



102-07033-TNW/MDD/CJS  
April 10, 2015

**Palo Verde**  
**Nuclear Generating Station**  
5801 S. Wintersburg Road  
Tonopah, AZ 85354

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

Dear Sirs:

Subject: **Palo Verde Nuclear Generating Station (PVNGS)  
Units 1, 2, and 3  
Docket Nos. STN 50-528/529/530  
Emergency Core Cooling System (ECCS) Performance  
Evaluation Models, 10 CFR 50.46(a)(3)(ii) Annual Report  
for Calendar Year 2014**

Pursuant to 10 CFR 50.46(a)(3)(ii), Arizona Public Service Company (APS) is providing a summary of the cumulative effects on calculated peak clad temperature (PCT) for PVNGS due to changes or errors in ECCS performance evaluation models.

There were no changes or errors that affected either the large break loss of coolant accident (LOCA) or the small break LOCA peak clad temperature (PCT) calculations for PVNGS Units 1, 2 or 3 for calendar year (CY) 2014.

Additionally, because PCT is not calculated as part of the post LOCA long-term cooling (LTC) analysis, there are no changes or errors in the LTC models that affect PCT.

The enclosures provide a more detailed discussion of the LOCA analyses in the Westinghouse (formerly Combustion Engineering) models for Pressurized Water Reactors (PWRs) ECCS performance analyses in calendar year 2014 for PVNGS.

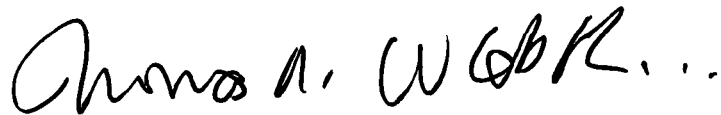
No commitments are being made to the NRC by this letter.

Should you need further information regarding this submittal, please contact Michael D. Dilorenzo, Licensing Section Leader, at (623) 393-3495.

ADD  
NRC

102-07033-TNW/MDD/CJS  
ATTN: Document Control Desk  
U. S. Nuclear Regulatory Commission  
Emergency Core Cooling System (ECCS) Performance Evaluation Models,  
10 CFR 50.46(a)(3)(ii) Annual Report for Calendar Year 2014  
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Sincerely,



Thomas N. Weber  
Department Leader, Regulatory Affairs

TNW/MDD/CJS/hsc

Enclosure 1: Summary of Cumulative Effects on Calculated Peak Clad Temperature (PCT) for PVNGS Due to Changes/Errors in Emergency Core Cooling System (ECCS) Performance Evaluation Models

Enclosure 2: Westinghouse Electric Company Letter, *Palo Verde Nuclear Generating Station Units 1, 2, and 3, 10 CFR 50.46 Annual Notification and Reporting for 2013*, letter number LTR-TLA-15-015, dated March 26, 2015

cc:

M. L. Dapas  
M. M. Watford  
C. A. Peabody

NRC Region IV Regional Administrator  
NRC NRR Project Manager for PVNGS  
NRC Senior Resident Inspector for PVNGS

## **Enclosure 1**

### **Summary of Cumulative Effects on Calculated Peak Clad Temperature (PCT) for PVNGS Due to Changes/Errors in Emergency Core Cooling System (ECCS) Performance Evaluation Models**

**Enclosure 1**

**Summary of Cumulative Effects on Calculated PCT for PVNGS  
Due to Changes/Errors in ECCS Performance Evaluation Models**

**Table 1: Large Break LOCA Margin Summary Sheet for 2014**

Plant Name: Palo Verde Nuclear Generating Station Units 1, 2, and 3

Utility Name: Arizona Public Service Company (APS)

Evaluation Model: Westinghouse (formerly Combustion Engineering) 1999 EM

Peak Clad Temperature: 2106 °F (analysis of record reported in PVNGS UFSAR Section 6.3.3)

|  |                | <b>Net PCT<br/>Effect</b> | <b>Absolute PCT<br/>Effect</b>                |
|--|----------------|---------------------------|---|
| A. Cumulative 10 CFR 50.46 Changes and Error Corrections - Previously Reported <sup>(a)</sup>  | $\Delta PCT =$ | + 4 °F (Unit 3 Only)      | + 4 °F (Unit 3 Only)                          |
| B. 10 CFR 50.46 Changes and Error Corrections - New for CY 2014  |                |                           |   |
| 1. None Identified for Units 1, 2 or 3   | $\Delta PCT =$ | + 0 °F                    | + 0 °F  |
| C. Absolute Sum of Cumulative 10 CFR 50.46 Changes and Error Corrections (Reflects evaluation of up to 8 Westinghouse NGF LUAs for Unit 3) | $\Delta PCT =$ |                           | + 0 °F (Units 1 and 2)<br><br>+ 4 °F (Unit 3) |
| D. Licensing Basis PCT (Reported in UFSAR) + Cumulative PCT Assessments (Changes and Error Corrections)                                    |                |                           | 2106 °F (Units 1 and 2)<br>2110 °F (Unit 3)   |

Notes: <sup>(a)</sup> PVNGS reanalyzed the Large Break LOCA event with an NRC approved Evaluation Model in 2009, as reported in Letter No. 102-06113, *30-Day Report Pursuant to 10 CFR 50.46(a)(3)(ii) and Submittal of Large Break Loss of Coolant Accident Reanalysis Results*, dated December 22, 2009 (NRC ADAMS Accession No. ML100040066). The reanalysis incorporated and corrected previously identified changes and errors, resetting the cumulative changes and error corrections that had previously been reported through the end of CY 2008 (NRC ADAMS Accession No. ML091810703).

The sum of the PCT from the most recent analysis of record (AOR) using an acceptable evaluation model, and the estimated cumulative effects of PCT impacts for changes and error corrections made since that AOR, remains less than 2200 °F.

**Enclosure 1**

**Summary of Cumulative Effects on Calculated PCT for PVNGS  
Due to Changes/Errors in ECCS Performance Evaluation Models**

**Table 2: Small Break LOCA Margin Summary Sheet for 2014**

Plant Name: Palo Verde Nuclear Generating Station Units 1, 2, and 3

Utility Name: Arizona Public Service Company (APS)

Evaluation Model: Westinghouse (formerly Combustion Engineering) S2M

Peak Clad Temperature: 1618°F (analysis of record reported in PVNGS UFSAR Section 6.3.3)

|   |        | <b>Net PCT<br/>Effect</b> | <b>Absolute PCT<br/>Effect</b> |
|---|--------|---------------------------|--------------------------------|
| A. Cumulative 10 CFR 50.46 Changes and Error Corrections - Previously Reported <sup>(a)</sup>           | ΔPCT = | + 0 °F                    | + 0 °F                         |
| B. 10 CFR 50.46 Changes and Error Corrections - New for CY 2014   |        |                           |                                |
| 1. None Identified  | ΔPCT = | + 0 °F                    | + 0 °F                         |
| C. Absolute Sum of Cumulative 10 CFR 50.46 Changes and Error Corrections                                | ΔPCT = |                           | + 0 °F                         |
| D. Licensing Basis PCT (Reported in UFSAR) + Cumulative PCT Assessments (Changes and Error Corrections) |        |                           | 1618 °F                        |

The sum of the PCT from the most recent AOR using an acceptable evaluation model, and the estimated cumulative effects of PCT impacts for changes and error corrections made since that AOR, remains less than 2200 °F.

## **Enclosure 2**

**Westinghouse Electric Company Letter, *Palo Verde Nuclear Generating Station Units 1, 2, and 3, 10 CFR 50.46 Annual Notification and Reporting for 2014*, letter number LTR-TLA-15-015, dated March 26, 2015**



Westinghouse Electric Company  
Nuclear Services  
20 International Drive  
Windsor, Connecticut 06095  
USA

Direct tel: (860) 731-6607  
Direct fax: (860) 731-2480  
e-mail: [tatarcj@westinghouse.com](mailto:tatarcj@westinghouse.com)

Our ref: LTR-TLA-15-015, Rev.0  
March 26, 2015

**Palo Verde Nuclear Generating Station Units 1, 2, and 3  
10 CFR 50.46 Annual Notification and Reporting for 2014**

Dear Sir or Madam:

This letter provides 10 CFR 50.46 reporting information pertaining to the Westinghouse Electric Company emergency core cooling system (ECCS) performance evaluation models (EMs) and their application to your plants for calendar year 2014.

There were no changes, error corrections, or enhancements to the 1999 EM, which is the EM used in your plants' large break loss of coolant accident (LBLOCA) ECCS performance analysis in calendar year 2014. Additionally, there were no 2014 changes, error corrections, or enhancements to the Supplement 2 evaluation model (S2M), which is the EM used in your plants' small break loss of coolant accident (SBLOCA) ECCS performance analysis.

The peak cladding temperature (PCT) rackup sheets, along with your plants' specific evaluation text, are enclosed in the attachment. The rackup sheets, which were obtained from the Westinghouse 10 CFR 50.46 rackup database, identify the PCTs of the ECCS performance analyses of record (AOR) for your plants and the PCT assessments associated with the AOR through the end of calendar year 2014.

There were no changes to or errors found in the 1999 LBLOCA Evaluation Model in calendar year 2014.

There were no changes to or errors found in the S2M SBLOCA Evaluation Model in calendar year 2014.

There is a cumulative sum of the absolute magnitudes of PCT changes of 4 °F for the Unit 3 LBLOCA AOR operation for 2014.

There are no PCT changes on the Unit 1 LBLOCA AOR, Unit 2 LBLOCA AOR, and Units 1, 2 and 3 SBLOCA AORs for 2014.

This letter is provided for your use in making a determination relative to the reporting requirements of 10 CFR 50.46. The information provided in this letter was prepared in accordance with Westinghouse's Quality Management System.

***\*Electronically approved records are authenticated in the electronic document management system.***

*Author: (Electronically Approved)\*  
Jessica L. Tatarczuk  
Transient & LOCA Analysis*

*Verifier: (Electronically Approved)\*  
Douglas W. Atkins  
Transient & LOCA Analysis*

*Approved: (Electronically Approved)\*  
Pat Kottas for John Ghergurovich  
Manager, Transient & LOCA Analysis*

**RACKUP SharePoint Check:**

**EMs applicable to Palo Verde Nuclear Generating Station Units 1, 2, and 3:  
Appendix K Small Break – S2M  
Appendix K Large Break – 1999 EM**

**2014 Issues**

| <b>Transmittal Letter</b> | <b>Issue Description</b> |
|---------------------------|--------------------------|
| None                      | N/A                      |



**Attachment: LBLOCA and SBLOCA Rackup Sheets**



**Westinghouse LOCA Peak Clad Temperature Summary for Appendix K Small Break**

**Plant Name:** Palo Verde Nuclear Generating Station Unit 1

**Utility Name:** Arizona Public Service

**Revision Date:** 3/12/2015

**Analysis Information**

**EM:** S2M                      **Analysis Date:** 3/22/2002                      **Limiting Break Size:** 0.05 sq ft/PD

**Fuel:** 16x16 System 80                      **SGTP (%):** 10

**PLHGR (kW/ft):** 13.5

**Notes:** 1. Plant Configuration: Rated Core Power = 3990 MWt, Replacement Steam Generators.

2. Fuel Design: 16x16 System 80 with ZIRLO™ cladding, value-added pellets, and erbia burnable absorbers.

|  | Clad Temp (°F) | Ref.         | Notes       |
|--|----------------|--------------|-------------|
| <b>LICENSING BASIS</b>                           |                |              |             |
| <b>Analysis-Of-Record PCT</b>                    | 1618           | 1            |             |
| <b>PCT ASSESSMENTS (Delta PCT)</b>               |                |              |             |
| <b>A. PRIOR ECCS MODEL ASSESSMENTS</b>           |                |              |             |
| 1 . None   | 0              |              |             |
| <b>B. PLANNED PLANT MODIFICATION EVALUATIONS</b> |                |              |             |
| 1 . None   | 0              |              |             |
| <b>C. 2014 ECCS MODEL ASSESSMENTS</b>            |                |              |             |
| 1 . None   | 0              |              |             |
| <b>D. OTHER*</b>                                 |                |              |             |
| 1 . None   | 0              |              |             |
| <b>LICENSING BASIS PCT + PCT ASSESSMENTS</b>     |                | <b>PCT =</b> | <b>1618</b> |

\* It is recommended that the licensee determine if these PCT allocations should be considered with respect to 10 CFR 50.46 reporting requirements.

**References:**

1 . A-PV-FE-0149, Rev. 001, "Palo Verde Units 1, 2 and 3 S2M Bounding SBLOCA ECCS Performance Analysis," March 2002.

**Notes:**

None

**Westinghouse LOCA Peak Clad Temperature Summary for Appendix K Large Break**

**Plant Name:** Palo Verde Nuclear Generating Station Unit 2  
**Utility Name:** Arizona Public Service  
**Revision Date:** 3/12/2015

**Analysis Information**

**EM:** 1999 EM                      **Analysis Date:** 8/31/2009                      **Limiting Break Size:** 0.6 DEG/PD  
**Fuel:** 16x16 System 80              **SGTP (%):** 10  
   **PLHGR (kW/ft):** 13.1

**Notes:** 1. Plant Configuration: Rated Core Power = 3990 MWt, Replacement Steam Generators.  
2. Fuel Design: 16x16 System 80 with ZIRLO™ cladding, value-added pellets, and erbia burnable absorbers.

|  | Clad Temp (°F) | Ref.              | Notes |
|--|----------------|-------------------|-------|
| <b>LICENSING BASIS</b>                           |                |                   |       |
| <b>Analysis-Of-Record PCT</b>                    | 2106           | 1                 |       |
| <b>PCT ASSESSMENTS (Delta PCT)</b>               |                |                   |       |
| <b>A. PRIOR ECCS MODEL ASSESSMENTS</b>           |                |                   |       |
| 1 . None   | 0              |                   |       |
| <b>B. PLANNED PLANT MODIFICATION EVALUATIONS</b> |                |                   |       |
| 1 . None   | 0              |                   |       |
| <b>C. 2014 ECCS MODEL ASSESSMENTS</b>            |                |                   |       |
| 1 . None   | 0              |                   |       |
| <b>D. OTHER*</b>                                 |                |                   |       |
| 1 . None   | 0              |                   |       |
| <hr/>  |                |                   |       |
| <b>LICENSING BASIS PCT + PCT ASSESSMENTS</b>     |                | <b>PCT = 2106</b> |       |

\* It is recommended that the licensee determine if these PCT allocations should be considered with respect to 10 CFR 50.46 reporting requirements.

**References:**

1 . CVER-09-62, "Analysis of Record for Large Break LOCA ECCS Performance Analysis Including Replacement Steam Generators and Simplified Head Implementation for PVNGS Units 1, 2, and 3," August 2009.

**Notes:**

None

**Westinghouse LOCA Peak Clad Temperature Summary for Appendix K Small Break**

**Plant Name:** Palo Verde Nuclear Generating Station Unit 2

**Utility Name:** Arizona Public Service

**Revision Date:** 3/12/2015

**Analysis Information**

**EM:** S2M                      **Analysis Date:** 3/22/2002                      **Limiting Break Size:** 0.05 sq ft/PD

**Fuel:** 16x16 System 80                      **SGTP (%):** 10

**PLHGR (kW/ft):** 13.5

- Notes:**
1. Plant Configuration: Rated Core Power = 3990 MWt, Replacement Steam Generators.
  2. Fuel Design: 16x16 System 80 with ZIRLO™ cladding, value-added pellets, and erbia burnable absorbers.

|  | Clad Temp (°F) | Ref.         | Notes       |
|--|----------------|--------------|-------------|
| <b>LICENSING BASIS</b>                           |                |              |             |
| <b>Analysis-Of-Record PCT</b>                    | 1618           | 1            |             |
| <b>PCT ASSESSMENTS (Delta PCT)</b>               |                |              |             |
| <b>A. PRIOR ECCS MODEL ASSESSMENTS</b>           |                |              |             |
| 1 . None   | 0              |              |             |
| <b>B. PLANNED PLANT MODIFICATION EVALUATIONS</b> |                |              |             |
| 1 . None   | 0              |              |             |
| <b>C. 2014 ECCS MODEL ASSESSMENTS</b>            |                |              |             |
| 1 . None   | 0              |              |             |
| <b>D. OTHER*</b>                                 |                |              |             |
| 1 . None   | 0              |              |             |
| <b>LICENSING BASIS PCT + PCT ASSESSMENTS</b>     |                | <b>PCT =</b> | <b>1618</b> |

\* It is recommended that the licensee determine if these PCT allocations should be considered with respect to 10 CFR 50.46 reporting requirements.

**References:**

- 1 . A-PV-FE-0149, Rev. 001, "Palo Verde Units 1, 2 and 3 S2M Bounding SBLOCA ECCS Performance Analysis," March 2002.

**Notes:**

None

## Westinghouse LOCA Peak Clad Temperature Summary for Appendix K Large Break

**Plant Name:** Palo Verde Nuclear Generating Station Unit 3  
**Utility Name:** Arizona Public Service  
**Revision Date:** 3/12/2015

### Analysis Information

**EM:** 1999 EM                      **Analysis Date:** 8/31/2009                      **Limiting Break Size:** 0.6 DEG/PD  
**Fuel:** 16x16 System 80              **SGTP (%):** 10  
   **PLHGR (kW/ft):** 13.1

**Notes:**  
1. Plant Configuration: Rated Core Power = 3990 MWt, Replacement Steam Generators.  
2. Fuel Design: 16x16 System 80 with ZIRLO™ cladding, value-added pellets, and erbia burnable absorbers.

|  | Clad Temp (°F) | Ref.         | Notes       |
|--|----------------|--------------|-------------|
| <b>LICENSING BASIS</b>                               |                |              |             |
| <b>Analysis-Of-Record PCT</b>                        | 2106           | 1            |             |
| <b>PCT ASSESSMENTS (Delta PCT)</b>                   |                |              |             |
| <b>A. PRIOR ECCS MODEL ASSESSMENTS</b>               |                |              |             |
| 1 . Evaluation for the insertion of up to 8 NGF LUAs | 4              | 2            |             |
| <b>B. PLANNED PLANT MODIFICATION EVALUATIONS</b>     |                |              |             |
| 1 . None   | 0              |              |             |
| <b>C. 2014 ECCS MODEL ASSESSMENTS</b>                |                |              |             |
| 1 . None   | 0              |              |             |
| <b>D. OTHER*</b>                                     |                |              |             |
| 1 . None   | 0              |              |             |
| <b>LICENSING BASIS PCT + PCT ASSESSMENTS</b>         |                | <b>PCT =</b> | <b>2110</b> |

\* It is recommended that the licensee determine if these PCT allocations should be considered with respect to 10 CFR 50.46 reporting requirements.

### References:

- 1 . CVER-09-62. "Analysis of Record for Large Break LOCA ECCS Performance Analysis Including Replacement Steam Generators and Simplified Head Implementation for PVNGS Units 1, 2, and 3," August 2009.
- 2 . WCAP-17188-P, Rev. 2, "Palo Verde NGF LUA Engineering Report," March 2011.

### Notes:

None

**Westinghouse LOCA Peak Clad Temperature Summary for Appendix K Small Break**

**Plant Name:** Palo Verde Nuclear Generating Station Unit 3

**Utility Name:** Arizona Public Service

**Revision Date:** 3/12/2015

**Analysis Information**

**EM:** S2M                      **Analysis Date:** 3/22/2002                      **Limiting Break Size:** 0.05 sq ft/PD

**Fuel:** 16x16 System 80                      **SGTP (%):** 10

**PLHGR (kW/ft):** 13.5

- Notes:**
1. Plant Configuration: Rated Core Power = 3990 MWt, Replacement Steam Generators.
  2. Fuel Design: 16x16 System 80 with ZIRLO™ cladding, value-added pellets, and erbia burnable absorbers.

|  | Clad Temp (°F) | Ref. | Notes |
|--|----------------|------|-------|
| <b>LICENSING BASIS</b>                           |                |      |       |
| <b>Analysis-Of-Record PCT</b>                    | 1618           | 1    |       |
| <b>PCT ASSESSMENTS (Delta PCT)</b>               |                |      |       |
| <b>A. PRIOR ECCS MODEL ASSESSMENTS</b>           |                |      |       |
| 1 . None   | 0              |      |       |
| <b>B. PLANNED PLANT MODIFICATION EVALUATIONS</b> |                |      |       |
| 1 . None   | 0              |      |       |
| <b>C. 2014 ECCS MODEL ASSESSMENTS</b>            |                |      |       |
| 1 . None   | 0              |      |       |
| <b>D. OTHER*</b>                                 |                |      |       |
| 1 . None   | 0              |      |       |

**LICENSING BASIS PCT + PCT ASSESSMENTS                      PCT =    1618**

\* It is recommended that the licensee determine if these PCT allocations should be considered with respect to 10 CFR 50.46 reporting requirements.

**References:**

- 1 . A-PV-FE-0149, Rev. 001, "Palo Verde Units 1, 2, and 3 S2M Bounding SBLOCA ECCS Performance Analysis," March 2002.

**Notes:**

None