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SCE&G®
A SCANA COMPANY

October 16, 2012
RC-12-0104

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

Dear Sir or Madam:

Subject: VIRGIL C. SUMMER NUCLEAR STATION (VCSNS) UNIT 1
DOCKET NO. 50-395
OPERATING LICENSE NO. NPF-12
ECCS EVALUATION MODEL REVISIONS 30-DAY REPORT

In accordance with the requirements of 10 CFR 50.46(a)(3)(ii), South Carolina Electric & Gas (SCE&G) hereby submits information regarding the estimated effects due to fuel pellet thermal conductivity degradation (TCD), peaking factor burndown, and an upgrade from PAD Version 3.4 to PAD Version 4.0 on the VCSNS Unit 1 Best Estimate Large Break Loss-of-Coolant Accident (BE LBLOCA) analysis of record. In addition, a correction to a prior evaluation for the Transverse Momentum Cells for Zero Cross-Flow Boundary Condition, which was previously reported, is also included.

Attachment 1 documents the 10 CRF 50.46 reporting text and the estimated peak cladding temperature (PCT) impacts. As shown in Attachment 1, the cumulative impact on PCT is significant as defined in 10 CFR 50.46(a)(3)(i). Revised LBLOCA PCT rack-up sheets are included in Attachment 2.

10 CFR 50.46(a)(3)(ii) requires the licensee to provide a report within 30 days, including a proposed schedule for providing a reanalysis or taking other action as may be needed to show compliance with 10 CFR 50.46. SCE&G has reviewed the information provided by Westinghouse and determined that the adjusted BE LBLOCA PCT values and manner in which they were derived continue to comply with the requirements of 10 CFR 50.46. For reanalysis, SCE&G proposes the following schedule:

Before June 15, 2017, SCE&G will submit to the NRC for review and approval, a BE LBLOCA analysis that applies NRC-approved methods that includes the effects of fuel TCD. The date for the analysis submittal is based on the following milestones, which must be completed in order to perform a revised BE LBLOCA analysis with an NRC-approved Emergency Core Cooling System (ECCS) Evaluation Models (EM) that explicitly accounts for TCD:

- *NRC approval of a Westinghouse fuel performance analysis methodology that includes the effects of TCD.*
- *NRC approval of a Westinghouse BE LBLOCA EM that includes the effects of TCD and accommodates the ongoing 10 CFR 50.46(c) rulemaking process.*

A002
NRR

This information is provided to satisfy the 30-day reporting requirements of 10 CFR 50.46(a)(3)(ii) for Virgil C. Summer Unit 1.

If you have any questions about this submittal, please contact Mr. Bruce L. Thompson at (803) 931-5042.

Very truly yours,

Thomas D. Gatlin

JMW/TDG/bq

Attachments: 3

1. V. C. Summer 10 CFR 50.46 Reporting Text and Peak Cladding Temperature Impacts
2. Revised Large Break Loss of Coolant Accident (LBLOCA) PCT Rackup Sheets
3. List of Regulatory Commitments

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VIRGIL C. SUMMER NUCLEAR STATION (VCSNS) Unit 1
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ATTACHMENT 1

V. C. Summer 10 CFR 50.46 Reporting Text and Peak Cladding Temperature Impacts

Evaluation of Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown

Background

Fuel pellet thermal conductivity degradation (TCD) and peaking factor burndown were not explicitly considered in the V. C. Summer Best Estimate Large Break Loss-of-Coolant Accident (BE LBLOCA) Analysis of Record (AOR). Nuclear Regulatory Commission (NRC) Information Notice 2011-21 (Reference 1) notified addressees of recent information obtained concerning the impact of irradiation on fuel thermal conductivity and its potential to cause significantly higher predicted peak cladding temperature (PCT) results in realistic emergency core cooling system (ECCS) evaluation models. This evaluation provides an estimated effect of fuel pellet TCD and peaking factor burndown on the PCT calculation for the V. C. Summer BE LBLOCA AOR. This change represents a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451 (Reference 2).

Affected Evaluation Model

1996 Westinghouse Best Estimate Large Break LOCA Evaluation Model

Estimated Effect

A quantitative evaluation, as discussed in Reference 3, was performed to assess the PCT effect of fuel pellet TCD and peaking factor burndown on the V. C. Summer BE LBLOCA analysis and concluded that the estimated PCT impact is 0°F for Blowdown, 113°F for Reflood 1 and 123°F for Reflood 2 for 10 CFR 50.46 reporting purposes. The peaking factor burndown included in the evaluation is provided in Table 1 and is conservative for the current cycle. South Carolina Electric & Gas and its vendor, Westinghouse Electric Company LLC, utilize processes which ensure that the LOCA analysis input values conservatively bound the as-operated plant values for those parameters and will be validated as part of the reload design process.

Rod Burnup (MWd/MTU)	FdH (1),(2)	FQ Transient (1)	FQ Steady-State
0	1.70	2.50	2.00
30,000	1.70	2.50	2.00
30,000	1.62	2.45	2.00
60,000	1.40	1.96	1.60
62,000	1.40	1.96	1.60

Table 1: Peaking Factors Assumed in the Evaluation of TCD

(1) Includes uncertainties.
(2) Hot assembly average power follows the same burndown, since it is a function of FdH.

References

1. NRC Information Notice 2011-21, McGinty, T. J., and Dudes, L. A., "Realistic Emergency Core Cooling System Evaluation Model Effects Resulting From Nuclear Fuel Thermal Conductivity Degradation," December 13, 2011. (NRC ADAMS # ML113430785)
2. WCAP-13451, "Westinghouse Methodology for Implementation of 10 CFR 50.46 Reporting," October 1992.
3. OG-12-386, "For Information Only – Input Supporting the PWROG LBLOCA Program Regarding Nuclear Fuel Thermal Conductivity Degradation (PA-ASC-1073, Revision 0) (Proprietary/Non-Proprietary)," September 18, 2012.

PAD 4.0 Implementation

Background
The Best Estimate Large Break Loss-of-Coolant Accident (BE LBLOCA) Analysis of Record (AOR) for V. C. Summer utilized fuel rod design inputs from PAD Version 3.4. To isolate the effect of fuel rod design input from PAD code version differences, the impact of using fuel rod design input from PAD Version 4.0 was estimated prior to explicitly considering fuel rod design input which includes fuel pellet thermal conductivity degradation (TCD) and peaking factor burndown and is based on the PAD Version 4.0 code. The implementation of PAD Version 4.0 into the 1996 Westinghouse Best Estimate Large Break LOCA Evaluation Model was described in Reference 1 as a forward-fit, Discretionary Change in accordance with Section 4.1.1 of WCAP-13451 (Reference 2). The plant-specific implementation of PAD Version 4.0 into the BE LBLOCA AOR for V. C. Summer is considered a design input change into the BE LBLOCA analysis.

South Carolina Electric & Gas and its vendor, Westinghouse Electric Company LLC, utilize processes which ensure that LOCA analysis input values conservatively bound the as-operated plant values for those parameters.

Affected Evaluation Model
1996 Westinghouse Best Estimate Large Break LOCA Evaluation Model

Estimated Effect
A qualitative evaluation, as discussed in Reference 3, was performed to estimate a PCT effect resulting from a change in fuel rod design input parameters from PAD Version 3.4 and PAD Version 4.0. The evaluation concluded that the estimated PCT impact is -83°F for Blowdown, -118°F for Reflood 1 and -118°F for Reflood 2 for 10 CFR 50.46 reporting purposes.

References
1. LTR-NRC-01-6, Letter from H. A. Sepp (Westinghouse) to J. S. Wermiel (NRC), "U. S. Nuclear Regulatory Commission, 10 CFR 50.46 Annual Notification and Reporting for 2000," March 13, 2001.
2. WCAP-13451, "Westinghouse Methodology for Implementation of 10 CFR 50.46 Reporting," October 1992.
3. OG-12-386, "For Information Only – Input Supporting the PWROG LBLOCA Program Regarding Nuclear Fuel Thermal Conductivity Degradation (PA-ASC-1073, Revision 0) (Proprietary/Non-Proprietary)," September 18, 2012.

PCT Assessment of Transverse Momentum Cells for Zero Cross-flow Boundary Condition Error in the V. C. Summer (CGE) Best-Estimate Large Break LOCA Analysis

Background

An error was identified in the input of the transverse momentum cells for zero cross-flow boundary condition. Based on the nature of the input error, it was determined that no WCOBRA/TRAC calculations are necessary. This change represents a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451 (Reference 1).

Affected Evaluation Model(s)

1996 Westinghouse Best Estimate Large Break LOCA Evaluation Model

Estimated Effect

This error was determined to have no impact on the calculated results; thus, the estimated PCT impact is 0°F for all time periods for 10 CFR 50.46 reporting purposes.

Reference

1. WCAP-13451, "Westinghouse Methodology for Implementation of 10 CFR 50.46 Reporting," October 1992.

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ATTACHMENT 2

Revised Large Break Loss of Coolant Accident (LBLOCA) PCT Rackup Sheets

Westinghouse LOCA Peak Clad Temperature Summary for Best Estimate Large Break

Plant Name: V. C. Summer
Utility Name: South Carolina Electric & Gas

Revision Date: 9/20/2012

Composite

Analysis Information

EM:	CQD (1996)	**Analysis Date:**	2/3/2003	**Limiting Break Size:**	Guillotine
FQ:	2.5	**FdH:**	1.7		
Fuel:	Vantage +	**SGTP (%):**	10		
Notes:	Delta 75 Replacement Steam Generator Uprate Core Power 2900 MWt				

	Clad Temp (°F)	Ref.	Notes
LICENSING BASIS			
Analysis-Of-Record PCT	**1988**	**1**	
PCT ASSESSMENTS (Delta PCT)			
A. PRIOR ECCS MODEL ASSESSMENTS			
1 . Backfit Through 2001 Reporting Year	0	2	
2 . Revised Blowdown Heatup Uncertainty Distribution	5	3	
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1 . Fan Cooler Performance Increase	2	2	
2 . Upflow Conversion Evaluation	-29	4	
C. 2012 ECCS MODEL ASSESSMENTS			
1 . PAD 4.0 Implementation	-118	5	
2 . Evaluation of Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown	123	5	(a)
3 . Transverse Momentum Cells for Zero Cross-flow Boundary Condition Error	0	5	(b)
D. OTHER*			
1 . None	0		
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT =** 1971		

* 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 . WCAP-16043, "Best Estimate Analysis of the Large Break Loss of Coolant Accident for the Virgil C. Summer Nuclear Station," June 2003.

2 . CGE-03-12, "10 CFR 50.46 Annual Notification and Reporting for 2002," March 2003.

3 . CGE-05-20, "10 CFR 50.46 Annual Notification and Reporting for 2004," April 2005.

4 . LTR-LIS-08-578, Revision 2, "10 CFR 50.46 Reports for the V. C. Summer (CGE) Upflow Conversion Large Break LOCA Evaluation and Assessment of Transverse Momentum Cells with a Zero Cross-flow Boundary Condition Error," January 2009.

5 . LTR-LIS-12-372, "V. C. Summer, 10 CFR 50.46 Notification and Reporting for Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown," September 20, 2012.

Notes:

(a) This evaluation credits peaking factor burndown, see Reference 5.

(b) This input error was originally reported in Reference 4. That evaluation is superseded by the report in Reference 5.

Westinghouse LOCA Peak Clad Temperature Summary for Best Estimate Large Break

Plant Name: V. C. Summer
Utility Name: South Carolina Electric & Gas

Revision Date: 9/20/2012

Blowdown

Analysis Information

EM:	CQD (1996)	**Analysis Date:**	2/3/2003	**Limiting Break Size:**	Guillotine
FQ:	2.5	**FdH:**	1.7		
Fuel:	Vantage +	**SGTP (%):**	10		
Notes:	Delta 75 Replacement Steam Generator Uprate Core Power 2900 MWt				

	Clad Temp (°F)	Ref.	Notes
LICENSING BASIS			
Analysis-Of-Record PCT	**1860**	**1**	
PCT ASSESSMENTS (Delta PCT)			
A. PRIOR ECCS MODEL ASSESSMENTS			
1 . Backfit Through 2001 Reporting Year	0	2	
2 . Revised Blowdown Heatup Uncertainty Distribution	49	3	
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1 . Fan Cooler Performance Increase	0	2	
2 . Upflow Conversion Evaluation	-7	4	
C. 2012 ECCS MODEL ASSESSMENTS			
1 . PAD 4.0 Implementation	-83	5	
2 . Evaluation of Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown	0	5	(a)
3 . Transverse Momentum Cells for Zero Cross-flow Boundary Condition Error	0	5	(b)
D. OTHER*			
1 . None.	0		
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT =** 1819		

* 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 . WCAP-16043, "Best Estimate Analysis of the Large Break Loss of Coolant Accident for the Virgil C. Summer Nuclear Station," June 2003.

2 . CGE-03-12, "10 CFR 50.46 Annual Notification and Reporting for 2002," March 2003.

3 . CGE-05-20, "10 CFR 50.46 Annual Notification and Reporting for 2004," April 2005.

4 . LTR-LIS-08-578, Revision 2, "10 CFR 50.46 Reports for the V. C. Summer (CGE) Upflow Conversion Large Break LOCA Evaluation and Assessment of Transverse Momentum Cells with a Zero Cross-flow Boundary Condition Error," January 2009.

5 . LTR-LIS-12-372, "V. C. Summer, 10 CFR 50.46 Notification and Reporting for Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown," September 20, 2012.

Notes:

(a) This evaluation credits peaking factor burndown, see Reference 5.

(b) This input error was originally reported in Reference 4. That evaluation is superseded by the report in Reference 5.

Westinghouse LOCA Peak Clad Temperature Summary for Best Estimate Large Break

Plant Name: V. C. Summer
Utility Name: South Carolina Electric & Gas

Revision Date: 9/20/2012

Reflood 1

Analysis Information

EM:	CQD (1996)	**Analysis Date:**	2/3/2003	**Limiting Break Size:**	Guillotine
FQ:	2.5	**FdH:**	1.7		
Fuel:	Vantage +	**SGTP (%):**	10		
Notes:	Delta 75 Replacement Steam Generator Uprate Core Power 2900 MWt				

	Clad Temp (°F)	Ref.	Notes
LICENSING BASIS			
Analysis-Of-Record PCT	**1808**	**1**	
PCT ASSESSMENTS (Delta PCT)			
A. PRIOR ECCS MODEL ASSESSMENTS			
1 . Backfit Through 2001 Reporting Year	0	2	
2 . Revised Blowdown Heatup Uncertainty Distribution	5	3	
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1 . Fan Cooler Performance Increase	1	2	
2 . Upflow Conversion Evaluation	-44	4	
C. 2012 ECCS MODEL ASSESSMENTS			
1 . PAD 4.0 Implementation	-118	5	
2 . Evaluation of Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown	113	5	(a)
3 . Transverse Momentum Cells for Zero Cross-flow Boundary Condition Error	0	5	(b)
D. OTHER*			
1 . None	0		
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT =** 1765		

* 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 . WCAP-16043, "Best Estimate Analysis of the Large Break Loss of Coolant Accident for the Virgil C. Summer Nuclear Station," June 2003.

2 . CGE-03-12, "10 CFR 50.46 Annual Notification and Reporting for 2002," March 2003.

3 . CGE-05-20, "10 CFR 50.46 Annual Notification and Reporting for 2004," April 2005.

4 . LTR-LIS-08-578, Revision 2, "10 CFR 50.46 Reports for the V. C. Summer (CGE) Upflow Conversion Large Break LOCA Evaluation and Assessment of Transverse Momentum Cells with a Zero Cross-flow Boundary Condition Error," January 2009.

5 . LTR-LIS-12-372, "V. C. Summer, 10 CFR 50.46 Notification and Reporting for Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown," September 20, 2012.

Notes:

(a) This evaluation credits peaking factor burndown, see Reference 5.

(b) This input error was originally reported in Reference 4. That evaluation is superseded by the report in Reference 5.

Westinghouse LOCA Peak Clad Temperature Summary for Best Estimate Large Break

Plant Name: V. C. Summer
Utility Name: South Carolina Electric & Gas

Revision Date: 9/20/2012

Reflood 2

Analysis Information

EM:	CQD (1996)	**Analysis Date:**	2/3/2003	**Limiting Break Size:**	Guillotine
FQ:	2.5	**FdH:**	1.7		
Fuel:	Vantage +	**SGTP (%):**	10		
Notes:	Delta 75 Replacement Steam Generator Uprate Core Power 2900 MWt				

	Clad Temp (°F)	Ref.	Notes
LICENSING BASIS			
Analysis-Of-Record PCT	**1988**	**1**	
PCT ASSESSMENTS (Delta PCT)			
A. PRIOR ECCS MODEL ASSESSMENTS			
1 . Backfit Through 2001 Reporting Year	0	2	
2 . Revised Blowdown Heatup Uncertainty Distribution	5	3	
B. PLANNED PLANT MODIFICATION EVALUATIONS			
1 . Fan Cooler Performance Increase	2	2	
2 . Upflow Conversion Evaluation	-29	4	
C. 2012 ECCS MODEL ASSESSMENTS			
1 . PAD 4.0 Implementation	-118	5	
2 . Evaluation of Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown	123	5	(a)
3 . Transverse Momentum Cells for Zero Cross-flow Boundary Condition Error	0	5	(b)
D. OTHER*			
1 . None	0		
LICENSING BASIS PCT + PCT ASSESSMENTS	**PCT =** 1971		

* 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 . WCAP-16043, "Best Estimate Analysis of the Large Break Loss of Coolant Accident for the Virgil C. Summer Nuclear Station," June 2003.

2 . CGE-03-12, "10 CFR 50.46 Annual Notification and Reporting for 2002," March 2003.

3 . CGE-05-20, "10 CFR 50.46 Annual Notification and Reporting for 2004," April 2005.

4 . LTR-LIS-08-578, Revision 2, "10 CFR 50.46 Reports for the V. C. Summer (CGE) Upflow Conversion Large Break LOCA Evaluation and Assessment of Transverse Momentum Cells with a Zero Cross-flow Boundary Condition Error," January 2009.

5 . LTR-LIS-12-372, "V. C. Summer, 10 CFR 50.46 Notification and Reporting for Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown," September 20, 2012.

Notes:

(a) This evaluation credits peaking factor burndown, see Reference 5.

(b) This input error was originally reported in Reference 4. That evaluation is superseded by the report in Reference 5.

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ATTACHMENT 3

List of Regulatory Commitments

The following table identifies those actions committed to by SCE&G, Virgil C. Summer Nuclear Station in this document. Any other statements in this submittal are provided for information purposes and are not considered to be commitments. Please direct questions regarding these commitments to Mr. Bruce L. Thompson, Manager, Nuclear Licensing, (803) 931-5042.

COMMITMENT	Due Date/Event
SCE&G will submit to the NRC for review and approval a BE LBLOCA analysis that applies NRC-approved methods that includes the effects of fuel TCD.	Before June 15, 2017.