Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Level Instrumentation*, dated March 12, 2012  
2. APS Letter 102-06613, *Initial Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Reliable Spent Fuel Pool Level Instrumentation (Order Number EA-12-051)*, dated October 29, 2012

3. APS Letter 102-06669, *APS Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Level Instrumentation (Order Number EA-12-051)*, dated February 28, 2013
4. NRC Letter, *Palo Verde Nuclear Generating Station, Units 1, 2, and 3 - Request for Additional Information Regarding Overall Integrated Plan in Response to Order EA-12-051, "Reliable Spent Fuel Pool Instrumentation,"* dated June 10, 2013
5. APS Letter 102-06728, *Response to Request for Additional Information for the PVNGS Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Level Instrumentation (Order Number EA-12-051)*, dated July 11, 2013
6. APS Letter 102-06759, *APS First 6-Month Status Report on the PVNGS Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Level Instrumentation (Order Number EA-12-051)*, dated August 28, 2013
7. NRC Letter, *Interim Staff Evaluation and Request for Additional Information Regarding Order EA-12-051 Reliable Spent Fuel Pool Instrumentation*, dated October 29, 2013
8. APS Letter 102-06841, *APS Second 6-Month Status Report on the PVNGS Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Level Instrumentation (Order Number EA-12-051)*, dated February 28, 2014
9. APS Letter 102-06933, *APS Third 6-Month Status Report on the PVNGS Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Level Instrumentation (Order Number EA-12-051)*, dated August 28, 2014
10. APS Letter 102-06985, *Notification of Full Compliance with NRC Orders EA-12-049 and EA-12-051 for PVNGS Unit 1*, dated January 09, 2015
11. APS Letter 102-07006, *APS Fourth 6-Month Status Report on the PVNGS Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Level Instrumentation (Order Number EA-12-051)*, dated February 27, 2015
12. APS Letter 102-07048, *Notification of Full Compliance with NRC Orders EA-12-049 and EA-12-051 for PVNGS Unit 3*, dated May 26, 2015

**ENCLOSURE**

**APS Fifth 6-Month Status Report on the Overall Integrated Plan  
for Spent Fuel Pool Level Instrumentation**

**APS Fifth 6-Month Status Report on the Overall Integrated Plan for  
Spent Fuel Pool Level Instrumentation**

**1 Introduction**

Arizona Public Service (APS) developed an Overall Integrated Plan (OIP) (Reference 2 in Section 8), documenting the requirements to install reliable spent fuel pool level instrumentation (SFP LI), in response to Reference 1. This enclosure provides an update of milestone accomplishments since submittal of the OIP, including any changes to the compliance method, schedule, or need for relief or relaxation and the basis for such changes, if any.

**2 Milestone Accomplishments**

The following milestone(s) have been completed since the development of the OIP, and are current as of August 12, 2015:

- Engineering and design work for Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2, and 3 has been completed. Installation work has been completed for Units 1 and 3. Reference Section 3 Milestone Schedule Status Table for Units 2.
- Completed implementation and provided notification of Full Compliance with NRC Orders EA-12-049 and EA-12-051 for PVNGS Unit 1 on January 9, 2015 and Unit 3 on dated May 26, 2015 (Reference 5 and 6, respectively).

**3 Milestone Schedule Status**

The following table provides an update to the milestone schedule in support of implementation of the OIP. This section provides the activity status of each item and whether the expected completion date has changed. The provided dates are for planning purposes and subject to change as design and implementation details are developed.

The Milestone Schedule Status Table below lists the design status of the modifications by project identification number and design modification work order (DMWO) package numbers.

Milestone	Target Completion Date	Activity Status	Revised Target Completion Date
Submit 60 Day Status Report	Oct 2012	Complete	
Submit Overall Integrated Plan	Feb 2013	Complete	
<b>Submit 6 Month Updates:</b>			
Update 1	Aug 2013	Complete	
Update 2	Feb 2014	Complete	
Update 3	Aug 2014	Complete	
Update 4	Feb 2015	Complete	
Update 5	Aug 2015	Complete <sup>1</sup>	
<b>Modifications:</b>			
Modifications Evaluation	Feb 2013	Complete	
Units 1, 2, and 3 Engineering and	2Q2014	Complete	

**APS Fifth 6-Month Status Report on the Overall Integrated Plan for  
Spent Fuel Pool Level Instrumentation**

Milestone	Target Completion Date	Activity Status	Revised Target Completion Date
Design Work			
1. PC-1631 Spent Fuel Pool Remote Level Instrumentation (DMWO 4304155)	Apr 2014	Complete	
2. PC-1639 Spent Fuel Pool Remote Pool Level Electrical Power (DMWO 4345889)	Apr 2014	Complete	
Receipt of Unit 1 SFP Instruments	2Q2014	Complete	
Receipt of Unit 2 SFP Instruments	4Q2014	Complete	
Receipt of Unit 3 SFP Instruments	4Q2014	Complete	
Unit 1 Implementation Online	Fall 2014	Complete	
Unit 2 Implementation Online	Fall 2015	Started	
Unit 3 Implementation Online	Spring 2015	Complete	
<b>Procedures:</b>			
Create Procedures <sup>2</sup>	Oct 2014	Complete	
<b>Training:</b>			
Develop Training Plan	Apr 2014	Complete	
Issue Unit 1 SFP Instruments Procedures & Complete Training	Nov 2014	Complete	
Issue Unit 2 SFP Instruments Procedures & Complete Training	3Q2015	Complete	
Issue Unit 3 SFP Instruments Procedures & Complete Training	1Q2015	Complete	
<b>Full Implementation:</b>			
Unit 1 SFP Instruments Operational	Nov 2014	Complete	
Unit 2 SFP Instruments Operational	Nov 2015 <sup>3</sup>	Started	
Unit 3 SFP Instruments Operational	May 2015	Complete	
<b>Submit Full Compliance Report</b>			
Unit 1	Jan 2015	Complete	
Unit 2	Jan 2016	Not Started	
Unit 3	July 2015	Complete	
Full Site SFPLI Implementation	Dec 2015	Not Started	
Submit Completion Report	Apr 2016	Not Started	

<sup>1</sup> The Fifth 6-Month update is complete with this submittal. The milestone schedule dates in Attachment 2 of the Order required updating as described in Section 3.

<sup>2</sup> Includes maintenance procedures

<sup>3</sup> Implementation for Unit 2 will complete prior to startup from 2R19 (Fall 2015).

#### **4 Changes to Compliance Method**

There are no changes to the compliance method as documented in the OIP.

**APS Fifth 6-Month Status Report on the Overall Integrated Plan for  
Spent Fuel Pool Level Instrumentation**

**5 Need for Relief/Relaxation and Basis for the Relief/Relaxation**

APS expects to comply with the order implementation date and no relief or relaxation is requested at this time.

**6 Open Items from Overall Integrated Plan and Interim Staff Evaluation**

The following tables provide a summary of the open items documented in the OIP and the Interim Staff Evaluation (ISE) and the status of each item.

<b>Overall Integrated Plan Open Item</b>	<b>Status</b>
OII- Reference 1, Section VII, <i>Arrangement</i> , finalize primary and backup system probe locations for all three SFPs.	Complete  Probe locations have been finalized. Final locations are selected based on guidance provided in Reference 3. Detailed engineering and design work is documented in DMWO 4304155.

<b>Interim Staff Evaluation Requests for Additional Information (RAIs)<sup>1</sup></b>	<b>Status</b>
RAI #1  Please provide the following:  a) A description of how the other structures in the vicinity of the SFPs (cask loading pit, transfer canals and gates) shown in Figure 2, "Spent Fuel Pool Geometry and Dimensions" are connected to the SFPs.  b) If additional structures, other than the SFPs in each unit, are used for fuel storage, describe in detail their usage, operation, and provide justifications for not installing separate level instrumentation in other structures used for fuel storage.	Complete  APS response has been provided for NRC review in the STARS Alliance website e-portal.  Complete
RAI #2  Please provide your plant-specific performance	Complete  APS response has been provided

**APS Fifth 6-Month Status Report on the Overall Integrated Plan for Spent Fuel Pool Level Instrumentation**

<b>Interim Staff Evaluation Requests for Additional Information (RAIs)<sup>1</sup></b>	<b>Status</b>
evaluation result and a brief summary of the proposed wireless technology that will be used in the primary and backup measurement systems to address the criteria summarized in Section 3.1 of NEI 12-02.	for NRC review in the STARS Alliance website e-portal.
<p>RAI #3</p> <p>Please provide the following:</p> <p>a) The final locations/placement of the primary and back-up SFP level sensor.</p> <p>b) Additional information describing how the proposed arrangement of the sensor probe assembly and routing of the cabling between the sensor probe assembly and the electronics in the Auxiliary Building 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.</p>	<p>Complete</p> <p>APS response has been provided for NRC review in the STARS Alliance website e-portal.</p> <p>Complete</p>
<p>RAI #4</p> <p>Please provide the analyses verifying that the seismic testing of the sensor probe assembly and the electronics units, and the licensee's analysis of the combined maximum seismic and hydrodynamic forces on the sensor probe assembly exposed to the potential sloshing effects, show that the SFP instrument design configuration will be maintained during and following the maximum seismic ground motion considered in the design of the SFP structure.</p>	<p>Complete</p> <p>APS response has been provided for NRC review in the STARS Alliance website e-portal.</p>
<p>RAI #5</p> <p>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.</p>	<p>Complete</p> <p>APS response has been provided for NRC review in the STARS Alliance website e-portal.</p> <p>Complete</p>
<p>RAI #6</p> <p>Please provide analysis of the maximum expected</p>	<p>Complete</p> <p>APS response has been provided</p>



**APS Fifth 6-Month Status Report on the Overall Integrated Plan for Spent Fuel Pool Level Instrumentation**

<b>Interim Staff Evaluation Requests for Additional Information (RAIs)<sup>1</sup></b>	<b>Status</b>
radiological conditions (dose rate and total integrated dose) to which the equipment located within the control building or AB will be exposed. Also, please provide documentation indicating the radiological dosage amount that the electronics for this equipment is capable of withstanding. Please discuss the time period over which the analyzed total integrated dose was applied.	for NRC review in the STARS Alliance website e-portal.
<p>RAI #7</p> <p>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) what will be the maximum expected temperature and relative humidity conditions in the room(s) in which the sensor electronics will be located under BDB conditions in which there will be no ac power available to run Heating Ventilation and Air Conditioning (HVAC) systems.</p>	<p>Complete</p> <p>APS response has been provided for NRC review in the STARS Alliance website e-portal.</p>
<p>RAI #8</p> <p>Please provide the following:</p> <p>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 that the testing provides an appropriate means to demonstrate reliability of the sensor electronics under the effects of severe shock.</p> <p>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 that the testing provides an appropriate means to demonstrate reliability of the sensor electronics under the effects of high vibration.</p>	<p>Complete</p> <p>APS response has been provided for NRC review in the STARS Alliance website e-portal.</p> <p>Complete</p>
<p>RAI #9</p> <p>Please provide analysis of the seismic testing results</p>	<p>Complete</p> <p>APS response has been provided</p>

**APS Fifth 6-Month Status Report on the Overall Integrated Plan for Spent Fuel Pool Level Instrumentation**

<b>Interim Staff Evaluation Requests for Additional Information (RAIs)<sup>1</sup></b>	<b>Status</b>
<p>and show that the instrument performance reliability, following exposure to simulated seismic conditions representative of the environment anticipated for the SFP structures at Palo Verde, 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 #5 above.</p>	<p>for NRC review in the STARS Alliance website e-portal.</p>
<p>RAI #10</p> <p>Please provide the NRC staff with the final configuration of the power supply source for each channel so that the staff may conclude that the two channels are independent from a power supply assignment perspective.</p>	<p>Complete</p> <p>APS response has been provided for NRC review in the STARS Alliance website e-portal.</p>
<p>RAI #11</p> <p>Please provide the following:</p> <p>a) A description of the electrical ac power sources and capabilities for the primary and backup channels.</p> <p>b) Please provide the results of the calculation depicting the battery backup duty cycle requirements demonstrating that its capacity is sufficient to maintain the level indication function until offsite resource availability is reasonably assured.</p>	<p>Complete</p> <p>APS response has been provided for NRC review in the STARS Alliance website e-portal.</p>
<p>RAI #12</p> <p>Please provide the following:</p> <p>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.</p> <p>b) A description of the methodology that will be used for determining the maximum allowed deviation from</p>	<p>Complete</p> <p>APS response has been provided for NRC review in the STARS Alliance website e-portal.</p> <p>Complete</p>

**APS Fifth 6-Month Status Report on the Overall Integrated Plan for  
Spent Fuel Pool Level Instrumentation**

<b>Interim Staff Evaluation Requests for Additional Information (RAIs)<sup>1</sup></b>	<b>Status</b>
<p>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.</p>	
<p>RAI #13</p> <p>Please provide the following:</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>d) A description of what preventive 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.</p>	<p>Complete</p> <p>APS response has been provided for NRC review in the STARS Alliance website e-portal.</p>
<p>RAI #14</p> <p>For the SFP level instrumentation back up display please describe the evaluation used to validate that the display location can be accessed without unreasonable delay following a BDB event. Include the time available for personnel to access the display as credited in the evaluation, as well as the actual</p>	<p>Complete</p> <p>APS response has been provided for NRC review in the STARS Alliance website e-portal.</p>

**APS Fifth 6-Month Status Report on the Overall Integrated Plan for Spent Fuel Pool Level Instrumentation**

<b>Interim Staff Evaluation Requests for Additional Information (RAIs)<sup>1</sup></b>	<b>Status</b>
<p>time (e.g., based on walk-throughs) that it will take for personnel to access the display. Additionally, please include a description of the radiological and environmental conditions on the paths personnel might take. Describe whether the 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 display or monitor the display periodically.</p>	
<p>RAI #15</p> <p>Please provide a list of the procedures addressing operation (both normal and abnormal response), calibration, test, maintenance, and inspection procedures that will be developed for use of the spent SFP instrumentation. The licensee is requested to include a brief description of the specific technical objectives to be achieved within each procedure.</p>	<p>Complete</p> <p>APS response has been provided for NRC review in the STARS Alliance website e-portal.</p>
<p>RAI #16</p> <p>Please provide the following:</p> <p>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.</p> <p>b) 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.</p>	<p>Complete</p> <p>APS response has been provided for NRC review in the STARS Alliance website e-portal.</p> <p>Complete</p>

<sup>1</sup> An Interim Staff Evaluation with RAIs has been received from the NRC (Reference 4).

**7 Potential Interim Staff Evaluation Impacts**

There are no potential impacts to the Interim Staff Evaluation identified at this time.

## **8 References**

The following references support the updates to the Overall Integrated Plan described in this enclosure:

1. NRC Order Number EA-12-051, *Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Level Instrumentation*, dated March 12, 2012 (ML12054A679)
2. APS Letter 102-06669, *APS Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Level Instrumentation (Order Number EA-12-051)*, dated February 28, 2013 (ML13070A077)
3. 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
4. NRC Letter, *Interim Staff Evaluation and Request for Additional Information Regarding Order EA-12-051 Reliable Spent Fuel Pool Instrumentation*, dated October 29, 2013 (ML13296A006)
5. APS Letter 102-06985, *Notification of Full Compliance with NRC Orders EA-12-049 and EA-12-051 for PVNGS Unit 1*, dated January 09, 2015 (ML15012A444)
6. APS Letter 102-07048, *Notification of Full Compliance with NRC Orders EA-12-049 and EA-12-051 for PVNGS Unit 3*, dated May 26, 2015 (ML15149A020)