



EA-12-049

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102-07005-DCM/TNW/PJH  
February 27, 2015

**Palo Verde**  
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U.S. Nuclear Regulatory Commission  
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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 Fourth 6-Month Status Report on the PVNGS Overall  
Integrated Plan for Mitigation Strategies for Beyond-Design-  
Basis External Events (Order Number EA-12-049)**

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 APS to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities 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 mitigation strategies. In Reference 3, APS provided the PVNGS OIP.

After reviewing the PVNGS OIP for mitigation strategies, the NRC issued a request for additional information (RAI) to APS (Reference 4). On July 18, 2013, APS provided a response to the NRC RAI regarding the PVNGS OIP for mitigation strategies (Reference 5).

Reference 1 also required submission of status reports at 6-month intervals following submittal of the OIP. NEI 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*, Revision 0, provides direction regarding the content of the status reports.

Reference 6 provided the APS first 6-Month Status Report on the PVNGS Overall Integrated Plan for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049) pursuant to Section IV, Condition C.2, of Reference 1. References 8 and 9 provided the APS second and third 6-Month Status Reports, 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 for the PVNGS OIP on November 25, 2013 (Reference 7).

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The enclosure to this letter provides the fourth 6-Month status report on the PVNGS OIP for mitigation strategies.

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 2/27/2015  
(Date)

Sincerely,

 FOR DC MIMS

DCM/TNW/hsc

Enclosure: APS Fourth 6-Month Status Report on the PVNGS Overall Integrated Plan for Mitigation Strategies for Beyond-Design-Basis External Events

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

References: 1. NRC Order Number EA-12-049, *Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events*, dated March 12, 2012  
2. APS Letter 102-06614, *Initial Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)*, dated October 29, 2012

3. APS Letter 102-06670, *APS Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)*, 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 Commission Order EA-12-049 Modifying License with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events*, dated June 20, 2013
5. APS Letter 102-06733, *Response to Request for Additional Information for the PVNGS Overall Integrated Plan in Response to the March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)*, dated July 18, 2013
6. APS Letter 102-06758, *APS First 6-Month Status Report on the PVNGS Overall Integrated Plan for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)*, dated August 28, 2013
7. NRC Letter, *Palo Verde Nuclear Generating Station, Units 1,2, and 3- Interim Staff Evaluation Relating to Overall Integrated Plan in Response to Order EA-12-049- Mitigation Strategies*, dated November 25, 2013
8. APS Letter 102-06840, *APS Second 6-Month Status Report on the PVNGS Overall Integrated Plan for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)*, dated February 28, 2014
9. APS Letter 102-06932, *APS Third 6-Month Status Report on the PVNGS Overall Integrated Plan for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)*, 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 9, 2015

**ENCLOSURE**

**APS Fourth 6-Month Status Report on the PVNGS Overall  
Integrated Plan for Mitigation Strategies for  
Beyond-Design-Basis External Events**

# **APS Fourth 6-Month Status Report on the PVNGS Overall Integrated Plan for Mitigation Strategies for Beyond-Design-Basis External Events**

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## **1 Introduction**

Arizona Public Service (APS) developed an Overall Integrated Plan (OIP) (Reference 2 in Section 8), documenting the diverse and flexible strategies (FLEX), in response to Reference 1. This attachment 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 February 10, 2015:

- **Develop Storage Plan:** A location for the onsite FLEX Emergency Equipment Storage Facility (EESF) has been selected (See Open Item 1 [OI1] in Section 6 of this enclosure). The EESF will consist of five separate, stand-alone structures that are seismically designed to American Society of Civil Engineers (ASCE) 7-10, *Minimum Design Loads for Buildings and Other Structures*. The EESF design is complete and construction has started on the seismic concrete storage pads and tie-downs. The initial pad to be used on an interim bases has seismic tie-downs and has been completed. Construction of the EESF to shelter FLEX equipment from the environment will be completed in Fall 2015.
- **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 (Reference 7).**

## **3 Milestone Schedule Status**

The following table provides an update to Attachment 2 of the OIP. This section provides the status of each activity and changes to target completion dates. The provided dates are for planning purposes and are subject to change as design and implementation details are developed. Additional changes in target completion dates will be noted in future 6-month status reports.

A number of activities have occurred to validate the feasibility of the mitigation strategies. FLEX strategies were validated using applicable configuration management procedure requirements during development of modification packages. Procedural requirements and instructions were aligned with modifications and staffing analysis. During and after planned training activities, desktop simulation and plant walk-throughs were performed for FLEX equipment connections and tie-ins to validate the mitigation strategies. FLEX strategies were validated using the NEI *FLEX Validation Process* (Section 8, Reference 5).

The revised milestone target completion dates do not impact the order implementation date. The Milestone Schedule Status Table below lists the design status of the

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modifications by project identification number and design modification work order (DMWO) package numbers.

<b>Milestone</b>	<b>Target Completion Date</b>	<b>Activity Status</b>	<b>Revised Target Completion Date</b>
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 <sup>1</sup>	
Update 5	Aug 2015	Not Started	
<b>Implementation Preparation:</b>			
Develop Strategies <sup>5</sup>	Sept 2013	Complete	
Walk-throughs or Demonstrations <sup>2</sup>	Sept 2014	Complete	
Perform Staffing Analysis	May 2014	Complete (Section 8, Reference 6)	
<b>Modifications:</b>			
Modifications Evaluation	Feb 2013	Complete	
Units 1, 2, and 3 Engineering Design Work (Mod Design Status)	Sept 2014	Complete	
AF-1626 Steam Generator Injection via Auxiliary Feedwater (AF) System (DMWO 4345882)	Mar 2014	Complete	
AF-1633 Equipment Hatch Opening to "A" AF Room for Access and Ventilation (DMWO 4345887)	Feb 2014	Complete	
CH-1624 Reactor Water Tank Tie-In (DMWO 4345884)	Dec 2013	Complete	
CT-1625 Condensate Storage Tank Tie-In (DMWO 4345885)	Dec 2013	Complete	
DG-1634 Fuel Oil Day Tank Gravity Drain (DMWO 4345888)	Aug 2013	Complete	
PB-1630 Electrical Connection to 4160kV and 480V (DMWO 4304157)	Apr 2014	Complete	

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Milestone	Target Completion Date	Activity Status	Revised Target Completion Date
PB-1648 Electrical Connection to 4160kV Calvert Bus (DMWO 4491931)	Sept 2014	Started <sup>3</sup>	Dec 2015
PC-1629 Pool Cooling Electrical, Spent Fuel Pool Remote Fill, Alternate Gas for Gate Seals and Deployment Pads (DMWO 4345883)	Jan 2014	Complete	
SI-1627 Reactor Coolant System Makeup via High Pressure Safety Injection (DMWO 4304156)	Jan 2014	Complete	
Unit 1 Implementation Outage	Nov 2014	Complete	
Unit 2 Implementation Outage	Nov 2015	Not Started	
Unit 3 Implementation Outage	May 2015	Not Started	
<b>Onsite Storage:</b>			
Develop Storage Plan	Jul 2013	Complete	
Temporary Pads with Seismic Tie-downs Installed (For Unit 1 and N+1 Implementation)	Nov 2014	Complete	
EESF Complete	Fall 2015	Started	Sept 2015
Protected Area Pads for FLEX Equipment Deployment Installed	Fall 2015	Started	Sept 2015
<b>FLEX Equipment:</b>			
Procure On-Site Equipment			
Unit 1 and N+1	Oct 2014	Complete	
Unit 2	Oct 2015	Started	
Unit 3	April 2015	Complete	
Both of the National Strategic Alliance for FLEX Emergency Response (SAFER) Response Centers Operational	Sept 2014	Complete	
Select Staging Area 'C' – Offsite Staging Area for Phase III FLEX equipment. It is the area where the Phase III portable equipment is readied for transport to the plant site.	Sept 2014	Complete	

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<b>Milestone</b>	<b>Target Completion Date</b>	<b>Activity Status</b>	<b>Revised Target Completion Date</b>
<b>Procedures:</b>			
PWROG issues NSSS-specific guidelines (Modes 1 – 4)	May 2013	Complete	
Develop FSGs <sup>4</sup>	Sept 2014	Complete	
Create Administrative & Maintenance Procedures	Oct 2014	Complete	
<b>Training:</b>			
Develop Training Plan	Mar 2014	Complete	
Implement Training	Sep 2014	Complete	
<b>Full Implementation:</b>			
Unit 1 FLEX Implementation	Nov 2014	Complete	
Unit 2 FLEX Implementation	Nov 2015	Not Started	
Unit 3 FLEX Implementation	May 2015	Not Started	
<b>Submit Full Compliance Report</b>			
Unit 1	Jan 2015	Complete	
Unit 2	Mar 2016	Not Started	Jan 2016
Unit 3	Sept 2015	Not Started	July 2015
Submit Final Integrated Plan	Apr 2016	Not Started	

<sup>1</sup> The Fourth 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> Desktop simulation and plant walk-throughs

<sup>3</sup> Modification is not required for Phase II or III FLEX Strategy. Equipment is for recovery phase. Implementation is pending and schedule will be dependent on availability of materials needed for modification.

<sup>4</sup> Includes Basis Document and Procedures for all operating Modes

<sup>5</sup> The strategies have been completed for all 3 Units, any differences will be noted in future 6-Month update.

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

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

#### **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.



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

The following tables provide a summary of the open and confirmatory items documented in the OIP and the Interim Staff Evaluation (ISE) and the status of each item for the Palo Verde Nuclear Generating Station (PVNGS).

<b>Overall Integrated Plan Open Items</b>	<b>Status</b>
OI1- A storage location for FLEX equipment needs to be selected.	<p>Complete</p> <p>Location has been selected for FLEX equipment storage. The FLEX Emergency Equipment Storage Facility (EESF) will be located true west of the new Protected Area (PA) warehouse (outside of the PA but inside the Security Owner Controlled Area) and true east of the helicopter pad (See Section 9 Figure 1). Additional details on the locations of the temporary pad, FLEX EESF, and Helipad are included in Figure 2 (See Section 9 Figure 2).</p>
OI2- PVNGS FSG is currently a draft document and will need to be finalized. Existing site EOPs will need to be updated to direct use of the PVNGS Extended Loss of All Site AC Guideline during an ELAP. Additionally, a program and procedural control process is under development and will be implemented to meet the requirement of NEI 12-06 (Reference 3).	<p>Complete</p> <p>Activities have been completed as scheduled and noted, as applicable, on the Milestone Schedule Status Table in Section 3 of this enclosure.</p>
OI3- Structure, content, and details of the National SAFER Response Center Phoenix playbook, and location of the offsite staging area will be determined.	<p>Complete</p> <p>The contract agreement and the Response Plan template with PVNGS-specific information have been issued. The National SAFER Response Center Phoenix has been designated to be the Staging Area 'C' location.</p>

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<b>Overall Integrated Plan Open Items</b>	<b>Status</b>
<p>OI4- Additional strategies to maintain containment conditions during Modes 5 and 6 ELAP will be evaluated.</p>	<p>Complete</p> <p>The Nuclear Energy Institute (NEI) generic guidance (Reference 4) has been incorporated in FSGs.</p>

<b>Interim Staff Evaluation Open Items<sup>1</sup></b>	<b>Status</b>
<p>3.1.1.2.A - Means to move equipment.</p> <p>In its Integrated Plan, APS has identified that there is a time constraint of 34 hours to install portable 500 kW 480 V generators in order to recharge batteries. APS has not identified a means to move the generators along with the concomitant method for reasonable protection of that means from the identified hazards applicable to PVNGS as would be required to conform to the guidance of NEI 12-06, Section 5.3.2, consideration 5 and Section 9.3.2.</p>	<p>Complete</p> <p>APS response has been provided for NRC review in the STARS Alliance website e-portal.</p>
<p>3.2.1.2.A - RCP Seal Leakage Rate</p> <p>The licensee was requested to provide RCP seal leakage testing data applicable to ELAP conditions for Palo Verde and show the following:</p> <p>(a) the calculated maximum RCP seal leakage of 17 gpm/seal exceeds the RCP seal leakage rate obtained from the RCP seal testing data, and</p> <p>(b) the assumed maximum seal gap increase of 0.01 inches exceeds the seal gap increase obtained from the RCP seal testing data. The testing data used to support the calculated maximum leakage rate and the assumed maximum increase in the seal gap should be applicable to Palo Verde seals (with respect to the seal design and material, and seal cooling system), and ELAP conditions (in terms of the maximum temperature and pressure conditions) for an extended testing period consistent with the ELAP coping time.</p>	<p>Complete</p> <p>APS response has been provided for NRC review in the STARS Alliance website e-portal.</p>
<p>3.2.1.2.B - Operating Conditions</p> <p>To determine whether the licensee adequately addressed the information discussed in Section 3.2.1.2</p>	<p>Complete</p> <p>APS response has been provided for NRC review in the STARS</p>

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<b>Interim Staff Evaluation Open Items<sup>1</sup></b>	<b>Status</b>
<p>of this evaluation relating to Section 4.4.2 of WCAP-17601, the NRC staff requested the licensee to provide the following information.</p> <p>(a) Confirm whether an instruction step is available or not for the operator to maintain the subcooled margin which is credited for an ELAP event. If the procedure step is not available, provide justification.</p> <p>(b) Justify the following statement that was used to satisfy criterion (b) discussed in Section 3.2.1.2 of this evaluation: "... the temperature must reach 460 °F at the inlet of the Fourth stage seal prior to posing a pop open concern."</p>	<p>Alliance website e-portal.</p>

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

<b>Interim Staff Evaluation Confirmatory Items<sup>1</sup></b>	<b>Status</b>
<p>3.1.1.4.A - Utilization of offsite resources.</p> <p>APS has provided information regarding its use of the offsite resources through the industry SAFER program, and identified the local staging area, but needs to provide details on transportation to the site following a seismic event.</p>	<p>APS Actions Complete.</p> <p>APS is using the National SAFER Response Center Phoenix facility as the Staging Area 'C' and the SAFER Team will supply the transport vehicles to move the equipment to the PVNGS site.</p>
<p>3.2.2.A - SFP cooling makeup flow rates.</p> <p>Table A of Reference 18 identifies a performance criterion of 110 gpm for the identified SFP makeup pumps. This flow rate is lower than the identified minimum flow rate to compensate for boil off due to the design basis heat load and postulated losses due to leakage, which total 131 gpm. The licensee stated they would change this to provide at least 200 gpm per pump. Confirm this change.</p>	<p>Complete</p> <p>The value of 110 gpm in Table A of Reference 18 is incorrect. SFP makeup FLEX pump and delivery system is designed to provide 200 gpm.</p> <p>The OIP is Reference 18 of the APS response cited in this RAI and was provided to the NRC by Reference 2 of this enclosure.</p>

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<b>Interim Staff Evaluation Confirmatory Items<sup>1</sup></b>	<b>Status</b>
<p>3.2.3.A - Containment Functions Strategies.</p> <p>Consistent with the resolution of Open Item 3.2.1.2.A, ensure that the finalized containment analysis properly utilizes the correct RCP seal leakage values and the mass/energy values consistent with the approved CENTS analysis.</p>	<p>Complete</p> <p>APS response has been provided for NRC review in the STARS Alliance website e-portal.</p>
<p>3.2.4.2.A - Ventilation of main control room.</p> <p>In its Integrated Plan, APS has presented insufficient information for the NRC staff to conclude that the habitability limits of the control room will be maintained in all phases of an ELAP.</p>	<p>Complete</p> <p>APS response has been provided for NRC review in the STARS Alliance website e-portal.</p>
<p>3.2.4.8.A - Portable equipment instrumentation.</p> <p>In its Integrated Plan, APS stated that instrumentation will be provided for portable equipment operation. The NRC staff requested the licensee to describe the instrumentation that will be used to monitor portable/FLEX electrical power equipment including their associated measurement tolerances/accuracy in order to support a conclusion that the equipment will be capable of being operated in a manner to protect installed equipment from adverse electrical interactions in conformance with the guidance of NEI 12-06, Section 3.2.2, guideline (13), as endorsed by JLD-ISG-2012-01. The licensee committed to provide this in a future update.</p>	<p>Complete</p> <p>APS response has been provided for NRC review in the STARS Alliance website e-portal.</p>
<p>3.2.4.10.A - Battery Duty Cycle.</p> <p>During the audit process, the licensee stated that the FLEX strategy station battery run-time was calculated in accordance with the IEEE- 485 methodology using manufacturer discharge test data applicable to the licensee's FLEX strategy as outlined in the NEI position paper entitled "EA-12-049 Mitigating Strategies Resolution of Extended Battery Duty Cycles Generic Concern," ADAMS Accession No. ML13241A186. The NRC staff will evaluate a licensee's application of the guidance (calculations</p>	<p>APS Action Complete.</p> <p>APS has implemented NEI position paper entitled <i>EA-12-049 Mitigating Strategies Resolution of Extended Battery Duty Cycles Generic Concern</i>, ADAMS Accession No. ML13241A186.</p>

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<b>Interim Staff Evaluation Confirmatory Items<sup>1</sup></b>	<b>Status</b>
and supporting data) in its development of the final Safety Evaluation documenting compliance with NRC Order EA-12-049.	APS Action Complete.

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

<b>U1 Full Compliance Letter 102-06985, dated January 09, 2015, pending RAIs:</b>	<b>Status</b>
<p>RAI-33-B</p> <p>Discuss the analysis (including methods, assumptions, and results) to show that core cooling with SG not available can be maintained through once through heat removal from the RCS via coolant boil-off.</p>	<p>Working</p> <p>RAI 33-B was identified as a generic concern or question during the NRC public meeting on April 18, 2013, regarding the NRC order on mitigating strategies (Order EA-12-049). The nuclear industry will resolve this concern generically through the applicable industry groups (e.g., PWROG, EPRI, etc.). Once this concern is resolved, APS will provide an update to this RAI response in a periodic six-month update.</p>
<p>RAI-34-B</p> <p>Provide the following items regarding the discussion of core cooling with steam generators not available in Phases 2 and 3:</p> <p>b. The source of borated coolant once the inventory of the refueling water tank is depleted (e.g., reactor grade water, raw water mixed with boric acid).</p>	<p>Working</p> <p>RAI 34-B was identified as a generic concern and the nuclear industry will resolve this concern generically through the applicable industry groups (e.g., PWROG, EPRI, etc.). Once this concern is resolved, APS will provide an update to this RAI response in a periodic six-month update.</p>

**7 Potential Interim Staff Evaluation Impacts**

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

## **APS Fourth 6-Month Status Report on the PVNGS Overall Integrated Plan for Mitigation Strategies for Beyond-Design-Basis External Events**

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### **8 References**

The following references support the updates to the PVNGS OIP described in this enclosure:

1. NRC Order Number EA-12-049, *Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events*, dated March 12, 2012 (ML12054A735)
2. APS Letter 102-06670, *APS Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)*, dated February 28, 2013 (ML13136A022)
3. NEI 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*, Revision 0, dated August 2012
4. NRC Letter, *Palo Verde Nuclear Generating Station, Units 1,2, and 3- Interim Staff Evaluation Relating to Overall Integrated Plan in Response to Order EA-12-049- Mitigation Strategies*, dated November 25, 2013 (ML13308C153)
5. NEI APC 14-17, *FLEX Validation Process*, dated July 18, 2014
6. APS Letter 102-06885, *APS Submittal for Fukushima Response NEI 12-01 of Phase 2 Staffing Assessment Report*, dated June 11, 2014
7. 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)

9 Figures

Location of the FLEX EESF

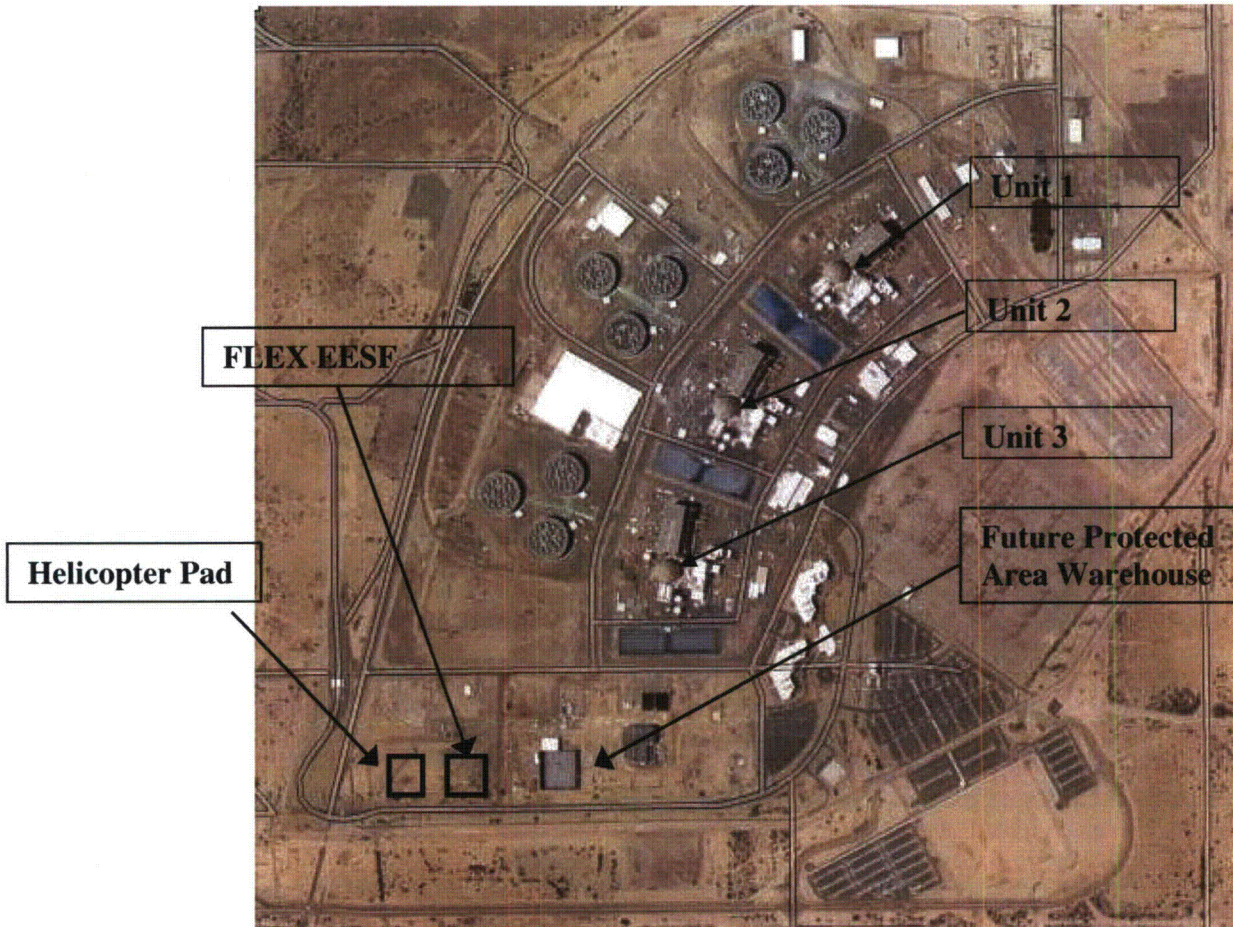


Figure 1

**APS Fourth 6-Month Status Report on the PVNGS Overall Integrated Plan for Mitigation Strategies for Beyond-Design-Basis External Events**

U1 & (N+1) Temporary Equipment Seismic Storage Pad

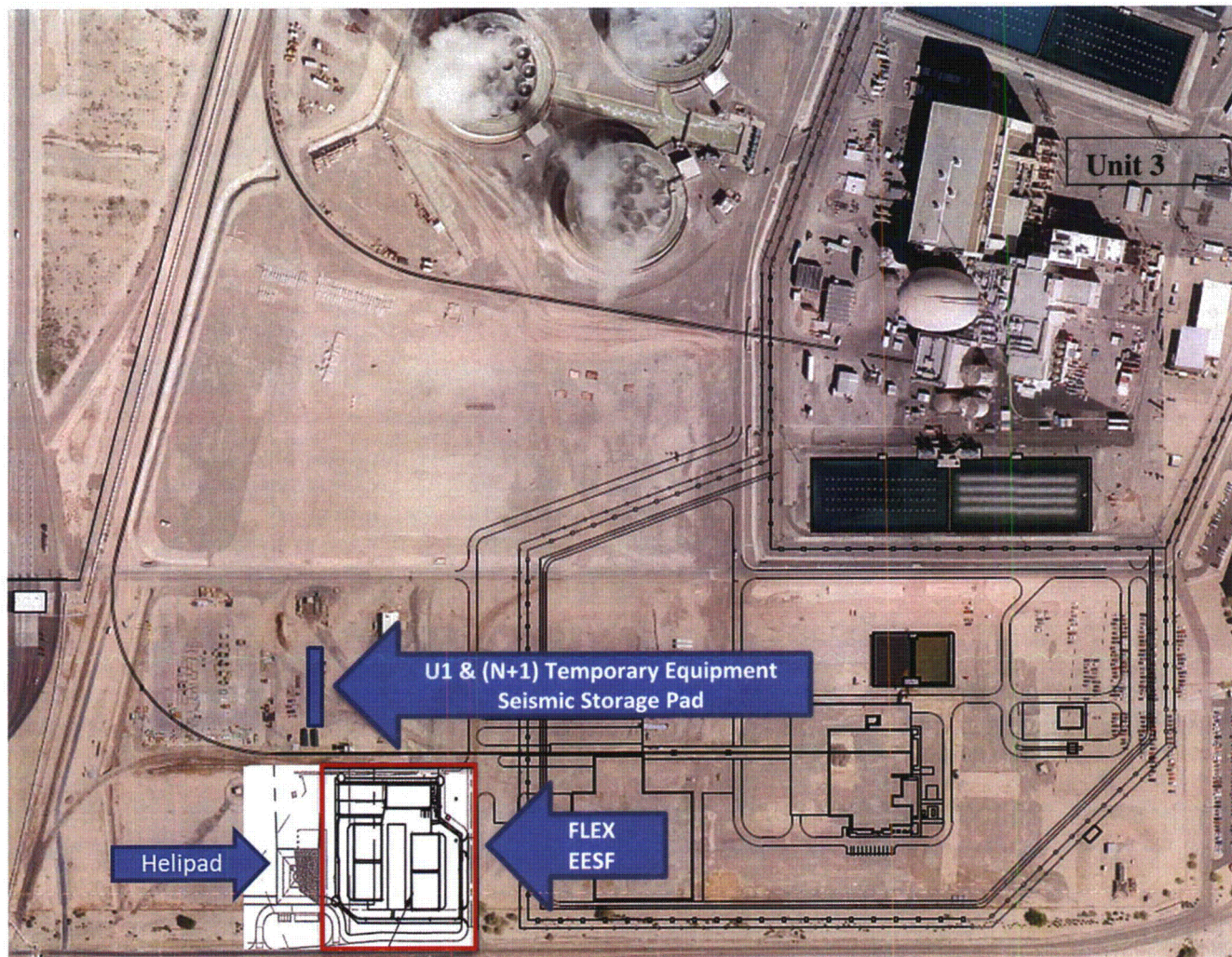


Figure 2