VIRGINIA ELECTRIC AND POWER COMPANY

RICHMOND, VIRGINIA 23261

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United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Serial No. 94-436
NA&F/GLD-CGL R0'
Docket Nos. 50-338
50-339
License Nos. NPF-4
NPF-7

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNITS 1 AND 2
REPORT OF ECCS EVALUATION MODEL CHANGES
AND 30-DAY REPORT PURSUANT TO 10CFR50.46 REQUIREMENTS

Pursuant to 10CFR50.46(a)(3)(ii), Virginia Electric and Power Company is providing information concerning changes to the ECCS Evaluation Models and their application in existing licensing analyses. Information is also provided which quantifies the effect of these changes upon reported results for North Anna Power Station and demonstrates continued compliance with the acceptance criteria of 10CFR50.46.

Attachment 1 contains excerpted portions of the Westinghouse report describing the changes to the Westinghouse ECCS Evaluation Models which are applicable to North Anna and have been implemented during calendar year 1993. In addition to these generic changes, there were plant-specific changes associated with application of the small break LOCA evaluation model for the North Anna units. Attachment 2 provides a report describing these plant-specific evaluation model changes.

Attachment 3 provides information regarding the effect of the ECCS Evaluation Model changes upon the reported LOCA results for the North Anna Power Station analysis of record. To summarize the information in Attachment 3, the calculated PCT for the small and large break LOCA analyses for North Anna are given below. Results which represent significant changes, based upon the criterion established in 10CFR50.46(a)(3)(i), are designated with an asterisk.

North Anna Units 1 and 2 - Small break: 1948°F (*)
North Anna Unit 1 - Large break: 2041°F
North Anna Unit 2 - Large break: 2076°F

We have evaluated these model issues and the associated changes in the applicable licensing basis PCT results. These results demonstrate compliance with the requirements of 10CFR50.46(b). Although the North Anna small break LOCA changes

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described in Attachment 2 are significant, the licensing basis PCT result has adequate margin to the limit. Therefore, no further reanalysis or action is required to demonstrate compliance with 10CFR50.46 requirements.

If you have questions or require additional information, please contact us.

Very truly yours,

James P. O'Hanlon

James P. O'Hanlon
Senior Vice President - Nuclear

Attachments:

1. Westinghouse Report of ECCS Evaluation Model Changes for 1993 - North Anna Units 1 and 2
2. Report of Changes in Application of ECCS Evaluation Models - North Anna Units 1 and 2
3. Effect of ECCS Evaluation Model Changes - North Anna Units 1 and 2

cc: U. S. Nuclear Regulatory Commission
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Mr. R. D. McWhorter
NRC Senior Resident Inspector
North Anna Power Station

ATTACHMENT 1

WESTINGHOUSE REPORT OF
ECCS EVALUATION MODEL CHANGES FOR 1993

NORTH ANNA UNITS 1 AND 2

VESSEL AND STEAM GENERATOR CALCULATION ERRORS IN LUCIFER

Background

The LUCIFER code is used to generate the component databases, from raw input data, to be used in the small and large break LOCA analyses. Errors were found in the VESCAL subroutine of the LUCIFER code. These errors were in the geometric and mass calculations of the vessel and steam generator portions of the needed data. All LOCA analyses using the LUCIFER code outputs are affected by these error corrections. The errors were corrected in a manner to maintain the consistency of the LUCIFER code.

The errors were determined to be a Non-Discretionary Change as described in Section 4.1.2 of WCAP-13451 and were corrected in accordance with Section 4.1.3 of WCAP-13451.

Affected Evaluation Models

1985 SBLOCA Evaluation Model
1981 ECCS Evaluation Model
1981 ECCS Evaluation Model with BART
1981 ECCS Evaluation Model with BASH

Estimated Effect

Representative plant calculations indicate a net PCT effect of -16°F for small break LOCA and a -6°F for large break LOCA.

ISHII DRIFT FLUX ERROR

Background

An error was discovered both in WCAP-10079-P-A and the relevant coding in NOTRUMP SUBROUTINE ISHIIA which led to an incorrect calculation of the drift flux in NOTRUMP when a laminar film annular flow was predicted. The affected equation in WCAP-10079-P-A is Equation G-74 wherein a factor of 'g', the gravitational constant, was inadvertently omitted from both the documentation and the equivalent coding. The correction of this error returned NOTRUMP to consistency with the ultimate reference for the affected correlation.

This was determined to be a Non-discretionary Change as described in Section 4.1.2 of WCAP-13451 and was corrected in accordance with Section 4.1.3 of WCAP-13451.

Affected Evaluation Models

1985 Small Break LOCA Evaluation Model

Estimated Effect

Representative plant analyses were used to estimate a generic PCT effect of 0°F.

NOTRUMP POINT KINETICS ERROR

Background

An error was discovered in the coding used in the NOTRUMP User External SUBROUTINE VOLHEAT. The coding did not correctly perform the calculation described by Equation 3-12-28 of WCAP-10054-P-A. This calculation is only used during the time when the Point Kinetics option is used to determine the core power before reactor trip. Therefore, any analysis which used the more conservative assumption of constant core power until reactor trip time is not affected by this error. The correction of this error returned NOTRUMP to consistency with WCAP-10054-P-A.

This was determined to be a Non-discretionary Change as described in Section 4.1.2 of WCAP-13451 and was corrected in accordance with Section 4.1.3 of WCAP-13451.

Affected Evaluation Models

1985 Small Break LOCA Evaluation Model

Estimated Effect

Representative plant analyses were used to estimate a generic PCT effect of 0°F.

NOTRUMP DRIFT FLUX FLOW REGIME MAP ERRORS

Background

Errors were discovered in both WCAP-10079-P-A and related coding in NOTRUMP SUBROUTINE DFCORRS where the improved TRAC-P1 vertical flow regime map is evaluated. In Evaluation Model applications, this model is only used during counter-current flow conditions in vertical flow links. The affected equation in WCAP-10079-P-A is Equation G-65 which previously allowed for unbounded values of the parameter C_∞ contrary to the intent of the original source of this equation. This allowed a discontinuity to exist in the flow regime map under some circumstances. This was corrected by placing an upper limit of 1.3926 on the parameter C_∞ as reasoned from the discussion in the original source. As stated, this correction returned NOTRUMP to consistency with the original source for the affected equation.

Further investigation of the DFCORRS uncovered an additional closely related logic error which led to discontinuities under certain other circumstances. This error was also corrected and returned the coding to consistency with WCAP-10079-P-A.

This was determined to be a Non-discretionary Change as described in Section 4.1.2 of WCAP-13451 and was corrected in accordance with Section 4.1.3 of WCAP-13451.

Affected Evaluation Models

1985 Small Break LOCA Evaluation Model

Estimated Effect

Representative plant calculations indicated PCT effects ranging from -13°F to -55°F. For the purposes of tracking PCT, an estimated effect of -13°F will be assigned to this change.

CORE NODE INITIALIZATION ERROR

Background

An error was discovered in how the properties of CORE NODE components were initialized for non-existent regions in the adjoining FLUID NODE. In particularly this led to artificially high core temperatures during the timestep when the core mixture level crossed a node boundary, conservatively causing slightly more core mixture level depression than appropriate during this timestep. Correction of this error allows for a smoother mixture level uncovery transient during node crossings.

This was determined to be a Non-discretionary Change as described in Section 4.1.2 of WCAP-13451 and was corrected in accordance with Section 4.1.3 of WCAP-13451.

Affected Evaluation Models

1985 Small Break LOCA Evaluation Model

Estimated Effect

The nature of this error led to an estimated generic PCT effect of 0°F.

NOTRUMP HEAT LINK POINTER ERROR

Background

An error was discovered in how NOTRUMP initialized certain HEAT LINK pointer variables at the start of a calculation. Correction of this error returned NOTRUMP to consistency with the original intent of this section of coding.

This was determined to be a Non-discretionary Change as described in Section 4.1.2 of WCAP-13451 and was corrected in accordance with Section 4.1.3 of WCAP-13451.

Affected Evaluation Models

1985 Small Break LOCA Evaluation Model

Estimated Effect

Representative plant analyses were used to estimate a generic PCT effect of 0°F.

FUEL ROD MODEL ERRORS IN SBLOCA

Background

A number of minor programming errors were corrected in the fuel rod heat up code used in SBLOCA analyses. These corrections were related to:

1. Individual rod plenum temperatures
2. Individual rod stack lengths
3. Clad thinning logic
4. Pellet/clad contact logic
5. Corrected gamma redistribution
6. Including ZrO_2 thickness at t=0 initialization
7. Numerics and convergence criteria of initialization.

These changes were determined to be Non-Discretionary Changes in accordance with Section 4.1.2 of WCAP-13451 and were implemented in accordance with Section 4.1.3 of WCAP-13451.

Affected Evaluation Models

1975 SBLOCA Evaluation Model
1985 SBLOCA Evaluation Model

Estimated Effect

The cumulative effect of the error corrections and convergence criteria change was found to be less than approximately $\pm 4°F$. This change is therefore judged to have a negligible effect on PCT and on a generic basis the estimated effect will be reported as 0°F.

CHARGING/SAFETY INJECTION SYSTEM ISSUES

Background

Westinghouse has recently completed its evaluation of a potential safety issue regarding four specific issues related to the design and use of the miniflow line for the charging/safety injection (CHG/SI) pumps. Two of these issues involved SBLOCA PCT penalties for certain plants. One issue involves the operation of the centrifugal charging pump (CCP) miniflow line during accident conditions. A CCP runout condition may occur if the CCP injection lines were balanced with the CCP miniflow path closed and credit was taken for operator action to isolate the miniflow line during the accident. Also, the existence of this condition may impact the ECCS flows assumed in plant specific Small Break LOCA analyses. The other issue involves miniflow orifices that are used for the CHG/SI pumps. Westinghouse has supplied two different orifice types: 60 or 70 gpm orifice at a differential head of 6000 feet. Additional confirmation testing indicates that the orifice plates will allow a higher than design flow rate through the orifice at the design differential head. As a result, a discrepancy may exist between the installed miniflow line capacity and the ECCS analysis assumptions. The discrepancy would occur if the ECCS analysis assumed that the miniflow line resistance was based on the orifice allowing design flow at the design head as opposed to the higher as tested flow and head. Consequently, the miniflow path may permit more flow than previously determined which may reduce SI flow during injection.

Affected Evaluation Models

1975 SBLOCA Evaluation Model
1985 SBLOCA Evaluation Model

Estimated Effect

The PCT effect on the Small Break LOCA Evaluation Model for this issue varied depending on the affected plant ECCS configuration and capability. The specific PCT penalty, for affected plants, is shown on the attached PCT Summary Sheet. If Westinghouse is in possession of sufficient plant configuration information to determine that the penalty is certainly applicable, this effect is included in Section D of the summary Sheet. Otherwise, it is included in Section E pending confirmation of the assumed plant configuration.

LARGE BREAK LOCA FUEL ROD MODEL ERRORS

Background

Minor errors in the rod heat up code used in Large Break LOCA analyses were corrected. These errors concerned conditions which exist during periods of pellet/clad contact and the internal book-keeping logic associated with clad thinning.

These changes were determined to be Non-Discretionary Changes in accordance with Section 4.1.2 of WCAP-13451 and were implemented in accordance with Section 4.1.3 of WCAP-13451.

Affected Evaluation Models

1981 ECCS Evaluation Model with BASH

Estimated Effect

Representative plant calculations have shown that these corrections have a negligible effect on PCT for near Beginning-of-Life (BOL) fuel rod conditions (i.e. < 2000 MWD/MTU). These effects become prevalent as burnup increases, but are not expected to be of any significance until pellet/clad contact is predicted for steady-state operating conditions (typically > 8000 MWD/MTU). These corrections therefore result in a negligible PCT impact for Large Break LOCA licensing basis PCT's which are calculated with near BOL conditions. This impact is being reported generically as 0°F.

HIGH TEMPERATURE FUEL ROD BURST MODEL

Background

A model for calculating the prediction of zircaloy cladding burst behavior above the previous limit of 1742°F was implemented. This model was described to the NRC in:

> Letter ET-NRC-92-3746, N. J. Liparulo (W) to R. C. Jones (NRC), "Extension of NUREG-0630 Fuel Rod Burst Strain and Assembly Blockage Models to High Fuel Rod Burst Temperatures", September 16, 1992.

This was determined to be a Non-discretionary Change as described in Section 4.1.2 of WCAP-13451 and was corrected in accordance with Section 4.1.3 of WCAP-13451.

Affected Evaluation Models

1981 ECCS Evaluation Model with BASH

Estimated Effect

The effect of the extended burst model has been directly incorporated in the Analysis of Record for those plants who are affected.

HOT ASSEMBLY AVERAGE ROD BURST EFFECTS

Background

The rod heat up code used in Small Break LOCA calculations contains a model to calculate the amount of clad strain that accompanies rod burst. However, the methodology which has historically been used is to not apply this burst strain model to the hot assembly average rod. This was done so as to minimize the rod gap and therefore maximize the heat transferred to the fluid channel, which in turn would maximize the hot rod temperature. However, due to mechanisms governing the zirc-water temperature excursion (which is the subject of the SBLOCA Limiting Time-in-Life penalty for the hot rod), modeling of clad burst strain for the hot assembly average rod can result in a penalty for the hot rod by increasing the channel enthalpy at the time of PCT. Therefore, the methodology has been revised such that burst strain will also be modeled on the hot assembly average rod.

This was determined to be a Non-discretionary Change as described in Section 4.1.2 of WCAP-13451 and was corrected in accordance with Section 4.1.3 of WCAP-13451.

Affected Evaluation Models

1975 SBLOCA Evaluation Model
1985 SBLOCA Evaluation Model

Estimated Effect

Representative plant calculations have shown that this change introduces an approximately 10% increase in the SBLOCA Limiting Time-in-Life penalty on the hot rod. However, this penalty is being offset in affected plants PCT Summary Sheets by the Revised Burst Strain Limit Model described on the following page. These models will be implemented concurrently in the Small Break Evaluation Model rod heat-up code in 1994.

REVISED BURST STRAIN LIMIT MODEL

Background

A revised burst strain limit model which limits strains is being implemented into the rod heat up codes used in both Large Break and Small Break LOCA. This model, which is identical to that previously approved for use for Appendix K analyses of Upper Plenum Injection plants with WCOBRA/TRAC, as described in WCAP-10924-P-A, Rev. 1, Vol. 1, Add. 4, "Westinghouse Large Break LOCA Best Estimate Methodology: Volume 1: Model Description and Validation, Addendum 4: Model Revisions," 1991.

This has been determined to be a Non-Discretionary Change as discussed in Section 4.1.2 of WCAP-13451 and is being implemented in accordance with Section 4.1.3 of WCAP-13451.

Affected Evaluation Models

1975 SBLOCA Evaluation Model
1985 SBLOCA Evaluation Model
1978 ECCS Evaluation Model
1981 ECCS Evaluation Model
1981 ECCS Evaluation Model with BART
1981 ECCS Evaluation Model with BASH

Estimated Effect

The estimated effect on Large Break LOCA PCT's ranges from negligible to a moderate, unquantified benefit which will be inherent in calculations once this model is implemented. In Small Break LOCA, representative plant calculations indicate that the magnitude of the benefit is conservatively estimated to be exactly offsetting to the penalty introduced by the Hot Assembly Average Rod Burst issue documented on the previous page. This model will be implemented in both Large Break and Small Break Evaluation Models during 1994.

LARGE BREAK LOCA ROD INTERNAL PRESSURE ISSUES

Issue Description

Westinghouse recently completed an evaluation of a potential issue concerning the impact of increased beginning of life rod internal pressure (RIP) uncertainties on LOCA analyses. Historically, beginning of life fuel pressure and temperature uncertainties, were based upon end of life considerations. These RIP uncertainties were found to be potentially nonconservative. During the evaluation of this issue, a second issue related to the applicability of generic IFBA fuel analyses to updated LOCA Evaluation Models was also identified and combined with this issue since the underlying mechanisms were the same.

Technical Evaluation

The technical evaluation of this issue concluded that both the RIP uncertainty and the current IFBA designs with 200 psig initial fill pressure fuel typically will result in a maximum $\pm 15°F$ PCT variation. Consequently, RIP manufacturing uncertainties and 200 psig initial fill pressure IFBA fuel do not have significant effects on the large break LOCA analyses. Also, based on these results, it was concluded that only nominal RIP (with an upper bound bias) should be used in the LOCA analyses for fuel designs with an initial cold fill pressure $\geq$ 200 psig. This is consistent with past LOCA analysis.

Specific analyses were performed for all plants with initial fill pressure $<$ 200 psig. It was demonstrated that the acceptance criteria of 10 CFR 50.46 continued to be met for each of these plants.

Assessment of Safety Significance

A 10 CFR, Part 21 evaluation concluded that the effects of low initial fill pressure and increased RIP uncertainty will not represent a defect creating a substantial safety hazard and, more likely than not, will not result in a failure to comply with any applicable regulation relating to a substantial safety hazard. This conclusion was based upon the implementation of an extended burst and blockage correlation for burst temperatures above 1742°F and a more realistic minimum burnup assumption at hot full power conditions. In addition, any new reloads which would utilize low ($<$200 psig) initial fill pressure fuel would be specifically analyzed.

Recommended Actions

Resolution of this issue may have resulted in a plant specific PCT change and would be shown on the attached annual 50.46 report PCT Margin Utilization Sheets. Aside from determining reporting requirements relative to 10 CFR 50.46, no other utility action is necessary.

SMALL BREAK LOCA LIMITING TIME IN LIFE - ZIRC/WATER OXIDATION TEMPERATURE EXCURSION

Issue Description

Westinghouse recently completed an evaluation of a potential issue with regard to burst/blockage modeling in the Westinghouse small break LOCA evaluation model. This potential issue involved a number of synergistic effects, all related to the manner in which the small break model accounts for the swelling and burst of fuel rods, modeling of the rod burst strain, and resulting effects on clad temperature and oxidation from the metal/water reaction models and channel blockage.

Technical Evaluation

Fuel rod burst during the course of a small break LOCA analysis was found to potentially result in a significant temperature excursion above the clad temperature transient for a non-burst case. Since the methodology for SBLOCA analyses had been to perform the analyses at a near beginning of life (BOL) condition, where rod internal pressures are relatively low, most analyses did not result in the occurrence of rod burst, and therefore may not have reflected the most limiting time in life PCT. In order to evaluate the effects of this phenomenon, Westinghouse has developed an analytical model which allows the prediction of rod burst PCT effects based upon the existing analysis of record.

Assessment of Safety Significance

A 10 CFR Part 21 evaluation concluded that the effects of the burst/blockage modeling in the Westinghouse small break LOCA evaluation model will not represent a defect creating a substantial safety hazard and, more likely than not, will not result in a failure to comply with any applicable regulation relating to a substantial safety hazard.

Recommended Actions

Resolution of this issue may have resulted in a plant specific PCT change. Since evaluation of the issue was in progress in 1992, some PCT effect may have previously been reported as a temporary impact. The evaluation for this issue has been finalized, and remaining PCT effects are now considered a permanent change with respect to evaluating 1993 reporting requirements. Aside from determining reporting requirements relative to 10 CFR 50.46, no other utility action is necessary.

ATTACHMENT 2

REPORT OF CHANGES IN
APPLICATION OF ECCS EVALUATION MODELS

NORTH ANNA UNITS 1 AND 2

Revised SBLOCA Analysis for Reduced HHSI Flowrate

1.0 Background

This report provides a summary of changes in LOCA analysis results from those last reported for North Anna Units 1 and 2 (1). These changes are described in Section 2.0 below. It has been concluded that these changes are significant, as defined in 10CFR50.46(a)(3)(i).

2.0 Evaluation Model Changes

2.1 Revised Small Break LOCA Analysis (North Anna Units 1 and 2)

Since our previous 10CFR50.46 report (1), a revised analysis of the small break LOCA transient has been performed for North Anna Units 1 and 2. This revised analysis has been implemented as the analysis of record for both units via a station 10CFR50.59 evaluation (2), in conjunction with the provisions of North Anna Technical Specification 6.9.1.7.a (relating to the Core Operating Limits Report). This discussion summarizes the changes incorporated in this analysis. Analysis assumptions have been made which reflect operation with reduced high head safety injection (HHSI) flowrates, in addition to changes in other key analysis inputs. The key changes in assumptions from the prior analysis are listed below.

- ZIRLO cladding was assumed for the limiting fuel assemblies (versus Zircaloy-4 in the existing analysis)

- Reduction of 21 gpm in HHSI flow delivered to core at 1000 psig by two minimum flowing lines

- Peak Heat Flux Hot Channel Factor, FQ, of 2.20 (versus 2.32 in existing analysis)

- Peak value for Enthalpy Hot Channel Factor, $F\Delta h$, of 1.55 (versus 1.60 in existing analysis)

These changes are discussed further in the following paragraphs.

This analysis was performed using the 1985 Small Break LOCA Evaluation Model with NOTRUMP (3). Technical Specification 6.9.1.7.a lists this as an acceptable reference methodology for determination of relevant power distribution limits in the Core Operating Limits Report.

The revised analysis was performed to provide additional margin for the test acceptance criteria associated with Technical Specification 4.5.2.h. This specification requires "a flow balance test, during shutdown, following the completion of modifications to the ECCS subsystems that alter the subsystem flow characteristics." The acceptance criteria are intended to ensure that both the minimum flow requirements as established in the LOCA analysis and the maximum HHSI pump flow runout limitations are met.

The analysis assumed a reference cosine axial power distribution with a peak Heat Flux Hot Channel Factor, FQ(z), value of 2.20. A value of 1.55 was assumed for the peak Enthalpy Hot Channel Factor, FΔh. The assumed value for these parameters equals or bounds the maximum allowed value presently in North Anna Core Operating Limits Reports (2.19 for FQ(z), 1.55 for FΔh). These key assumptions were changed to partially offset the increase in calculated PCT associated with assuming reduced HHSI flowrates, so that the final margin to the 2200°F limit is sufficient for future needs.

The revised analysis of record PCT is 1961°F (1880°F base case + 81°F penalty for the limiting time in life-zirc/water oxidation penalty). This result does not include the PCT adjustments associated with other issues discussed in Attachment 1. These additional effects are presented on the summary table in Attachment 3. Since this result is more than 50°F greater than the existing analysis of record, implementation of this analysis represents a significant change, as defined in 10CFR50.46(a)(3)(i). The resulting licensing basis PCT demonstrates that operation at the rated thermal power of 2893 MWt with reduced HHSI flowrates and within current limits as specified in the Core Operating Limits Report will comply with all of the acceptance criteria specified in 10CFR50.46. Attachment 3 provides the PCT result for the revised analysis of record, in conjunction with appropriate margin assessments which address NOTRUMP evaluation model issues.

3.0 References

(1) Letter from W. L. Stewart (Va. Electric & Power Co.) to NRC, "Report of ECCS Evaluation Model Changes and 30-Day Report Per Requirements of 10CFR50.46, Surry Power Station Units 1 and 2, North Anna Power Station Units 1 and 2" Serial No. 93-182B, November 9, 1993.

(2) "North Anna Power Station Units 1 and 2 - Safety Evaluation for Revised Small Break LOCA Analysis with Reduced HHSI Flowrates," 10CFR50.59 Safety Evaluation 94-SE-OT-044, July 14, 1994.

(3) "Westinghouse Small Break ECCS Evaluation Model Using the NOTRUMP Code," WCAP-10054-P-A, August 1985.

ATTACHMENT 3

EFFECT OF WESTINGHOUSE ECCS EVALUATION MODEL MODIFICATIONS

NORTH ANNA UNITS 1 AND 2

Effect of Westinghouse ECCS Evaluation Model Modifications - North Anna

The information provided herein is applicable to North Anna Power Station, Units 1 and 2. It is based upon reports from Westinghouse Electric Corporation for issues involving the ECCS evaluation models and plant-specific application of the models in the existing analyses. Peak cladding temperature (PCT) values and margin allocations represent issues for which permanent resolutions have been implemented. Section A presents the detailed assessment for small break LOCA. The large break LOCA details are given in Section B.

Section A - Small Break LOCA Margin Utilization - North Anna Units 1 and 2

A. PCT for Analysis of Record (AOR) (1)	1880°F
B. Prior PCT Assessments Allocated to AOR (2)	0°F
1. Safety Injection in the Broken Loop	0°F
2. NOTRUMP Drift Flux Flow Regime Map Errors	- 13°F
3. Vessel & SG Calculation Errors in LUCIFER {4}	0°F
SBLOCA Augmented PCT for AOR	1867°F
C. PCT Assessments for 10CFR50.46(a)(3)(i) Accumulation	
1. Hot Assembly Average Rod Burst Effects {1} {2}	+ 5°F
2. Revised Burst Strain Limit Model {1} {2}	- 5°F
3. SBLOCA Limiting Time in Life-Zirc/Water Oxidation {1} {2}	+ 81°F
4. Charging/Safety Injection System Issues {2} {3}	0°F
SBLOCA Licensing Basis PCT (AOR PCT + PCT Assessments)	1948°F

Section B - Large Break LOCA Margin Utilization - North Anna Units 1 and 2

	Unit 1	Unit 2
A. PCT for Analysis of Record (AOR) (3)	2066°F	2066°F
B. Prior PCT Assessments Allocated to AOR (2)	0°F	0°F
1. Structural Metal Heat Modeling	- 25°F	- 25°F
2. LBLOCA/Seismic SG Tube Collapse	+ 6°F	+ 6°F
3. N2C10 Extended SGTP Evaluation	n/a	+ 35°F
LBLOCA Augmented PCT for AOR	2047°F	2082°F
C. PCT Assessments for 10CFR50.46(a)(3)(i) Accumulation		
1. Vessel & SG Calculation Errors in LUCIFER	- 6°F	- 6°F
2. LBLOCA Rod Internal Pressure Issues	0°F	0°F
LBLOCA Licensing Basis PCT (AOR PCT + PCT Assessments)	2041°F	2076°F

Notes { } and References ( ) on the following page

Effect of Errors/Changes in Application of ECCS Evaluation Models
North Anna Units 1 and 2

Notes:

{1} The current report is the initial quantification of effects for this issue.

{2} Refer to the Report of Westinghouse ECCS Evaluation Model Changes for 1993 provided in Attachment 1.

{3} The effects of these issues have been explicitly incorporated into the Charging/Safety Injection System design inputs used in the revised AOR.

{4} The effect of these issues have been explicitly incorporated into the vessel and steam generator design inputs used in the revised AOR.

References:

(1) "North Anna Power Station Units 1 and 2 - Safety Evaluation for Revised Large Break LOCA Analysis," 10CFR50.59 Safety Evaluation 94-082, March 28, 1994.

(2) Letter from W. L. Stewart (Va. Electric & Power Co.) to NRC, "Report of ECCS Evaluation Model Changes and 30-Day Report Per Requirements of 10CFR50.46-North Anna Power Station Units 1 and 2, North Anna Power Station Units 1 and 2," Serial No. 93-182B, November 9, 1993.

(3) Letter from W. L. Stewart (Va. Electric & Power Co.) to NRC, "North Anna Power Station Units 1 and 2, Proposed Technical Specifications Changes -Implementation of ZIRLO Cladding," Serial No. 93-614, October 4, 1993.