10 CFR 50.46(a)(3)(ii)

A subsidiary of Pinnacle West Capital Corporation

Palo Verde Nuclear Generating Station

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102-05850-TNW/RKR
April 23, 2008

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 2007

Pursuant to 10 CFR 50.46(a)(3)(ii), Arizona Public Service Company (APS) has enclosed (see Enclosure 3) the Westinghouse Electric Company's, "Palo Nuclear Generating Station Units 1, 2, and 3, 10 CFR 50.46 Annual Notification and Reporting for 2007," (letter number LTR-OA-08-17, dated March 25, 2008). This report describes the changes and errors in Westinghouse (formerly Combustion Engineering) models for Pressurized Water Reactors (PWRs) ECCS performance analysis in calendar year (CY) 2007. There were no significant changes or errors in CY 2007.

As shown in the tables in Enclosure 1, the PVNGS large break loss of coolant accident (LBLOCA) and small break loss of coolant accident (SBLOCA) analyses used the 1999 EM and S2M evaluation models, respectively, throughout CY 2007. For CY 2007, there was one change that affected the PVNGS large break LOCA peak clad temperature (PCT) calculation by as much as 10 °F (see Enclosure 2). This was not a significant change. There were no known errors or changes that affected the small break LOCA PCT calculation. Additionally, because PCT is not calculated as part of the post loss of coolant accident (LOCA) long-term cooling (LTC) analysis, there are no changes or errors in the LTC models that affect PCT.

A002

NRR

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

If you have any questions, please contact Glenn A. Michael at (623) 393-5750.

Sincerely,

TNW/GAM/RKR/gat

Enclosures
1. Summary of Cumulative Effects on Calculated Peak Clad Temperature (PCT) for PVNGS Due to Changes/Errors in ECCS Performance Evaluation Models
2. Westinghouse Electric Company's, "10 CFR 50.46 Report for PVNGS Units 1, 2, and 3 for 13-NC-ZC-0237, Rev. 4 Changes in Containment Passive Heat Sink Data," letter number LTR-OA-07-109, dated December 20, 2007
3. Westinghouse Electric Company's, "Palo Nuclear Generating Station Units 1, 2, and 3, 10 CFR 50.46 Annual Notification and Reporting for 2007," letter number LTR-OA-08-17, dated March 25, 2008

cc:
E. E. Collins Jr.	NRC Region IV Regional Administrator
M. T. Markley	NRC NRR Project Manager
R. I. Treadway	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 ECCS Performance Evaluation Models

Table 1: Large Break LOCA Margin Summary Sheet for CY 2007

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

Utility Name: Arizona Public Service Company

Evaluation Model: Westinghouse (formerly Combustion Engineering) 1999 EM

Peak Clad Temperature: 2110 °F (Analysis-of-Record reported in PVNGS UFSAR Section 6.3)

			Net PCT Effect	Absolute PCT Effect
A.	Cumulative 10 CFR 50.46 Changes and Error Corrections – Previously Reported for CY 2006			
	1. STRIKIN-II Steam Cooling Model Error	ΔPCT =	+ 2 °F	+ 2 °F
	2. Revised Containment Passive Heat Sinks (e.g., Containment Sump Strainers Plant Modification)	ΔPCT =	+ 4 °F	+ 4 °F
B.	10 CFR 50.46 Changes and Error Corrections – New for CY 2007			
	1. Revised Containment Passive Heat Sinks (Changes Made Since Item A.2. ΔPCT Assessment)	ΔPCT =	+ 10 °F	+ 10 °F
C.	Absolute Sum of Cumulative 10 CFR 50.46 Changes and Error Corrections	ΔPCT =		+ 16 °F
D.	Licensing Basis PCT (Reported in UFSAR) + Cumulative PCT Assessments (Changes and Error Corrections)			2126 °F

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.

Table 2: Small Break LOCA Margin Summary Sheet for CY 2007

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

Utility Name: Arizona Public Service Company

Evaluation Model: Westinghouse (formerly Combustion Engineering) S2M

Peak Clad Temperature: 1618 °F (Analysis-of-Record reported in PVNGS UFSAR Section 6.3)

			Net PCT Effect	Absolute PCT Effect
A.	Cumulative 10 CFR 50.46 Changes and Error Corrections – Previously Reported for CY 2006			
	1. None Identified	ΔPCT =	+ 0 °F	+ 0 °F
B.	10 CFR 50.46 Changes and Error Corrections – New for CY 2007			
	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 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 2

Westinghouse Electric Company's, "10 CFR 50.46 Report for PVNGS Units 1, 2, and 3 for 13-NC-ZC-0237, Rev. 4 Changes in Containment Passive Heat Sink Data," letter number LTR-OA-07-109, dated December 20, 2007

Westinghouse Electric Company
Nuclear Services
Windsor Service Center
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Our ref: LTR-OA-07-109

December 20, 2007

10 CFR 50.46 Report for PVNGS Units 1, 2, and 3 for 13-NC-ZC-0237, Rev.4 Changes in Containment Passive Heat Sink Data

Dear Sir or Madam:

The attachment documents the 10 CFR 50.46 Report for the evaluation of the impact of the revised containment passive heat sink data in Revision 4 of Arizona Public Service calculation 13-NC-ZC-0237 on the Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2, and 3 Large Break Loss-of-Coolant Accident (LBLOCA) Emergency Core Cooling System (ECCS) performance analysis. In addition, the report also updates the Analysis Information for the Unit 3 LBLOCA and Small Break LOCA ECCS performance analyses to reflect the uprated power level and the installation of Replacement Steam Generators.

Please contact your LOCA Plant Cognizant Engineer if there are any questions concerning this information.

Author: *Electronically Approved**
J.M. Cleary
PVNGS Plant Cognizant Engineer
Operations Analysis

Verifier: *Electronically Approved**
E.J. Rogers
Operations Analysis

Approved: *Electronically Approved**
S.P. Rigby
Manager, Operations Analysis

**Electronically approved records are authenticated in the Electronic Document Management System.*

Westinghouse LOCA Peak Clad Temperature Summary for Appendix K Large Break

Plant Name: Palo Verde Nuclear Generating Station Unit 1
Utility Name: Arizona Public Service
Revision Date: 12/20/07

Analysis Information

EM:	1999 EM	**Analysis Date:**	3/18/02	**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
LICENSING BASIS			
Analysis-Of-Record PCT	**2110**	**1**	
PCT ASSESSMENTS (Delta PCT)			
A. PRIOR ECCS MODEL ASSESSMENTS			
1 . STRIKIN-II Steam Cooling Model Error	2	2	
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1 . Revised Containment Passive Heat Sinks	4	3	
2 . Reference 4 Containment Passive Heat Sinks	10	5	
C. 2007 ECCS MODEL ASSESSMENTS			
1 . None	0		
D. OTHER*			
1 . None	0		
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT =** 2126		

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

References:

1 . A-PV-FE-0148, Rev. 002, "PVNGS LBLOCA ECCS Performance Analysis with Revised Containment Heat Sinks Data and ZIRLO™ Using 1999 EM," March 2002.

2 . LTR-LIS-06-117, "10 CFR 50.46 Annual Notification and Reporting for 2005," March 2006.

3 . LTR-OA-06-94, "10 CFR 50.46 Report for PVNGS Units 1, 2, and 3 Changes in Containment Passive Heat Sink Data," October 2006.

4 . 13-NC-ZC-0237, Rev. 4, "Maximum Passive Heat Sink For Hydrogen Generation & ECCS Evaluation," April 2007.

5 . LTR-OA-07-109, "10 CFR 50.46 Report for PVNGS Units 1, 2, and 3 for 13-NC-ZC-0237, Rev. 4 Changes in Containment Passive Heat Sink Data," December 2007.

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: 12/20/07

Analysis Information

EM:	1999 EM	**Analysis Date:**	3/18/02	**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
LICENSING BASIS			
Analysis-Of-Record PCT	**2110**	**1**	
PCT ASSESSMENTS (Delta PCT)			
A. PRIOR ECCS MODEL ASSESSMENTS			
1 . STRIKIN-II Steam Cooling Model Error	2	2	
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1 . Revised Containment Passive Heat Sinks	4	3	
2 . Reference 4 Containment Passive Heat Sinks	10	5	
C. 2007 ECCS MODEL ASSESSMENTS			
1 . None	0		
D. OTHER*			
1 . None	0		
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT =** 2126		

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

References:

1 . A-PV-FE-0148, Rev. 002, "PVNGS LBLOCA ECCS Performance Analysis with Revised Containment Heat Sinks Data and ZIRLO™ Using 1999 EM," March 2002.

2 . LTR-LIS-06-117, "10 CFR 50.46 Annual Notification and Reporting for 2005," March 2006.

3 . LTR-OA-06-94, "10 CFR 50.46 Report for PVNGS Units 1, 2, and 3 Changes in Containment Passive Heat Sink Data," October 2006.

4 . 13-NC-ZC-0237, Rev. 4, "Maximum Passive Heat Sink For Hydrogen Generation & ECCS Evaluation," April 2007.

5 . LTR-OA-07-109, "10 CFR 50.46 Report for PVNGS Units 1, 2, and 3 for 13-NC-ZC-0237, Rev. 4 Changes in Containment Passive Heat Sink Data," December 2007.

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: 12/20/07

Analysis Information

EM:	1999 EM	**Analysis Date:**	3/18/02	**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
LICENSING BASIS			
Analysis-Of-Record PCT	**2110**	**1**	
PCT ASSESSMENTS (Delta PCT)			
A. PRIOR ECCS MODEL ASSESSMENTS			
1 . STRIKIN-II Steam Cooling Model Error	2	2	
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1 . Revised Containment Passive Heat Sinks	4	3	
2 . Reference 4 Containment Passive Heat Sinks	10	5	
C. 2007 ECCS MODEL ASSESSMENTS			
1 . None	0		
D. OTHER*			
1 . None	0		
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT =** 2126		

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

References:

1 . A-PV-FE-0148, Rev. 002, "PVNGS LBLOCA ECCS Performance Analysis with Revised Containment Heat Sinks Data and ZIRLO™ Using 1999 EM," March 2002.

2 . LTR-LIS-06-117, "10 CFR 50.46 Annual Notification and Reporting for 2005," March 2006.

3 . LTR-OA-06-94, "10 CFR 50.46 Report for PVNGS Units 1, 2, and 3 Changes in Containment Passive Heat Sink Data," October 2006.

4 . 13-NC-ZC-0237, Rev. 4, "Maximum Passive Heat Sink For Hydrogen Generation & ECCS Evaluation," April 2007.

5 . LTR-OA-07-109, "10 CFR 50.46 Report for PVNGS Units 1, 2, and 3 for 13-NC-ZC-0237, Rev. 4 Changes in Containment Passive Heat Sink Data," December 2007.

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: 12/20/07

Analysis Information

EM:	S2M	**Analysis Date:**	3/22/02	**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
LICENSING BASIS			
Analysis-Of-Record PCT	**1618**	**1**	
PCT ASSESSMENTS (Delta PCT)			
A. PRIOR ECCS MODEL ASSESSMENTS			
1 . None	0		
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1 . None	0		
C. 2007 ECCS MODEL ASSESSMENTS			
1 . None	0		
D. OTHER*			
1 . None	0		
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT =** 1618		

* It is recommended that the licensee determine if these PCT allocations 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

ENCLOSURE 3

Westinghouse Electric Company's, "Palo Nuclear Generating Station Units 1, 2, and 3, 10 CFR 50.46 Annual Notification and Reporting for 2007," letter number LTR-OA-08-17, dated March 25, 2008

Westinghouse Electric Company
Nuclear Services
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Our ref: LTR-OA-08-17
March 25, 2008

Palo Verde Nuclear Generating Station Units 1, 2, and 3
10 CFR 50.46 Annual Notification and Reporting for 2007

Dear Sir or Madam,

This letter provides 10 CFR 50.46 reporting information pertaining to changes and errors in the Westinghouse Electric Company Emergency Core Cooling System (ECCS) performance Evaluation Models (EMs) and their application to your plant(s) for calendar year 2007.

Descriptions of all calendar year 2007 changes that were made to the 1999 EM are enclosed in Attachment 1. The 1999 EM is the EM used in the PVNGS Units 1, 2, and 3 Large Break Loss-of-Coolant Accident (LOCA) ECCS performance analysis. There were no error corrections to the 1999 EM in calendar year 2007. In addition, there were no changes or error corrections in calendar year 2007 to the Supplement 2 Evaluation Model (S2M), which is the EM used in the PVNGS Units 1, 2, and 3 Small Break LOCA ECCS performance analysis. The descriptions of the calendar year 2007 changes to the 1999 EM in Attachment 1 will be provided to the NRC via a Westinghouse letter.

The Peak Cladding Temperature (PCT) Rackup sheets for your plant(s) are enclosed in Attachment 2. The rackup sheets, which were obtained from the Westinghouse 10 CFR 50.46 Rackup eRoom, identify the PCTs of the ECCS performance Analyses of Record (AORs) for your plant(s) and the PCT assessments associated with the AORs through the end of calendar year 2007. Note that changes and errors in the EMs that have a PCT assessment of 0°F are generally not listed in Section C of the rackup sheet.

The information in Attachment 1 was previously transmitted to you in References 1 and 2. The information in Attachment 2 was obtained from the PCT Rackup sheet data base in the Westinghouse 10 CFR 50.46 eRoom. The data base was last updated for PVNGS Units 1, 2, and 3 in Reference 3. References 1, 2, and 3 are available to you in the PVNGS Units 1, 2, and 3 plant folder in the Westinghouse 10 CFR 50.46 Rackup eRoom.

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 (QMS).

References:

1. LTR-OA-07-28, "10 CFR 50.46 Reporting Information for the 1999 EM", March 16, 2007.
2. LTR-OA-07-86, "10 CFR 50.46 Reporting Information for the 1999 EM", September 14, 2007.
3. LTR-OA-07-109, "10 CFR 50.46 Report for PVNGS Units 1, 2, and 3 for 13-NC-ZC-0237, Rev. 4 Changes in Containment Passive Heat Sink Data," December 20, 2007.

Attachments:

1. Evaluation Model Changes and Errors for Calendar Year 2007 (12 pages)
2. PCT Rackup Sheets (7 pages)

Authors: *Electronically Approved**
J. M. Cleary
PVNGS Plant Cognizant Engineer
Operations Analysis

*Electronically Approved**
E. J. Rogers
Operations Analysis

Verifier: *Electronically Approved**
E. V. Mangan
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Approved: *Electronically Approved**
S.P. Rigby
Manager, Operations Analysis

**Electronically approved records are authenticated in the Electronic Document Management System.*

Attachment 1
Our ref: LTR-OA-08-17
March 25, 2008

Attachment 1
Evaluation Model Changes and Errors for Calendar Year 2007
(12 pages including this page)

PROPRIETARY NOTATIONS IN SOURCE AND OUTPUT
(Non-Discretionary Change)

Background
The Appendix K ECCS Performance Analysis for LBLOCA for CE plants is performed with the 1999 Evaluation Model (1999 EM). Modifications to the source file notation and output edit headers for the major computer codes of the 1999 EM have been made to indicate the copyright status and proprietary class in conformance with Westinghouse policy, WCAP-7211.

Affected Evaluation Model(s)
Appendix K LBLOCA Evaluation Model, 1999 EM

Estimated Effect
This process improvement has no impact on the licensed methodology of the 1999 EM and does not conflict with the SER limitation/constraints imposed on the methodology by NRC. There is no impact on PCT for 10 CFR 50.46 reporting purposes.

IMPLEMENTATION OF OPTIMIZED ZIRLO™ CLADDING SPECIFIC HEAT
(Non-Discretionary Change)

Background
The Appendix K ECCS Performance Analysis for LBLOCA for CE plants is performed with the 1999 Evaluation Model (1999 EM). The evaluation of fuel designs that use Optimized ZIRLO™ cladding was described in Reference 1 and approved by NRC in Reference 2. In compliance with SER Limitation/Constraint #9 from Reference 2, the Optimized ZIRLO™ cladding specific heat has been implemented into all of the computer codes of the 1999 EM as described by Westinghouse in the response to RAI #21 in Reference 3. The Optimized ZIRLO™ cladding specific heat has been implemented as an option for any future LBLOCA analysis of a Westinghouse fuel rod design that uses this cladding.

Affected Evaluation Model(s)
Appendix K LBLOCA Evaluation Model, 1999 EM

Estimated Effect
Since this change has already been approved by NRC, the licensed methodology of the 1999 EM is not affected. With the selection of this option for analyses using the 1999 EM, all of the computer codes are brought into compliance with the SER Limitation/Constraint imposed on the modeling of Optimized ZIRLO™ cladding. The impact of the change on PCT becomes integrated with the plant-specific and reload-specific analysis results used in the 10 CFR 50.46 reporting process.

Reference(s)

1. WCAP-12610-P-A and CENPD-404-P-A Addendum 1, "Addendum 1 to WCAP-12610-P-A and CENPD-404-P-A Optimized ZIRLO™," LTR-NRC-03-2, February 14, 2003. (ADAMS Accession No. ML030520455)
2. Letter from H. N. Berkow (NRC) to J. A. Gresham (Westinghouse), "Final Safety Evaluation for Addendum 1 to Topical Report WCAP-12610-P-A and CENPD-404-P-A, 'Optimized ZIRLO™,' (TAC No. MB8041)," June 10, 2005.
3. Letter from J. A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "Westinghouse Responses to NRC Request for Additional Information (RAIs) on Optimized ZIRLO™ Topical – Addendum 1 to WCAP-12610-P-A," LTR-NRC-04-44, August 4, 2004. (ADAMS Accession No. ML042240408)

FLOW PATH ENTHALPY TRANSPORT NUMERICAL STABILITY IN CEFLASH-4A (Discretionary Change)

Background

The Appendix K ECCS Performance Analysis for LBLOCA for CE plants is performed with the 1999 Evaluation Model (1999 EM). Appendix I of CENPD-133 P (Reference 1) documents the flow path enthalpy transport model used in the CEFLASH-4A computer code for calculating the blowdown thermal-hydraulics response during a LBLOCA transient. An upgrade to the flow path enthalpy transport model has been implemented as an optional process improvement to give the user additional numerical stability control other than modifying time step size. The optional improvement has been implemented to automatically control numerical convergence during time periods where the system flow rates are nearly zero, such as near end of blowdown, and the stability of the calculation is more difficult to maintain.

Affected Evaluation Model(s)

Appendix K LBLOCA Evaluation Model, 1999 EM

Estimated Effect

This process improvement has no impact on the licensed methodology of the 1999 EM and does not conflict with the SER limitation/constraints imposed on the methodology by NRC. The improvement is made available to the user as an option and is designed to maintain a numerically stable solution. Use of the option will prevent abnormal code operation requiring manual time step adjustments with the current logic to achieve convergence. The impact on PCT for 10 CFR 50.46 reporting purposes is not significant when compared to converged results.

Reference(s)

1. CENPD-133P, "CEFLASH-4A, A FORTRAN-IV Digital Computer Program for Reactor Blowdown Analysis," August 1974.

CORRECTION OF AN INCORRECT ERROR MESSAGE IN CEFLASH-4A
(Non-Discretionary Change)

Background
The Appendix K ECCS Performance Analysis for LBLOCA for CE plants is performed with the 1999 Evaluation Model (1999 EM). The editing logic in CEFLASH-4A, the blowdown thermal-hydraulics systems code of the 1999 EM, has been modified to prevent an incorrect error message from causing the utility script, which manages the operation of the 1999 EM, from an improper termination. In CEFLASH-4A, the error message should have been only a debug warning message and should not cause the utility script to stop execution.

Affected Evaluation Model(s)
Appendix K LBLOCA Evaluation Model, 1999 EM

Estimated Effect
This process improvement has no impact on the licensed methodology of the 1999 EM and does not conflict with the SER limitation/constraints imposed on the methodology by NRC. There is no impact on PCT for 10 CFR 50.46 reporting purposes.

UPGRADE TO THE AUTO-AXIAL POWER SHAPE OPTION IN STRIKIN-II
(Discretionary Change)

Background
The Appendix K ECCS Performance Analysis for LBLOCA for CE plants is performed with the 1999 Evaluation Model (1999 EM). The 1999 EM is required to specify the axial power shape for LBLOCA analyses consistent with the methodology documented in Appendix A of CENPD-132 Supplement 3-P-A. Also, the specification of the axial power shape must be in compliance with an SER Limitation/Constraint on the use of this methodology.
As part of the Advanced Automated Integrated Code System (AAICS) for the 1999 EM, an option was implemented previously to automatically determine the axial power shape that complies with the core design characteristics of the analysis and also meets the methodology requirements. One aspect of the automatic process involves achieving a particular power distribution consistent with the target value for the minimum ASI, the limiting axial shape index prescribed for top peaked power distributions that are worst for LBLOCA. An upgrade to the computer logic has been implemented to improve the process for matching the prescribed target ASI for the 1999 EM. The improvement more accurately achieves the target ASI over a broader range of conditions than before. This improved computer logic replaces the previous logic. However, it still remains the responsibility of the user to examine the axial power shape generated by the automatic process on a case by case basis.

Affected Evaluation Model(s)
Appendix K LBLOCA Evaluation Model, 1999 EM

Estimated Effect
This process improvement has no impact on the licensed methodology of the 1999 EM and does not conflict with the SER limitation/constraints imposed on the methodology by NRC. There is no impact on PCT for 10 CFR 50.46 reporting purposes.

AUTO-GENERATION OF THE STRIKIN-II BASE AND CASE DECKS
(Discretionary Change)

Background
The Appendix K ECCS Performance Analysis for LBLOCA for CE plants is performed with the 1999 Evaluation Model (1999 EM). Computer code base and case decks provide the inputs to the operation of the 1999 EM. One of the advancements of the 1999 EM has been the auto-generation of base decks that can be created using inputs provided elsewhere in the 1999 EM code system. This eliminates some documentation and quality assurance and improves quality control by eliminating sources of error. The hot rod heatup computer code of the 1999 EM is STRIKIN-II. A process improvement has been implemented to automatically generate the STRIKIN-II base and case decks in a manner consistent with the fuel performance data set from the FATES3B computer code, which provides initial conditions for fuel rod stored energy and rod internal pressure.

Affected Evaluation Model(s)
Appendix K LBLOCA Evaluation Model, 1999 EM

Estimated Effect
This process improvement has no impact on the licensed methodology of the 1999 EM and does not conflict with the SER limitation/constraints imposed on the methodology by NRC. There is no impact on PCT for 10 CFR 50.46 reporting purposes.

INCREASE THE NUMBER OF RADIAL REGIONS FOR COMZIRC
(Discretionary Change)

Background
The Appendix K ECCS Performance Analysis for LBLOCA for CE plants is performed with the 1999 Evaluation Model (1999 EM). The core-wide cladding oxidation is calculated using the COMZIRC computer code. COMZIRC represents the core fuel pin census with a table of values of fuel rod power versus fraction of rods. The current version allows a maximum of only 12 radial intervals to represent the core. The purpose of this change is to increase the radial detail from 12 to 120 intervals, thus allowing enhanced control of the discretionary conservatism needed to bound the core pin census with the COMZIRC input table.

Affected Evaluation Model(s)
Appendix K LBLOCA Evaluation Model, 1999 EM

Estimated Effect
This process improvement has no impact on the licensed methodology of the 1999 EM and does not conflict with the SER limitation/constraints imposed on the methodology by NRC. There is no impact on PCT for 10 CFR 50.46 reporting purposes.

ASSIGNMENT OF CEFLASH-4A REGIONS IN COMZIRC
(Non-Discretionary Change)

Background
The Appendix K ECCS Performance Analysis for LBLOCA for CE plants is performed with the 1999 Evaluation Model (1999 EM). The core-wide cladding oxidation is calculated using the COMZIRC computer code. COMZIRC represents the core fuel pin census with a table of values of fuel rod power versus fraction of rods. COMZIRC initializes the radial core regions using information provided by the CEFLASH-4A computer code for its radial distribution in the core. The assignment of the CEFLASH-4A radial regions to the radial pin census in COMZIRC was previously a manual operation performed by the user. Computer logic has been implemented in COMZIRC to automatically confirm and/or provide the assignment of the CEFLASH-4A radial regions to the pin census.

Affected Evaluation Model(s)
Appendix K LBLOCA Evaluation Model, 1999 EM

Estimated Effect
This process improvement has no impact on the licensed methodology of the 1999 EM and does not conflict with the SER limitation/constraints imposed on the methodology by NRC. There is no impact on PCT for 10 CFR 50.46 reporting purposes.

IMPLEMENTATION OF CATHCART-PAWEL OXIDATION MODEL AND PRE-TRANSIENT OXIDATION MODEL
(Discretionary Change)

Background
A new UCI parameter ('oxidation_model') is added to the UCI File Parameter List to facilitate the selection of the Cathcart-Pawel model for cladding oxidation as an option for non-licensing applications. The Cathcart-Pawel oxidation model is a best estimate model utilized by the industry as an alternative to the Appendix K required Baker-Just model. This new UCI option is not permitted for licensing applications of the 1999 EM, which must use the Appendix K required Baker-Just model.

A new UCI parameter ('pre_tran_oxidation') is added to the UCI File Parameter List to facilitate the specification of the initial oxide layer thickness through the UCI input file instead of through the base decks for non-licensing applications. This option may also be used to link the input specification to an interface output file from the HIDUTYDRV computer code, which provides maximum oxide thickness as a function of burnup (coordinated with FATES3B cycle numbers) and cladding type. In addition, this UCI parameter contains a new cladding conductivity option, which includes the impact of the oxide layer on the cladding conductivity, thereby directly linking the initialization of the fuel stored energy with the amount of pre-transient oxidation. The initial oxide layer thickness is a user-specified required input to the evaluation model as a constraint on the acceptability of the model for licensing applications. Therefore, this new UCI option is not permitted for licensing applications of the 1999 EM, which must use the required input.

The alternate oxidation model and pre-transient oxidation model are used to study various aspects of new embrittlement criteria being suggested by NRC and to provide an alternate means to address NRC questions regarding the calculation of the peak cladding oxidation percentage in applications of the 1999 EM to CE plants. The new UCI options provide for automatic activation of input vector changes and ensure consistency among the other computer codes of the 1999 EM.

Affected Evaluation Model(s)
Non-Licensing Applications using the Appendix K LBLOCA Evaluation Model, 1999 EM

Estimated Effect
This process improvement is for non-licensing applications. Therefore, this change has no impact on the licensed methodology of the 1999 EM and does not conflict with the SER limitation/constraints imposed on the methodology by NRC for licensing applications. For licensing applications, there is no impact on PCT for 10 CFR 50.46 reporting purposes since these changes are intended only for use in non-licensing calculations.

IMPLEMENTATION OF FINAL SER LIMITATIONS AND CONDITIONS FOR THE OPTIONAL SPACER GRID STEAM COOLING HEAT TRANSFER MODEL IMPROVEMENT IN STRIKIN-II
(Non-Discretionary Change)

Background
The Appendix K ECCS Performance Analysis for LBLOCA for CE plants is performed with the 1999 Evaluation Model (1999 EM). An improved optional steam cooling heat transfer model for core reflood rates less than 1 in/sec was submitted to NRC in May 2006, to calculate the effects of spacer grids on steam cooling heat transfer mechanisms, CENPD-132, Supplement 4-P-A, Addendum 1-P. NRC acceptance of this improvement to the 1999 EM was documented in the final SER received by Westinghouse in June 2007.
The final SER from NRC requires that several changes be made to the methodology. All future licensing applications that utilize the optional spacer grid steam cooling heat transfer model will be required to implement these changes by using STRIKIN-II, Version STR.2.11 or higher. The following changes bring this version of STRIKIN-II into full compliance with the SER limitations and conditions on the use of the optional steam cooling model as imposed by NRC:

Grid Rewet Temperature Criterion – The final model approved by NRC requires that the spacer grid rewet temperature criterion be reset to a slightly different value than originally proposed.
Grid Model Output File – The final model approved by NRC requires that additional information be plotted and submitted for NRC review prior to the initial application of the model to a particular CE plant. To facilitate this documentation requirement, an additional output file is added to streamline generation of the needed plots.
Update Reynolds Number Formulation – The final model approved by NRC requires that the Reynolds number formulation for the wetted spacer grid heat transfer calculation be revised.
Diagnostic Edit Statements – The final model approved by NRC requires that the blockage fraction and Reynolds number ranges of applicability be confirmed for each application of the model. Diagnostic edit statements to display the range of validity checks are upgraded to alert the user if the use of the model is outside the range of applicability.

These changes have an insignificant impact on the overall calculated results with no impact on PCT. The revised methodology is activated with the selection of the user-specified option that is referred to as the "NRC-approved model." These changes have no effect on the calculated results if the optional steam cooling model is not used in the analysis.

Affected Evaluation Model(s)
Appendix K LBLOCA Evaluation Model, 1999 EM

Estimated Effect
These NRC-required changes to the optional steam cooling model have no impact on PCT for 10 CFR 50.46 reporting purposes for any application that utilizes the optional methodology.

UPDATE TO THE AUTO-GENERATION OF THE STRIKIN-II BASE AND CASE DECKS (Discretionary Change)

Background

The Appendix K ECCS Performance Analysis for LBLOCA for CE plants is performed with the 1999 Evaluation Model (1999 EM). Computer code base and case decks provide the inputs to the operation of the 1999 EM. One of the advancements of the 1999 EM has been the auto-generation of base decks that can be created using inputs provided elsewhere in the 1999 EM code system. This eliminates some documentation and quality assurance and improves quality control by eliminating sources of error. The hot rod heatup computer code of the 1999 EM is STRIKIN-II. A process improvement has been previously implemented to automatically generate the STRIKIN-II base and case decks in a manner consistent with the fuel performance data set from the FATES3B computer code, which provides initial conditions for fuel rod stored energy and rod internal pressure. For licensing applications, an update has been made to the auto-generation of these input decks for LBLOCA. These updates are categorized as general code maintenance changes to improve the operation and flexibility of this feature of the code.

Affected Evaluation Model(s)

Appendix K LBLOCA Evaluation Model, 1999 EM

Estimated Effect

This process improvement has no impact on the licensed methodology of the 1999 EM and does not conflict with the SER limitation/constraints imposed on the methodology by NRC. There is no impact on PCT for 10 CFR 50.46 reporting purposes.

Attachment 2
Our ref: LTR-OA-08-17
March 25, 2008

Attachment 2
PCT Rackup Sheets
(7 pages including this page)

Westinghouse LOCA Peak Clad Temperature Summary for Appendix K Large Break

Plant Name: Palo Verde Nuclear Generating Station Unit 1
Utility Name: Arizona Public Service
Revision Date: 12/20/2007

Analysis Information

EM:	1999 EM	**Analysis Date:**	3/18/2002	**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
LICENSING BASIS			
Analysis-Of-Record PCT	**2110**	1	
PCT ASSESSMENTS (Delta PCT)			
A. PRIOR ECCS MODEL ASSESSMENTS			
1 . STRIKIN-II Steam Cooling Model Error	2	2	
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1 . Revised Containment Passive Heat Sinks	4	3	
2 . Reference 4 Containment Passive Heat Sinks	10	5	
C. 2007 ECCS MODEL ASSESSMENTS			
1 . None	0		
D. OTHER*			
1 . None	0		
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT =** 2126		

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

References:

1 . A-PV-FE-0148, Rev. 002, "PVNGS LBLOCA ECCS Performance Analysis with Revised Containment Heat Sinks Data and ZIRLO™ Using 1999 EM," March 2002.

2 . LTR-LIS-06-117, "10 CFR 50.46 Annual Notification and Reporting for 2005," March 2006.

3 . LTR-OA-06-94, "10 CFR 50.46 Report for PVNGS Units 1, 2, and 3 Changes in Containment Passive Heat Sink Data," October 2006.

4 . 13-NC-ZC-0237, Rev. 4, "Maximum Passive Heat Sink For Hydrogen Generation & ECCS Evaluation," April 2007.

5 . LTR-OA-07-109, "10 CFR 50.46 Report for PVNGS Units 1, 2, and 3 for 13-NC-ZC-0237, Rev. 4 Changes in Containment Passive Heat Sink Data," December 2007.

Notes:

None

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: 10/16/2006

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
LICENSING BASIS			
Analysis-Of-Record PCT	**1618**	**1**	
PCT ASSESSMENTS (Delta PCT)			
A. PRIOR ECCS MODEL ASSESSMENTS			
1 . None	0		
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1 . None	0		
C. 2007 ECCS MODEL ASSESSMENTS			
1 . None	0		
D. OTHER*			
1 . None	0		
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT =** 1618		

* It is recommended that the licensee determine if these PCT allocations 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: 12/20/2007

Analysis Information

EM:	1999 EM	**Analysis Date:**	3/18/2002	**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
LICENSING BASIS			
Analysis-Of-Record PCT	**2110**	**1**	
PCT ASSESSMENTS (Delta PCT)			
A. PRIOR ECCS MODEL ASSESSMENTS			
1 . STRIKIN-II Steam Cooling Model Error	2	2	
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1 . Revised Containment Passive Heat Sinks	4	3	
2 . Reference 4 Containment Passive Heat Sinks	10	5	
C. 2007 ECCS MODEL ASSESSMENTS			
1 . None	0		
D. OTHER*			
1 . None	0		
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT =** 2126		

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

References:

1 . A-PV-FE-0148, Rev. 002, "PVNGS LBLOCA ECCS Performance Analysis with Revised Containment Heat Sinks Data and ZIRLO™ Using 1999 EM," March 2002.

2 . LTR-LIS-06-117, "10 CFR 50.46 Annual Notification and Reporting for 2005," March 2006.

3 . LTR-OA-06-94, "10 CFR 50.46 Report for PVNGS Units 1, 2, and 3 Changes in Containment Passive Heat Sink Data," October 2006.

4 . 13-NC-ZC-0237, Rev. 4, "Maximum Passive Heat Sink For Hydrogen Generation & ECCS Evaluation," April 2007.

5 . LTR-OA-07-109, "10 CFR 50.46 Report for PVNGS Units 1, 2, and 3 for 13-NC-ZC-0237, Rev. 4 Changes in Containment Passive Heat Sink Data," December 2007.

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:	10/11/2006

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
LICENSING BASIS			
Analysis-Of-Record PCT	**1618**	1	
PCT ASSESSMENTS (Delta PCT)			
A. PRIOR ECCS MODEL ASSESSMENTS			
1. None	0		
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1. None	0		
C. 2007 ECCS MODEL ASSESSMENTS			
1. None	0		
D. OTHER*			
1. None	0		
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT =** 1618		

* It is recommended that the licensee determine if these PCT allocations 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:	12/20/2007

Analysis Information

EM:	1999 EM	**Analysis Date:**	3/18/2002	**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
LICENSING BASIS			
Analysis-Of-Record PCT	**2110**	**1**	
PCT ASSESSMENTS (Delta PCT)			
A. PRIOR ECCS MODEL ASSESSMENTS			
1 . STRIKIN-II Steam Cooling Model Error	2	2	
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1 . Revised Containment Passive Heat Sinks	4	3	
2 . Reference 4 Containment Passive Heat Sinks	10	5	
C. 2007 ECCS MODEL ASSESSMENTS			
1 . None	0		
D. OTHER*			
1 . None	0		
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT =** 2126		

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

References:

1 . A-PV-FE-0148, Rev. 002, "PVNGS LBLOCA ECCS Performance Analysis with Revised Containment Heat Sinks Data and ZIRLO™ Using 1999 EM," March 2002.

2 . LTR-LIS-06-117, "10 CFR 50.46 Annual Notification and Reporting for 2005," March 2006.

3 . LTR-OA-06-94, "10 CFR 50.46 Report for PVNGS Units 1, 2, and 3 Changes in Containment Passive Heat Sink Data," October 2006.

4 . 13-NC-ZC-0237, Rev. 4, "Maximum Passive Heat Sink For Hydrogen Generation & ECCS Evaluation," April 2007.

5 . LTR-OA-07-109, "10 CFR 50.46 Report for PVNGS Units 1, 2, and 3 for 13-NC-ZC-0237, Rev. 4 Changes in Containment Passive Heat Sink Data," December 2007.

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: 12/20/2007

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
LICENSING BASIS			
Analysis-Of-Record PCT	**1618**	**1**	
PCT ASSESSMENTS (Delta PCT)			
A. PRIOR ECCS MODEL ASSESSMENTS			
1 . None	0		
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1 . None	0		
C. 2007 ECCS MODEL ASSESSMENTS			
1 . None	0		
D. OTHER*			
1 . None	0		
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT =** 1618		

* It is recommended that the licensee determine if these PCT allocations 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