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Docket Nos. 50-424
50-425

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

Gentlemen:

Vogtle Electric Generating Plant
10CFR50.46 Annual ECCS Model Changes Report

The October 17, 1988, revision to 10CFR50.46 required applicants and holders of operating licenses or construction permits to notify the Nuclear Regulatory Commission (NRC) of errors and changes in the ECCS Evaluation Models, which are not significant, on an annual basis. Enclosed is Georgia Power Company's report in compliance with this requirement for the Vogtle Electric Generating Plant Units 1 and 2.

Attachment A provides information regarding the effect of the ECCS Evaluation Model modifications on the peak cladding temperature (PCT) results reported in Section 15.6 of the Vogtle Electric Generating Plant Units 1 and 2 Final Safety Analysis Report (FSAR). There were no additional ECCS model modifications or errors identified that have reached final resolution since last year's 10 CFR 50.46 annual report.

Attachment B provides a summary of the plant change safety evaluations performed under the provisions of 10CFR50.59 that impact PCT. Please note that the facility change safety evaluations included in Attachment B reflect only those which result in non-zero PCT impact assessments. Only one new safety evaluation has been identified since last year's 10 CFR 50.46 annual report. It involves a facility change (steam generator lower level tap relocation) which affected the small-break LOCA analysis.

This information package constitutes Georgia Power Company's report to the NRC as part of annual reporting required by 10CFR50.46(a)(3)(ii). For completeness, Attachments A and B are included in their entirety (i.e., includes the PCT penalties reported in last year's 10 CFR 50.46 annual report, in addition to the new 10 CFR 50.59 penalty identified this year).

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It has been determined that compliance with the requirements of 10CFR50.46 continues to be maintained when the effects of plant design changes, performed under 10CFR50.59, which could affect the large break LOCA and small break LOCA analyses results are combined with the effects of the ECCS Evaluation Model modifications applicable to Vogtle Units 1 and 2.

If you have any questions regarding this report, please contact this office.

Sincerely,

W. G. Hairston, III

WGH,III/gps

Attachment

cc: Georgia Power Company
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ATTACHMENT A

EFFECT OF WESTINGHOUSE ECCS EVALUATION MODEL MODIFICATIONS ON THE LOCA ANALYSIS RESULTS FOUND IN SECTION 15.6 OF THE VOGTLE UNITS 1 AND 2 FINAL SAFETY ANALYSIS REPORT

BACKGROUND

The October 17, 1988, revision to 10CFR50.46 required applicants and holders of operating licenses or construction permits to notify the Nuclear Regulatory Commission (NRC) of errors and changes in the Emergency Core Cooling System (ECCS) Evaluation Models on an annual basis, when the errors and changes are not significant. Reference 1 defines a significant error or change as one which results in a calculated fuel peak cladding temperature (PCT) different by more than 50°F from the temperature calculated for the limiting transient using the last acceptable model, or as a cumulation of changes and errors such that the sum of the absolute magnitudes of the respective temperature changes is greater than 50°F.

In References 2 and 3, information regarding modifications to the Westinghouse large break and small break Loss-of-Coolant (LOCA) ECCS Evaluation Models was submitted to the NRC. The following presents an assessment of the effect of the modifications to the Westinghouse ECCS Evaluation Models on the LOCA analysis results found in Section 15.6 of the Vogtle Units 1 and 2 Final Safety Analysis Report (FSAR).

LARGE BREAK LOCA

ECCS EVALUATION MODEL

The large break LOCA analysis for Vogtle Units 1 and 2 was examined to assess the effect of the applicable modifications to the Westinghouse large break LOCA ECCS Evaluation Model on PCT results reported in Section 15.6 of the FSAR. The large break LOCA analysis results were calculated using the 1981 version of the Westinghouse large break LOCA ECCS Evaluation Model in July 1988 (Reference 4). The limiting break analysis assumed the following information important to the large break LOCA analyses:

- 17x17 Standard Fuel Assembly
- Core Power = 1.02 * 3411 MWT
- Vessel Average Temperature = 589.6°F
- Steam Generator Plugging Level = 5%
- F_Q = 2.32
- F-delta-H = 1.55

For Vogtle Units 1 and 2, the limiting break resulted from the double-ended guillotine rupture of the cold leg piping with a discharge coefficient of $C_D = 0.6$ for the maximum safeguards condition. The calculated PCT was 1995.8°F.

The following modification to the Westinghouse ECCS Evaluation Models would affect the large break LOCA analysis results found in Section 15.6 of the Vogtle Units 1 and 2 FSAR:

DOWNCOMER OVERFILLING DELAY

1981 ECCS Evaluation Model:

In the 1981 ECCS Evaluation Model, a modification as discussed in Reference 2 was made to delay downcomer overfilling. The delay corresponds to backfilling of the intact cold legs. Data from tests simulating cold leg injection during the post-large break LOCA reflood phase which have adequate safety injection flow to condense all of the available steam flow show a significant amount of subcooled liquid to be present in the cold leg pipe test section. This situation corresponds to the so-called maximum safety injection scenario of ECCS Evaluation Model analyses.

For maximum safety injection scenarios, the reflooding model in the Westinghouse 1981 ECCS Evaluation Model uses a WREFLOOD code version which predicts the downcomer to overfill. Flow through the vessel side of the break is computed based upon the available head of water in the downcomer in WREFLOOD using an incompressible flow in an open channel method. A modification to the WREFLOOD computer code was made to consider the cold leg inventory which would be present in conjunction with the enhanced downcomer level in the non-faulted loops.

WREFLOOD code logic was altered to consider the filling of the cold legs together with downcomer overfilling. Under this coding update, when the downcomer level exceeds its maximum value as input to WREFLOOD, liquid flow into the intact cold leg, as well as spillage out the break, is considered. This logic modification stabilizes the overfilling of the vessel downcomer as it approaches its equilibrium level. In some cases, this change could delay the downcomer overfilling process, which could result in a PCT penalty. The magnitude of the possible PCT penalty was assessed by reanalyzing a plant which is maximum safeguards limited ($C_D = 0.6$ Double-Ended Cold Leg Guillotine case), and which is most sensitive to the changes in the WREFLOOD code. The PCT penalty of 16°F, which resulted for this case, represents the maximum PCT penalty which could be exhibited for any plant due to the WREFLOOD logic change.

This change represents a model enhancement in terms of the consistency of the approach in the WREFLOOD code and the actual response of the

downcomer level. Since Appendix K to 10CFR50 does not require the explicit treatment of the mass storage feature, this modification represents an enhancement rather than an error. However, to assess the margin available for accommodating potential plant changes, a 16°F penalty in the peak cladding temperature will be tracked for this code modification.

RESULTANT LARGE BREAK LOCA PCT

As discussed above, modifications to the Westinghouse large break LOCA ECCS Evaluation Model could affect the large break LOCA analysis results by altering the PCT as follows:

A.	Analysis calculated result	1995.8°F
B.	Modifications to Westinghouse ECCS Evaluation Model	+ 16.0°F
C.	ECCS Evaluation Model Modifications Resultant PCT	=2011.8°F

CONCLUSION

An evaluation of the effect of modifications to the Westinghouse large break 1981 ECCS Evaluation Model, as reported in Reference 2, was performed for the large break LOCA analysis results found in Section 15.6 of the Vogtle Units 1 and 2 FSAR. When the effects of the ECCS model changes were combined with the current plant analysis results, it was determined that compliance with the requirements of 10CFR50.46 would be maintained.

SMALL BREAK LOCA

ECCS EVALUATION MODEL

The small break LOCA analysis for Vogtle Units 1 and 2 was also examined to assess the effect of the applicable modifications to the Westinghouse ECCS Evaluation Models on PCT results reported in Section 15.6 of the FSAR. The small break LOCA analysis results were calculated using the October 1975 version of the Westinghouse small break LOCA ECCS Evaluation Model incorporating the WFLASH computer code. For Vogtle Units 1 and 2, the limiting size small break resulted from a four-inch equivalent diameter break in the cold leg. The calculated PCT was 1537°F. The analysis assumed the following information important to the small break LOCA analyses:

- 17x17 Standard Fuel Assembly
- Core Power = 1.02 * 3411 MWT

- Vessel Average Temperature = 589.6°F
- Steam Generator Plugging Level = 5%
- F_Q = 2.20 at 10 ft
- F-delta-H = 1.55

As discussed below, the modifications to the Westinghouse ECCS Evaluation Models discussed in References 2 and 3 do not affect the WFLASH small break LOCA analysis results found in Section 15.6 of the Vogtle Units 1 and 2 FSAR.

WFLASH ECCS EVALUATION MODEL

Following the accident at Three Mile Island Unit 2, additional attention was focused on the small break LOCA, and Westinghouse submitted a report, WCAP-9600 (Reference 5), to the NRC detailing the performance of the Westinghouse small break LOCA Evaluation Model which utilized the WFLASH computer code. In NUREG-0611 (Reference 6), the NRC staff questioned the validity of certain models in the WFLASH computer code and required licensees to justify continued acceptance of the model. Section II.K.3.30 of NUREG-0737 (Reference 7) clarified the NRC post-TMI requirements regarding small break LOCA modeling and required licensee's to revise their small break LOCA ECCS models along the guidelines specified in NUREG-0611.

Following the issuance of NUREG-0737, Westinghouse and the Westinghouse Owners Group decided to develop the NOTRUMP (Reference 8) computer code for use in a new small break LOCA ECCS Evaluation Model (Reference 9). The NRC approved the use of NOTRUMP for small break LOCA ECCS analyses in May 1985. Since approval of the NOTRUMP small break LOCA ECCS Evaluation Model in 1985, the WFLASH computer code has not been maintained as part of the Westinghouse ECCS Evaluation Model computer codes.

In Section II.K.3.31 of NUREG-0737, the NRC required that each licensee submit a new small break LOCA analysis using an NRC-approved small break LOCA Evaluation Model which satisfied the requirements of NUREG-0737 section II.K.3.30. NRC Generic Letter 83-35 (Reference 10) relaxed the requirements of item II.K.3.31, by allowing a more generic response and providing a basis for retention of the existing small break LOCA analyses.

Provided that the previously existing model results were demonstrated to be conservative with respect to the new small break LOCA model approved under the requirements of NUREG-0737 section II.K.3.30 (NOTRUMP), plant-specific analyses using the new small break LOCA Evaluation Model would not be required. In WCAP-11145 (Reference 11), Westinghouse and the Westinghouse Owners Group demonstrated that the results obtained from calculations with WFLASH were conservative relative to those obtained with NOTRUMP. Compliance with item II.K.3.31 of NUREG-0737 has been completed by

referencing WCAP-11145 as documented in Supplement 3 to the Vogtle Safety Evaluation Report (Reference 12).

Westinghouse, therefore, has not been modifying, investigating, or evaluating proposed changes to the WFLASH portion of the small break LOCA ECCS Evaluation Model. There are no modifications to report.

SBLOCTA-IV COMPUTER CODE

Modifications were made to the small break LOCTA-IV computer code used in the small break LOCA ECCS Evaluation Model. Since the small break LOCTA-IV code modifications could, at most, result in a very small benefit, the effect of the small break LOCTA-IV code modifications do not need to be assessed or tracked.

RESULTANT SMALL BREAK LOCA PCT

As discussed above, modifications to the Westinghouse small break LOCA ECCS Evaluation Model do not affect the small break LOCA analysis results and do not alter the resultant PCT.

A.	Analysis calculated result	1537°F
B.	Modifications to Westinghouse ECCS Evaluation Model	+ 0°F
C.	ECCS Evaluation Model Modifications Resultant PCT	=1537°F

CONCLUSION

An evaluation of the effect of modifications to the Westinghouse small break October 1975 ECCS Evaluation Model using WFLASH was performed for the small break LOCA analysis results found in Section 15.6 of the Vogtle Units 1 and 2 FSAR. When the effects of the small break ECCS model changes were combined with the current plant analysis results, it was determined that compliance with the requirements of 10CFR50.46 would be maintained.

REFERENCES

1. "Emergency Core Cooling Systems; Revisions to Acceptance Criteria," Federal Register, Vol. 53, No. 180, pp. 35996-36005, dated September 16, 1988.

2. NS-NRC-89-3464, "10CFR50.46 Annual Notification for 1989 of Modifications in the Westinghouse ECCS Evaluation Models," Letter from W. J. Johnson (Westinghouse) to T. E. Murley (NRC), dated October 5, 1989.

3. NS-NRC-89-3463, "Correction of Errors and Modifications to the NOTRUMP Code in the Westinghouse Small Break LOCA ECCS Evaluation Model Which Are Potentially Significant," Letter from W. J. Johnson (Westinghouse) to T. E. Murley (NRC), dated October 5, 1989.

4. WCAP-9220-P-A, Revision 1 (Proprietary), WCAP-9221-A, Revision 1 (Non-Proprietary), "Westinghouse ECCS Evaluation Model - 1981 Version," 1981, Eicheldinger. C.

5. "Report on Small Break Accidents for Westinghouse Nuclear Steam Supply System," WCAP-9601 (Non-Proprietary), June 1979, WCAP-9600 (Proprietary), June 1979.

6. "Generic Evaluation of Feedwater Transients and Small Break Loss-of-Coolant Accidents in Westinghouse Designed Operating Plants," NUREG-0611, January 1980.

7. "Clarification of TMI Action Plan Requirements," NUREG-0737, November 1980.

8. "NOTRUMP - A Nodal Transient Small Break and General Network Code," WCAP-10079-P-A (Proprietary), WCAP-10080-A (Non-Proprietary), Meyer, P. E., et al., August 1985.

9. "Westinghouse Small Break ECCS Evaluation Model Using the NOTRUMP Code," WCAP-10054-P-A (Proprietary), WCAP-10081-A (Non-Proprietary), Lee, N., et al., August 1985.

10. "Clarification of TMI Action Plan Item II.K.3.31," NRC Generic Letter 83-35 from D. G. Eisenhut, November 2, 1983.

11. "Westinghouse Small Break ECCS Evaluation Model Generic Study with the NOTRUMP Code," WCAP-11145-P-A (Proprietary), WCAP-11372-A, (Non-Proprietary), Rupprecht, S. D., et al., October 1986.

12. "Safety Evaluation Report Related to the Operation of Vogtle Electric Generating Plant, Units 1 and 2," NUREG-1137, Supplement 3, dated August 1986.

ATTACHMENT B

EFFECT OF SAFETY EVALUATIONS PERFORMED
ON THE LOCA ANALYSIS RESULTS FOUND IN SECTION 15.6 OF THE
VOGTLE UNITS 1 AND 2 FINAL SAFETY ANALYSIS REPORT

LARGE BREAK LOCA

DESCRIPTION OF PLANT MODIFICATIONS

The large break Loss-of-Coolant (LOCA) analysis results have been supplemented by safety evaluations of changes which could affect the PCT as follows:

1. A safety evaluation to determine the effect for a change of the charging flow rates used in the FSAR Section 15.6 large break LOCA analysis due to increased runout flow of the charging pumps was performed for Vogtle Units 1 and 2. This evaluation determined that the large break LOCA analysis PCT results could be affected by a 2°F increase.

2. A safety evaluation to determine the effect of a change in safety injection flow was performed for the Vogtle Units 1 and 2 FSAR Section 15.6 large break LOCA analysis. This evaluation determined that the large break LOCA analysis PCT results could be affected by a 3°F increase.

3. A safety evaluation to determine the effect of containment purging during a LOCA was performed for the Vogtle Units 1 and 2 FSAR Section 15.6 large break LOCA analysis. This evaluation determined that the large break LOCA analysis PCT results could be affected by a 10°F increase.

RESULTANT LARGE BREAK LOCA PCT

As discussed above, plant modifications could affect the resultant PCT as follows:

	Resultant PCT from ECCS Evaluation Model Modifications Reported in Attachment A	2011.8°F
1.	Safety Evaluation for Charging Pump Increased Runout	+ 2.0°F
2.	Safety Evaluation for Safety Injection Flow Changes	+ 3.0°F
3.	Safety Evaluation for Containment Purging	+ 10.0°F
	Total Resultant PCT	=2026.8°F

CONCLUSIONS

It was determined that compliance with the requirements of 10CFR50.46 would be maintained when safety evaluations for changes which affected the large

break LOCA analysis results were combined with the effect of the large break ECCS Evaluation Model modifications applicable to Vogtle Units 1 and 2.

SMALL BREAK LOCA

DESCRIPTION OF PLANT MODIFICATIONS

The small break LOCA analysis results have been supplemented by a safety evaluation which could affect the PCT as follows:

1. A safety evaluation to determine the effect of changing instrumentation uncertainties due to Veritrak transmitters was performed for the Vogtle Units 1 and 2 FSAR Section 15.6 small break LOCA analysis. This evaluation determined that the small break LOCA analysis PCT results could be affected by a 3.7°F increase.

2. A safety evaluation was performed for the Vogtle Units 1 and 2 FSAR Section 15.6 small-break LOCA analysis to determine the effect of relocating each steam generator instrumentation line lower level tap and associated changes in each steam generator initial nominal water level. This evaluation determined that the small-break LOCA analysis PCT results could be affected by an 11.0°F increase.

RESULTANT SMALL BREAK LOCA PCT

As discussed above, plant modifications could affect the resultant PCT as follows:

Resultant PCT from ECCS Evaluation Model Modifications Reported in Attachment A	1537.0°F
1. Safety Evaluation for Veritrak Transmitters	+ 3.7°F
2. Safety Evaluation for Steam Generator Lower Level Tap Relocation	+ 11.0°F
Total Resultant PCT	=1551.7°F

CONCLUSIONS

It was determined that compliance with the requirements of 10CFR50.46 would be maintained when safety evaluations for changes which affected the small break LOCA analysis results were combined with the effect of the small break ECCS Evaluation Model modifications applicable to Vogtle Units 1 and 2.