



102-08428-KJG/MSC
April 26, 2022

**Palo Verde
Nuclear Generating Station**
5871 S. Wintersburg Road
Tonopah, AZ 85354

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

Subject: **Palo Verde Nuclear Generating Station Units 1, 2, and 3
License Nos. NPF-41, NPF-51 and NPF-74
Docket Nos. STN 50-528, 50-529, 50-530
Emergency Core Cooling System Performance Evaluation
Models, 10 CFR 50.46(a)(3)(ii) Annual Report for 2021**

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 cladding temperature (PCT) for the Palo Verde Nuclear Generating Station (PVNGS) due to changes or errors in emergency core cooling system (ECCS) performance evaluation models (EMs).

The following bullets summarize PVNGS ECCS performance relative to the 10 CFR 50.46 annual reporting requirements:

- Large break loss of coolant accident (LBLOCA) – During calendar year (CY) 2021 there were no new changes to, or errors discovered in, the Westinghouse 1999 EM, which is a 10 CFR Part 50 Appendix K EM. There was one minor error discovered in the application of the Framatome EMF-2103, Revision 3, EM for Unit 2, which is a realistic (or best estimate plus uncertainty) EM. However, the cumulative sum of the absolute magnitudes of the delta PCT assessments, for all changes and errors identified since performance of the Westinghouse and Framatome LBLOCA analyses of record (AORs), was 0 °F throughout CY 2021 for all three PVNGS units. The sum of the LBLOCA AOR PCT and the delta PCT assessments at the end of CY 2021 was 2130 °F for PVNGS Units 1 and 3 [Westinghouse Standard (CE16STD) and Westinghouse Next Generation Fuel (CE16NGF) fuel types], 2106 °F for PVNGS Unit 2 (CE16STD fuel type), and 1752 °F for PVNGS Unit 2 [Framatome High Thermal Performance (CE16HTP) fuel type]. These values are less than the 10 CFR 50.46(b)(1) regulatory limit of 2200 °F.
- Small break loss of coolant accident (SBLOCA) – During CY 2021 there were no new changes to, or errors discovered in, the Westinghouse Supplement 2 (S2M) EM or the Framatome EMF-2328, Revision 0, and Supplement 1, Revision 0, EM. Both of these SBLOCA methodologies are 10 CFR Part 50 Appendix K EMs. The cumulative sum of the absolute magnitudes of the delta PCT assessments, for all changes and errors identified since performance of the Westinghouse and Framatome SBLOCA AORs, was 0 °F throughout CY 2021 for all three PVNGS units. The sum of the SBLOCA AOR PCT and the

delta PCT assessments at the end of CY 2021 was 1678 °F for PVNGS Units 1 and 3 (CE16STD and CE16NGF fuel types), 1618 °F for PVNGS Unit 2 (CE16STD fuel type), and 1620 °F for PVNGS Unit 2 (CE16HTP fuel type). These values are less than the 10 CFR 50.46(b)(1) regulatory limit of 2200 °F.

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

The enclosure provides a more detailed discussion of the absolute PCT effects in the evaluation models for pressurized water reactors ECCS performance analyses in CY 2021 for PVNGS.

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

Should you need further information regarding this submittal, please contact, Matthew S. Cox, Licensing Section Leader, at (623) 393-5753.

Sincerely,



Digitally signed by Gil,
Katherine J(Z05492)
Date: 2022.04.26 07:17:35
-07'00'

Katherine J. Gil
Director, Nuclear Regulatory Affairs

KJG/MSC/CJS/mg

Enclosure: 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

cc:

S. A. Morris
S. P. Lingam
L. N. Merker

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

Enclosure

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

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

**Palo Verde Unit 1
Large Break Loss of Coolant Accident (LBLOCA)
Peak Cladding Temperature (PCT) Summary Sheet
Westinghouse CE16STD and CE16NGF Fuel Assemblies**

Utility Name:	Arizona Public Service Company (APS)
Plant Name:	Palo Verde Nuclear Generating Station, Unit 1
Calendar Year (CY)	2021
Operating Cycle(s)	Cycle 23
Fuel Type(s)	Westinghouse CE16STD and CE16NGF
Evaluation Model (EM):	Westinghouse 1999 EM
EM Description:	Appendix K Large Break

Analysis of Record (AOR)	PCT	Reference(s)	Note(s)	
	2130 °F	1, 2	1	
Assessments	Net PCT Effect	Absolute PCT Effect	Reference(s)	Note(s)
A. Cumulative 10 CFR 50.46 Changes and Error Corrections – Previously Reported	+ 0 °F	+ 0 °F	3	----
B. 10 CFR 50.46 Changes and Error Corrections – New for CY 2021	+ 0 °F	+ 0 °F	----	----
C. Absolute Sum of Cumulative 10 CFR 50.46 Changes and Error Corrections	----	+ 0 °F	----	----

AOR + Assessments	PCT = 2130 °F
	The sum of the PCT from the most recent AOR using an acceptable evaluation model, and the estimated cumulative effects of changes and error corrections made since that AOR, remains less than the 10 CFR 50.46(b)(1) regulatory limit of 2200 °F.

References

- Westinghouse WCAP-18076-P, Revision 1, "Reload Transition Safety Report for Palo Verde Nuclear Generating Station Units 1, 2 and 3 with Combustion Engineering 16x16 Next Generation Fuel," June 30, 2016.
- Westinghouse CN-TLA-14-016, Revision 2, "Palo Verde Units 1, 2 and 3 LBLOCA Bounding ECCS Performance Analysis for NGF Transition," May 12, 2017.
- APS Letter to NRC, 102-08264-MDD/MS, "Palo Verde Nuclear Generating Station Units 1, 2, and 3; License Nos. NPF-41, NPF-51 and NPF-74; Docket Nos. STN 50-528, 50-529, 50-530; Emergency Core Cooling System Performance Evaluation Models, 10 CFR 50.46(a)(3)(ii) Annual Report for 2020," April 16, 2021. [NRC ADAMS Accession No. ML21110A035.]

Notes

- Palo Verde Unit 1 began and ended CY 2021 in operating cycle 23, that unit's second fuel design transition cycle with 41 Westinghouse standard fuel (CE16STD) assemblies and 200 Westinghouse Next Generation Fuel (CE16NGF) assemblies. The PCT reported above (2130 °F) is bounding for both fuel types for that operating cycle.

Enclosure

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

**Palo Verde Unit 2
Large Break Loss of Coolant Accident (LBLOCA)
Peak Cladding Temperature (PCT) Summary Sheet
Westinghouse CE16STD Fuel Assemblies**

Utility Name:	Arizona Public Service Company (APS)
Plant Name:	Palo Verde Nuclear Generating Station, Unit 2
Calendar Year (CY)	2021
Operating Cycle(s)	Cycles 23 and 24
Fuel Type(s)	Westinghouse CE16STD
Evaluation Model (EM):	Westinghouse 1999 EM
EM Description:	Appendix K Large Break

Analysis of Record (AOR)	PCT 2106 °F	Reference(s) 1, 2	Note(s) 1
Assessments	Net PCT Effect	Absolute PCT Effect	Reference(s) Note(s)
A. Cumulative 10 CFR 50.46 Changes and Error Corrections – Previously Reported	+ 0 °F	+ 0 °F	3 -----
B. 10 CFR 50.46 Changes and Error Corrections – New for CY 2021	+ 0 °F	+ 0 °F	----- -----
C. Absolute Sum of Cumulative 10 CFR 50.46 Changes and Error Corrections	-----	+ 0 °F	----- -----

AOR + Assessments	PCT = 2106 °F
	The sum of the PCT from the most recent AOR using an acceptable evaluation model, and the estimated cumulative effects of changes and error corrections made since that AOR, remains less than the 10 CFR 50.46(b)(1) regulatory limit of 2200 °F.

References

1. Westinghouse 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 31, 2009.
2. Westinghouse CN-LAM-09-33, Revision 0, "LBLOCA ECCS Performance Analysis for Palo Verde Units 1, 2, and 3 for RSG and SHA Implementation," August 31, 2009.
3. APS Letter to NRC, 102-08264-MDD/MS, "Palo Verde Nuclear Generating Station Units 1, 2, and 3; License Nos. NPF-41, NPF-51 and NPF-74; Docket Nos. STN 50-528, 50-529, 50-530; Emergency Core Cooling System Performance Evaluation Models, 10 CFR 50.46(a)(3)(ii) Annual Report for 2020," April 16, 2021. [NRC ADAMS Accession No. ML21110A035.]

Notes

1. Palo Verde Unit 2 began CY 2021 in operating cycle 23, that unit's first fuel design transition cycle with 141 Westinghouse standard fuel (CE16STD) assemblies and 100 Framatome High Thermal Performance fuel (CE16HTP) assemblies. The unit ended the CY in operating cycle 24, that unit's second fuel design transition cycle with 41 Westinghouse CE16STD assemblies and 200 Framatome CE16HTP assemblies. The PCT reported above (2106 °F) is bounding for both operating cycles for Westinghouse CE16STD fuel only. The PCT for Framatome CE16HTP fuel is addressed on a separate summary sheet.

Enclosure

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

**Palo Verde Unit 2
Large Break Loss of Coolant Accident (LBLOCA)
Peak Cladding Temperature (PCT) Summary Sheet
Framatome CE16HTP Fuel Assemblies**

Utility Name:	Arizona Public Service Company (APS)
Plant Name:	Palo Verde Nuclear Generating Station, Unit 2
Calendar Year (CY)	2021
Operating Cycle(s)	Cycles 23 and 24
Fuel Type(s)	Framatome CE16HTP
Evaluation Model (EM):	EMF-2103 Revision 3
EM Description:	Realistic Large Break

Analysis of Record (AOR)	PCT	Reference(s)	Note(s)	
	1752 °F	1, 2, 3	1	
Assessments	Net PCT Effect	Absolute PCT Effect	Reference(s)	Note(s)
A. Cumulative 10 CFR 50.46 Changes and Error Corrections – Previously Reported	+ 0 °F	+ 0 °F	4	2
B. 10 CFR 50.46 Changes and Error Corrections – New for CY 2021				
1. Framatome CR 2020-1554; Power History Input Error	+ 0 °F	+ 0 °F	5	----
C. Absolute Sum of Cumulative 10 CFR 50.46 Changes and Error Corrections	----	+ 0 °F	----	----

AOR + Assessments	PCT = 1752 °F
	The sum of the PCT from the most recent AOR using an acceptable evaluation model, and the estimated cumulative effects of changes and error corrections made since that AOR, remains less than the 10 CFR 50.46(b)(1) regulatory limit of 2200 °F.

References

1. Framatome 32-9268125, Revision 0, "Palo Verde VQP Realistic Large Break LOCA (RLBLOCA) Uncertainty Analysis," February 21, 2018.
2. Framatome ANP-3639P, Revision 1, "Palo Verde Units 1, 2, and 3 Realistic Large Break LOCA Summary Report; Licensing Report," May 2018.
3. Framatome ANP-3639P, Revision 1Q1P, Revision 0, "Palo Verde Units 1, 2, and 3 Realistic Large Break LOCA Summary Report; NRC RAI Responses; Licensing Report," September 2019. Includes the effects of Framatome CRs 2019-840 and 2019-1130, that predate NRC staff approval of Framatome CE16HTP implementation at Palo Verde. [The NRC Safety Evaluation at NRC ADAMS Accession No. ML20031C947 references an APS letter to NRC at NRC ADAMS Accession No. ML19277J457, which addressed these CRs.]
4. APS Letter to NRC, 102-08264-MDD/MS, "Palo Verde Nuclear Generating Station Units 1, 2, and 3; License Nos. NPF-41, NPF-51 and NPF-74; Docket Nos. STN 50-528, 50-529, 50-530; Emergency Core Cooling System Performance Evaluation Models, 10 CFR 50.46(a)(3)(ii) Annual Report for 2020," April 16, 2021. [NRC ADAMS Accession No. ML21110A035.]
5. Framatome Letter to APS, FS1-0055542-1.0, "Evaluation of Condition Report 2020-1554 for Potential Reporting Under 10 CFR 50.46 for Palo Verde," April 26, 2021.

Notes

1. Palo Verde Unit 2 began CY 2021 in operating cycle 23, that unit's first fuel design transition cycle with 141 Westinghouse standard fuel (CE16STD) assemblies and 100 Framatome High Thermal Performance fuel (CE16HTP) assemblies. The unit ended the CY in operating cycle 24, that unit's second fuel design transition cycle with 41 Westinghouse CE16STD assemblies and 200 Framatome CE16HTP assemblies. The PCT reported above (1752 °F) is bounding for both operating cycles for Framatome CE16HTP fuel only. The PCT for Westinghouse CE16STD fuel is addressed on a separate summary sheet.
2. Changes and error corrections previously reported in Reference 3 include Framatome Condition Reports (CRs) 2020-0441 (Radiation Enclosure Input Error) and 2020-1165 (Radial Power Map Input Error).

Enclosure

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

**Palo Verde Unit 3
Large Break Loss of Coolant Accident (LBLOCA)
Peak Cladding Temperature (PCT) Summary Sheet
Westinghouse CE16STD and CE16NGF Fuel Assemblies**

Utility Name:	Arizona Public Service Company (APS)
Plant Name:	Palo Verde Nuclear Generating Station, Unit 3
Calendar Year (CY)	2021
Operating Cycle(s)	Cycles 22 and 23
Fuel Type(s)	Westinghouse CE16STD and CE16NGF
Evaluation Model (EM):	Westinghouse 1999 EM
EM Description:	Appendix K Large Break

Analysis of Record (AOR)	PCT	Reference(s)	Note(s)
	2130 °F	1, 2	1
Assessments	Net PCT Effect	Absolute PCT Effect	Reference(s)
A. Cumulative 10 CFR 50.46 Changes and Error Corrections – Previously Reported	+ 0 °F	+ 0 °F	3
B. 10 CFR 50.46 Changes and Error Corrections – New for CY 2021	+ 0 °F	+ 0 °F	-----
C. Absolute Sum of Cumulative 10 CFR 50.46 Changes and Error Corrections	-----	+ 0 °F	-----

AOR + Assessments	PCT = 2130 °F
	The sum of the PCT from the most recent AOR using an acceptable evaluation model, and the estimated cumulative effects of changes and error corrections made since that AOR, remains less than the 10 CFR 50.46(b)(1) regulatory limit of 2200 °F.

References

- Westinghouse WCAP-18076-P, Revision 1, "Reload Transition Safety Report for Palo Verde Nuclear Generating Station Units 1, 2 and 3 with Combustion Engineering 16x16 Next Generation Fuel," June 30, 2016.
- Westinghouse CN-TLA-14-016, Revision 2, "Palo Verde Units 1, 2 and 3 LBLOCA Bounding ECCS Performance Analysis for NGF Transition," May 12, 2017.
- APS Letter to NRC, 102-08264-MDD/MS, "Palo Verde Nuclear Generating Station Units 1, 2, and 3; License Nos. NPF-41, NPF-51 and NPF-74; Docket Nos. STN 50-528, 50-529, 50-530; Emergency Core Cooling System Performance Evaluation Models, 10 CFR 50.46(a)(3)(ii) Annual Report for 2020," April 16, 2021. [NRC ADAMS Accession No. ML21110A035.]

Notes

- Palo Verde Unit 3 began CY 2021 in operating cycle 22, that unit's first fuel design transition cycle with 141 Westinghouse standard fuel (CE16STD) assemblies and 100 Westinghouse Next Generation Fuel (CE16NGF) assemblies. The unit ended the CY in operating cycle 23, that unit's second fuel design transition cycle with 41 Westinghouse CE16STD assemblies and 200 Westinghouse CE16NGF assemblies. The PCT reported above (2130 °F) is bounding for both fuel types for both operating cycles.

Enclosure

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

**Palo Verde Unit 1
Small Break Loss of Coolant Accident (SBLOCA)
Peak Cladding Temperature (PCT) Summary Sheet
Westinghouse CE16STD and CE16NGF Fuel Assemblies**

Utility Name:	Arizona Public Service Company (APS)
Plant Name:	Palo Verde Nuclear Generating Station, Unit 1
Calendar Year (CY)	2021
Operating Cycle(s)	Cycle 23
Fuel Type(s)	Westinghouse CE16STD and CE16NGF
Evaluation Model (EM):	Westinghouse S2M
EM Description:	Appendix K Small Break

Analysis of Record (AOR)	PCT 1678 °F	Reference(s) 1, 2	Note(s) 1
Assessments	Net PCT Effect	Absolute PCT Effect	Reference(s) Note(s)
A. Cumulative 10 CFR 50.46 Changes and Error Corrections – Previously Reported	+ 0 °F	+ 0 °F	3 -----
B. 10 CFR 50.46 Changes and Error Corrections – New for CY 2021	+ 0 °F	+ 0 °F	----- -----
C. Absolute Sum of Cumulative 10 CFR 50.46 Changes and Error Corrections	-----	+ 0 °F	----- -----

AOR + Assessments	PCT = 1678 °F
	The sum of the PCT from the most recent AOR using an acceptable evaluation model, and the estimated cumulative effects of changes and error corrections made since that AOR, remains less than the 10 CFR 50.46(b)(1) regulatory limit of 2200 °F.

References

1. Westinghouse CN-TLA-14-020, Revision 1, "Palo Verde Units 1, 2 and 3 SBLOCA Bounding ECCS Performance Analysis for NGF Transition," January 7, 2016.
2. Westinghouse WCAP-18076-P, Revision 1, "Reload Transition Safety Report for Palo Verde Nuclear Generating Station Units 1, 2 and 3 with Combustion Engineering 16x16 Next Generation Fuel," June 30, 2016.
3. APS Letter to NRC, 102-08264-MDD/MS, "Palo Verde Nuclear Generating Station Units 1, 2, and 3; License Nos. NPF-41, NPF-51 and NPF-74; Docket Nos. STN 50-528, 50-529, 50-530; Emergency Core Cooling System Performance Evaluation Models, 10 CFR 50.46(a)(3)(ii) Annual Report for 2020," April 16, 2021. [NRC ADAMS Accession No. ML21110A035.]

Notes

1. Palo Verde Unit 1 began and ended CY 2021 in operating cycle 23, that unit's second fuel design transition cycle with 41 Westinghouse standard fuel (CE16STD) assemblies and 200 Westinghouse Next Generation Fuel (CE16NGF) assemblies. The PCT reported above (1678 °F) is bounding for both fuel types for that operating cycle.

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

**Palo Verde Unit 2
Small Break Loss of Coolant Accident (SBLOCA)
Peak Cladding Temperature (PCT) Summary Sheet
Westinghouse CE16STD Fuel Assemblies**

Utility Name:	Arizona Public Service Company (APS)
Plant Name:	Palo Verde Nuclear Generating Station, Unit 2
Calendar Year (CY)	2021
Operating Cycle(s)	Cycles 23 and 24
Fuel Type(s)	Westinghouse CE16STD
Evaluation Model (EM):	Westinghouse S2M
EM Description:	Appendix K Small Break

Analysis of Record (AOR)	PCT 1618 °F	Reference(s) 1	Note(s) 1
Assessments	Net PCT Effect	Absolute PCT Effect	Reference(s) Note(s)
A. Cumulative 10 CFR 50.46 Changes and Error Corrections – Previously Reported	+ 0 °F	+ 0 °F	2 -----
B. 10 CFR 50.46 Changes and Error Corrections – New for CY 2021	+ 0 °F	+ 0 °F	----- -----
C. Absolute Sum of Cumulative 10 CFR 50.46 Changes and Error Corrections	-----	+ 0 °F	----- -----

AOR + Assessments	PCT = 1618 °F
	The sum of the PCT from the most recent AOR using an acceptable evaluation model, and the estimated cumulative effects of changes and error corrections made since that AOR, remains less than the 10 CFR 50.46(b)(1) regulatory limit of 2200 °F.

References

1. Westinghouse A-PV-FE-0149, Revision 1, "Palo Verde Units 1, 2 and 3 S2M Bounding SBLOCA ECCS Performance Analysis," March 22, 2002.
2. APS Letter to NRC, 102-08264-MDD/MS, "Palo Verde Nuclear Generating Station Units 1, 2, and 3; License Nos. NPF-41, NPF-51 and NPF-74; Docket Nos. STN 50-528, 50-529, 50-530; Emergency Core Cooling System Performance Evaluation Models, 10 CFR 50.46(a)(3)(ii) Annual Report for 2020," April 16, 2021. [NRC ADAMS Accession No. ML21110A035.]

Notes

1. Palo Verde Unit 2 began CY 2021 in operating cycle 23, that unit's first fuel design transition cycle with 141 Westinghouse standard fuel (CE16STD) assemblies and 100 Framatome High Thermal Performance fuel (CE16HTP) assemblies. The unit ended the CY in operating cycle 24, that unit's second fuel design transition cycle with 41 Westinghouse CE16STD assemblies and 200 Framatome CE16HTP assemblies. The PCT reported above (1618 °F) is bounding for both operating cycles for Westinghouse CE16STD fuel only. The PCT for Framatome CE16HTP fuel is addressed on a separate summary sheet.

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

**Palo Verde Unit 2
Small Break Loss of Coolant Accident (SBLOCA)
Peak Cladding Temperature (PCT) Summary Sheet
Framatome CE16HTP Fuel Assemblies**

Utility Name:	Arizona Public Service Company (APS)
Plant Name:	Palo Verde Nuclear Generating Station, Unit 2
Calendar Year (CY)	2021
Operating Cycle(s)	Cycles 23 and 24
Fuel Type(s)	Framatome CE16HTP
Evaluation Model (EM):	EMF-2328 Revision 0 and Supplement 1 Revision 0
EM Description:	Appendix K Small Break

Analysis of Record (AOR)	PCT 1620 °F	Reference(s) 1, 2, 3	Note(s) 1
Assessments	Net PCT Effect	Absolute PCT Effect	Reference(s) Note(s)
A. Cumulative 10 CFR 50.46 Changes and Error Corrections – Previously Reported	+ 0 °F	+ 0 °F	3 -----
B. 10 CFR 50.46 Changes and Error Corrections – New for CY 2021	+ 0 °F	+ 0 °F	----- -----
C. Absolute Sum of Cumulative 10 CFR 50.46 Changes and Error Corrections	-----	+ 0 °F	----- -----

AOR + Assessments	PCT = 1620 °F
	The sum of the PCT from the most recent AOR using an acceptable evaluation model, and the estimated cumulative effects of changes and error corrections made since that AOR, remains less than the 10 CFR 50.46(b)(1) regulatory limit of 2200 °F.

References

1. Framatome 32-9268122, Revision 0, "Palo Verde VQP SBLOCA Transient Analyses," January 18, 2018.
2. Framatome ANP-3640P, Revision 0, "Palo Verde Units 1, 2, and 3 Small Break LOCA Summary Report; Licensing Report," March 2018.
3. Framatome ANP-3640Q1P, Revision 0, "Palo Verde Units 1, 2, and 3 Small Break LOCA Summary Report; NRC RAI Responses; Licensing Report," September 2019.
4. APS Letter to NRC, 102-08264-MDD/MS, "Palo Verde Nuclear Generating Station Units 1, 2, and 3; License Nos. NPF-41, NPF-51 and NPF-74; Docket Nos. STN 50-528, 50-529, 50-530; Emergency Core Cooling System Performance Evaluation Models, 10 CFR 50.46(a)(3)(ii) Annual Report for 2020," April 16, 2021. [NRC ADAMS Accession No. ML21110A035.]

Notes

1. Palo Verde Unit 2 began CY 2021 in operating cycle 23, that unit's first fuel design transition cycle with 141 Westinghouse standard fuel (CE16STD) assemblies and 100 Framatome High Thermal Performance fuel (CE16HTP) assemblies. The unit ended the CY in operating cycle 24, that unit's second fuel design transition cycle with 41 Westinghouse CE16STD assemblies and 200 Framatome CE16HTP assemblies. The PCT reported above (1620 °F) is bounding for both operating cycles for Framatome CE16HTP fuel only. The PCT for Westinghouse CE16STD fuel is addressed on a separate summary sheet.

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

**Palo Verde Unit 3
Small Break Loss of Coolant Accident (SBLOCA)
Peak Cladding Temperature (PCT) Summary Sheet
Westinghouse CE16STD and CE16NGF Fuel Assemblies**

Utility Name:	Arizona Public Service Company (APS)
Plant Name:	Palo Verde Nuclear Generating Station, Unit 3
Calendar Year (CY)	2021
Operating Cycle(s)	Cycles 22 and 23
Fuel Type(s)	Westinghouse CE16STD and CE16NGF
Evaluation Model (EM):	Westinghouse S2M
EM Description:	Appendix K Small Break

Analysis of Record (AOR)	PCT	Reference(s)	Note(s)
	1678 °F	1, 2	1
Assessments	Net PCT Effect	Absolute PCT Effect	Reference(s)
A. Cumulative 10 CFR 50.46 Changes and Error Corrections – Previously Reported	+ 0 °F	+ 0 °F	3
B. 10 CFR 50.46 Changes and Error Corrections – New for CY 2021	+ 0 °F	+ 0 °F	-----
C. Absolute Sum of Cumulative 10 CFR 50.46 Changes and Error Corrections	-----	+ 0 °F	-----

AOR + Assessments	PCT = 1678 °F
	The sum of the PCT from the most recent AOR using an acceptable evaluation model, and the estimated cumulative effects of changes and error corrections made since that AOR, remains less than the 10 CFR 50.46(b)(1) regulatory limit of 2200 °F.

References

- Westinghouse CN-TLA-14-020, Revision 1, "Palo Verde Units 1, 2 and 3 SBLOCA Bounding ECCS Performance Analysis for NGF Transition," January 7, 2016.
- Westinghouse WCAP-18076-P, Revision 1, "Reload Transition Safety Report for Palo Verde Nuclear Generating Station Units 1, 2 and 3 with Combustion Engineering 16x16 Next Generation Fuel," June 30, 2016.
- APS Letter to NRC, 102-08264-MDD/MS, "Palo Verde Nuclear Generating Station Units 1, 2, and 3; License Nos. NPF-41, NPF-51 and NPF-74; Docket Nos. STN 50-528, 50-529, 50-530; Emergency Core Cooling System Performance Evaluation Models, 10 CFR 50.46(a)(3)(ii) Annual Report for 2020," April 16, 2021. [NRC ADAMS Accession No. ML21110A035.]

Notes

- Palo Verde Unit 3 began CY 2021 in operating cycle 22, that unit's first fuel design transition cycle with 141 Westinghouse standard fuel (CE16STD) assemblies and 100 Westinghouse Next Generation Fuel (CE16NGF) assemblies. The unit ended the CY in operating cycle 23, that unit's second fuel design transition cycle with 41 Westinghouse CE16STD assemblies and 200 Westinghouse CE16NGF assemblies. The PCT reported above (1678 °F) is bounding for both fuel types for both operating cycles.