CE NUCLEAR POWER LLC

NON-PROPRIETARY CHANGE PAGES FOR CENPD-132, SUPPLEMENT 4-P, REVISION 1 CALCULATIVE METHODS FOR THE CE NUCLEAR POWER LARGE BREAK LOCA EVALUATION MODEL

December 2000

List of Change Pages for CENPD-132 Supplement 4-P, Revision 1

Page Number	Description of Change
v	Addition of Appendices F and G to table of contents
1.0-4 and 1.0-5	Removal of statements about 1985 EM process changes
1.0-12	Removal of proprietary brackets on Table 1.0-1
2.1-1	Removal of statements about 1985 EM process changes
2.2-4	Delta PCT correction
2.2-10	Delta PCT corrections in Tables 2.2-4 and 2.2-5
2.4-8 through 2.4-12	Model description nomenclature corrections and clarifications Removal of proprietary brackets on model description in Section 2.4.2.1
2.4-37	Added definition of average specific volume used in model as coded
2.4-40	Correction to Table 2.4.3-1
2.4-52	Addition of proprietary brackets on Figure 2.4.2.3.4-2
2.5-11	Added description of model as coded to define imposed regulatory limits
2.5-13	Consistent representation of times relative to beginning of transient
2.7-6 and 2.7-7	Typographical correction of reference numbers
3.0-4	Added text for use of CENPD-133 Supplement 4-P
3.0-12	Typographical correction of JOBID in Table 3.3-4
3.0-19	Added text on RWST temperature
A-1	Replacement of words for the 1985 EM process improvements
A-9	Added reference to COMZIRC code for interface file usage
A-11	Correction to Table A-6 heading
D-4	Correction to nomenclature definitions

Appendices

In addition, plant design data, used to provide analysis inputs, are conservatively biased in accordance with the LBLOCA EM to produce conservatism in the calculated limiting PCT and limiting peak cladding local oxidation percentage (PLO). In some cases, conservative biases have been selected that in reality cannot mutually co-exist.

In the 1985 EM, the CEFLASH-4A computer code (Reference 1.0-3) is used to perform the blowdown hydraulic analysis of the reactor coolant system (RCS) and the COMPERC-II computer code (Reference 1.0-4) is used to perform the refill/reflood hydraulic analysis and to calculate FLECHT-based reflood heat transfer coefficients. The HCROSS (Reference 1.0-5) and PARCH (Reference 1.0-6) computer codes are used to calculate steam cooling heat transfer coefficients. The PCT and PLO are calculated by the STRIKIN-II computer code (Reference 1.0-7). Core-wide cladding oxidation is calculated using the COMZIRC computer code (Appendix C of Supplement 1 of Reference 1.0-4). The initial steady state fuel rod conditions used in the analysis are determined using an NRC-approved fuel performance computer code, FATES3B (Reference 1.0-8).

1.2 Summary Description of Modifications to the LBLOCA EM

The following is a brief summary description of the modifications to the LBLOCA Evaluation Model for the 1999 EM. The modifications are organized into the three categories of changes described earlier.

1.2.1 1985 EM Process Changes Within the Current EM

There are three process changes to the LBLOCA ECCS performance analysis methodology that maintain consistency with the currently NRC-accepted EM. These 1985 EM process changes are included in this topical report in the context of the 1999 EM, but they do not require NRC review since they do not represent any change to the NRC-accepted EM. These process changes are as follows:

- Automated/Integrated Code System

  The automated/integrated code system for the 1985 EM and the 1999 EM is a process change that combines the various computer codes of the 1985 EM into an integrated code system. With the automated/integrated code system, the analysis process can be executed from start to finish without analyst intervention. The automated/integrated code system can be executed with selected computer codes, models, options, and features that fully represent the methodologies that comprise the currently NRC-accepted 1985 EM. This is referred to as "1985 EM Simulation." The modifications to the 1985 EM that are included in the 1999 EM are activated through options in the User Control Interface (UCI) file, which is part of the automated/integrated code system. The benefit of this 1985 EM process change is to reduce the introduction of discretionary conservatism that is commonly used to avoid repetitive case running and to eliminate interface hand calculations involved in manual transfer of data from one code to the next.

- Explicit NUREG-0630 Cladding Swelling/Rupture

  In the 1985 EM, the NUREG-0630 cladding swelling and rupture models are implemented through user controlled inputs. This process often leads to repetitive calculations while the analyst iterates on heating rate dependent inputs. The 1999 EM automated/integrated code system explicitly calculates the NUREG-0630 model components without analyst intervention or iteration in a manner fully consistent with the approach described in the NRC-approved documentation for the 1985 EM. Therefore, this 1985 EM process change improves numerical precision, eliminates iterative case running, and remains consistent with currently approved methodology.

Table 1.0-1
1985 EM Major Sources of Conservatism

Category of Conservatism	List of Sources of Conservatism
10 CFR 50, Appendix K	1971 ANS Decay Heat with 1.2 Multiplier Reactor Coolant Pump Locked Rotor Resistance to Steam Venting Less than 1 in/sec reflood steam cooling Baker-Just oxidation kinetics No return to nucleate boiling
SER Constraints/Limitations	Worst axial power shape and worst time-in-life fuel performance Worst single failure of ECCS component confirmed for every submittal Highest injection section pressure drop loss coefficients NRC uniform plastic strain modeled NRC prescribed hot wall delay for ECCS refilling the vessel Worst rod-to-rod radiation enclosure for hot rod heatup Heat transfer coefficients from steam cooling model must be no greater than FLECHT
Model Aspects/Assumptions	Injected ECCS removed from vessel at end of blowdown Infinite steam generator secondary heat source/heat sink modeling during reflood Steam cooling based on core average steam flow All reflood liquid carryover evaporated to minimize steam venting
Discretionary	Bounding plant parameter or analysis inputs Combine worst conditions for containment response with different worse conditions for core response Forced cladding rupture elevation to maximize PCT Maximize cladding swelling and blockage

2.1 Process Change within the Currently NRC-Accepted EM

This section describes three process changes to the LBLOCA ECCS performance analysis methodology that remain consistent with the currently NRC-accepted 1985 EM. These process changes are presented here in the context of the 1999 EM but they do not require NRC review since they do not represent any change to the NRC-accepted 1985 EM. These changes are provided herein for completeness of the 1999 EM description. These three process changes are the following:

1. Automated/Integrated Code System
2. Explicit NUREG-0630 Cladding Swelling/Rupture
3. Consistent Modeling of Spray and Spillage into the Containment

In the 1985 EM, the analyst may introduce conservatism in certain parameters in order to eliminate repetitive case running and excessive interface hand calculations required to transfer data from one code to the next. That is, the analyst may control the manner in which interface data is transferred from one code to the next by deliberately selecting values to conservatively bias the data transfer process. The purpose of these three 1985 EM process changes is to reduce this type of discretionary conservatism and bring more consistency to the analysis process and its results. These 1985 EM process changes represent no change to the NRC-accepted methodology. Conservatism is maintained through the many conservative aspects of the 1985 EM and through the other discretionary conservatisms listed in Section 2.1.1.1.

] These results are shown in Tables 2.2-4 and 2.2-5. Table 2.2-5 shows that the hot rod PCT during the late reflood [ ]

2.2.4 Applicability to LBLOCA Analysis

The [ ] film boiling correlation is [ ]

2.2.5 Model as Coded

2.2.5.1 CEFLASH-4A Code

The [ ] correlation is implemented in the CEFLASH-4A code in a heat transfer calculations subroutine. The correlation is implemented in the form given in Equation (2.2.1-1) with the following [

]

Table 2.2-4
Effect of Removing the Dougall-Rohsenow Correlation from CEFLASH-4A which Analyzes the Hot Assembly Average Rod during the Blowdown Portion of the LBLOCA Transient

[

]

Table 2.2-5
Effect of Removing the Dougall-Rohsenow Correlation from STRIKIN-II which Analyzes the Hot Rod During the Entire LBLOCA Transient

[

]

]

2.4.1.3 Sectionalized Steam Generator Model

[

]

i. Sectionalized Secondary Side Temperature Model

[

]

ii. Steam Generator Tube Temperature Model

[

]

Here section i ranges from 1 to 2N.

iii. Steam Generator Tube Primary Side Temperature Model

[

]

Here section i ranges from 1 to 2N. Note that the delta temperature definition at the inlet and outlet of axial section i, follows from the assumption that the tube metal temperature is constant along the length of each section (see Subsection ii).

iv. Primary Side Heat Transfer Coefficients

The primary side heat transfer coefficients for each axial section in the steam generator tubes are calculated with the [

]

All fluid properties are evaluated at the bulk temperature for section i.

The overall heat transfer coefficient on the primary side is calculated as follows for each axial section of the tubes:

[

]

v. Secondary Side Heat Transfer Coefficients

The heat transfer rate for each axial section on the steam generator tubes secondary side (i ranging from 1 to 2N) is calculated using the equation

$$Q_{sec,i} = H_{sec,i} A_{sec,i} (T_{tube,i} - T_{sec,j})$$

where

$Q_{sec,i}$	Steam generator tube heat transfer rate (secondary side) (Btu/sec) (section i)
$H_{sec,i}$	Overall secondary side heat transfer coefficient (Btu/sec ft^2 °F) (section i)
$A_{sec,i}$	Secondary side tube heat transfer area (ft^2) (section i)
$T_{tube,i}$	Steam generator tube temperature (°F) (section i)
$T_{sec,j}$	Secondary side layer temperature (°F) (layer j)
j	Secondary side layer in contact with section i of the tubes

The heat transfer coefficients for each axial section on the steam generator tubes secondary side are calculated with the[

]

The overall heat transfer coefficient on the secondary side of the tubes for each section is calculated as follows:

[

]

2.4.2 Model Assessment

2.4.2.1 Steam Generator Model Performance for LBLOCA Analysis

Implementation of the 1999 EM steam generator model to de-superheat the steam as it exits the steam generator tubes reduces the resistance to steam venting through the loops, and results in an increase of the core reflood rate. An evaluation of the system response to the implementation of the secondary side model on a COMPERC-II LBLOCA calculation is shown in Figures 2.4.2.1-1 through 2.4.2.1-16. In these figures, the performance of the 1985 EM is compared to the 1999 EM. These comparisons are intended to illustrate the effect and

]

Minkowycs and Sparrow (Reference 2.4-6) obtained analytical solutions for flow over vertical cylinders when the above criteria is not met. They have shown that for[

]

b. The [ ] Correlation

The [ ] correlation is used to calculate heat transfer to the steam phase in the steam generator tubes. The correlation was developed from data for heating and cooling in tubes in Reference 2.4-4. Its applicability to the turbulent region (Re > 6000) has been confirmed by experiments to within ±25% (Reference 2.4-11).

2.4.5 Model as Coded

The steam generator tube model coding follows the description of the model in Sections 2.4.1.3 (iii) and 2.4.2.3.1. The steam generator secondary side model coding follows the description of the model in Sections 2.4.1.2 and 2.4.1.3 ((i) and (ii)). The [ ] correlation (Section 2.1.4.3 (v)) and the [ ] correlation (Section 2.1.4.3 (iv)) are implemented as described. The steam generator resistance to steam venting is corrected for density as described in the COMPERC-II topical report, Reference 2.4-1, Page E-2. For the 1999 EM, the density used is the inverse of the steam generator tubes average specific volume, which is calculated as follows:

[

]

Table 2.4.3-1
Effect of Activating the 1999 EM Steam Generator Model in COMPERC-II

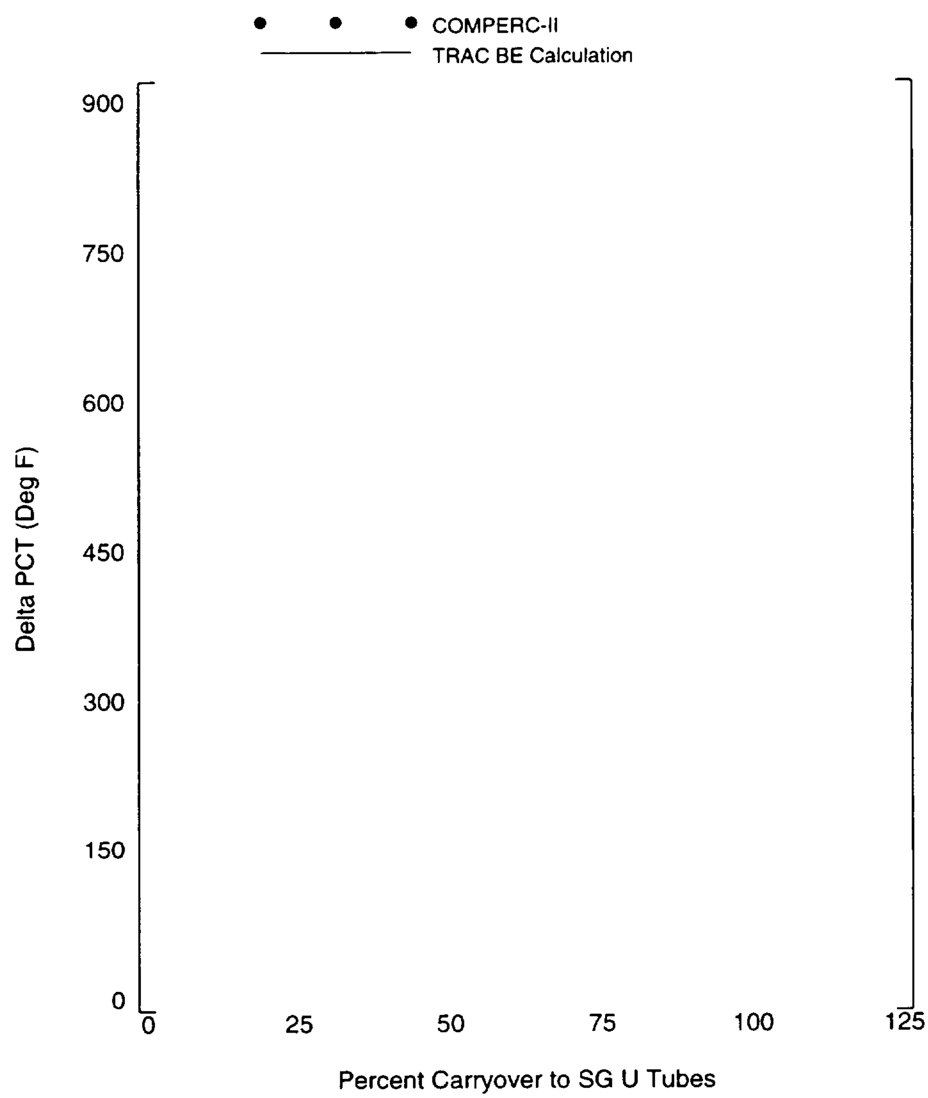
[

]

Figure 2.4.2.3.4-2

Effect of Entrainment on PCT

COMPERC-II vs. TRAC BE Calculation



2.5.4 Applicability to LBLOCA Analysis

- The discussion in CENPD-132 Volume 1, Section III.D.5 (Reference 2.5-2) includes results from one-fifth and one-third scale models of the cold leg piping, and showed that ECCS injection can be described[

  ]

- The 2D/3D Test Program (Reference 2.5-6), and the discussion in Section 2.5.2, show that the realistic observed effect of the nitrogen discharge process is a net addition of water into the core. Since the 1999 EM injection section delta pressure model reduces the amount of water entering the core during the time of nitrogen injection, the model [ ]

2.5.5 Model as Coded

The COMPERC-II nitrogen blowdown delta pressure is calculated as described. The nitrogen and liquid mixture velocity in the safety injection line is calculated using Equations (2.5-5), (2.5-6) and (2.5-7). The liquid, steam and nitrogen mixture velocity in the cold legs is calculated using Equations (2.5-2), (2.5-3) and (2.5-4).

The differential pressure across the injection line is calculated using Equation (2.5-1). To ensure conformance to regulatory limits on the injection section differential pressure, the updated code logic subjects the results of Equation (2.5-1) to the following limitations:

[

]

Table 2.5-1

Effect of the 1999 EM Nitrogen Release Flow Resistance Model on PCT

(Times Referenced to the Beginning of the Transient)

Case	Reduction in PCT °F	Comparison of time of one inch/sec (1985 EM vs. 1999 EM) Seconds	Time of end of nitrogen blowdown (1985 EM and 1999 EM) Seconds
[			
			]

2.7.4 Applicability to LBLOCA Analysis

- The STRIKIN-II rod-to-rod radiation model is an approved NRC model for LBLOCA analysis. The STRIKIN-II calculated heat flux is implemented into PARCH and is applied fully consistent with the STRIKIN-II application.
- The use of the minimum of the FLECHT and the steam cooling heat transfer coefficients in the PARCH code for the rupture node is consistent with the SER requirement on the STRIKIN-II calculation.
- The HCROSS steam cross-flow model for the calculation of flow blockage and flow redistribution is also a NRC approved model for LBLOCA calculations.

2.7.5 Model as Coded

2.7.5.1 Implementation of the STRIKIN-II Rod-to-Rod Radiation Heat Flux into PARCH

The rod-to-rod radiation heat flux is calculated in STRIKIN-II. The radiation heat flux is transferred to PARCH at each time step and each STRIKIN-II axial node through the heat flux interface variable in units of Btu/hr-ft^2.

The PARCH program transposes the radiation heat flux array from the STRIKIN-II nodalization into an array for the PARCH nodalization by[

]

To implement the radiation heat flux into the integration of the fuel rod temperature equations in PARCH, the term b_3 in Equation (3.2.1-21) in CENPD-138, Reference 2.7-2, is modified as follows:

[

]

2.7.5.2 Transfer of FLECHT Heat Transfer Coefficients for the Rupture Node to PARCH

STRIKIN-II calculates the heat transfer coefficients for all nodes during the reflood period. For the hot rod nodes equal to or above the rupture node elevation, the required heat transfer coefficient is equal to [

] In PARCH, the interface heat transfer coefficient is temperature corrected using the steam temperature, and is used to bound the new steam cooling heat transfer coefficient.

2.7.5.3 Transfer of all HCROSS Steam Cross-Flows to the PARCH Steam Channel

The steam cross-flows are calculated in HCROSS as axial flow fractions. The PARCH code reads the HCROSS flow fractions and defines the PARCH code flow fraction variables. The steam flow at each elevation is defined at each HCROSS axial node. This flow rate is [

] The PARCH coolant energy balance is calculated using the same methodology as the 1985 EM with a finer nodalization.

that no other SER for the 1985 EM or earlier versions of the EM implied any such similar limitation. Moreover, CE Nuclear Power LLC believes that the 1985 EM and the 1999 EM are in fact applicable to analysis of mixed core configurations.

Resolution of this issue is also important because of the acquisition of CE Nuclear Power LLC by Westinghouse. This means that the fuel for Combustion Engineering PWRs will be manufactured at a Westinghouse facility and could therefore be considered Westinghouse manufactured fuel, not CE manufactured fuel.

2. **Referencing CENPD-133 Supplement 4-P**

The SER for the 1985 EM, Reference 3.0-1, inadvertently failed to cite in its reference list one of the topical report supplements that comprise the 1985 EM; and which will also comprise the 1999 EM. During our research for the 1999 EM model changes documented in this submittal, no evidence was found regarding NRC disposition of CEFLASH-4A Supplement 4. It is possible that the supplement did not require an SER since it impacted PCT by less than the 20°F limit imposed in the 1970's. Furthermore, the exact model change had been made earlier to the STRIKIN-II code and was approved by the staff. Nevertheless, there should be closure to this issue since the submitted change is made in order to conform to the Appendix K requirement on "no return to nucleate boiling." The 1999 EM automated/integrated code system licensing basis includes the referenced supplement since it is part of the 1985 EM. All of the methodology changes described in CENPD-133 Supplement 4-P, including the change made to conform to the Appendix K requirement on "no return to nucleate boiling," were incorporated into the 1985 EM.

Table 3.3-4

1999 EM Parameter Study

Safety Injection Pump Actuation Time

[

Result	Case (1) 1999 EM SI on Early Reflood	Case (2) 1999 EM SI on at TAD	Case (3) 1999 EM SI on after SITs Empty

]

iii. 1999 EM with Failure of a Diesel Generator

This analysis utilizes all of the proposed 1999 EM improvements including the automated/integrated code system with the automatic spray and spillage model. ECCS delivery is represented by the minimum injection to the cold legs from one LPSI pump and one HPSI pump. Containment spray delivery is represented with one spray pump, and for conservatism, maximum delivery is assumed. Table 3.4-2 shows that the PCT for this case is [ ]which is a[ ]relative to the case with no ECCS component failure.

Figures 3.4-5 through 3.4-8 show the impact of the failure of a diesel to the previous cases with no failure and loss of a LPSI. [

]

3.4.4 Summary of Worst Single Failure Study

In summary, this worst single failure analysis shows that no failure of an ECCS component produces the highest PCT for the 1999 EM. Consistent representation of ECCS injection to the cold legs and spillage of ECCS inventory to containment using the automatic spray and spillage model produces a worse single failure response that is slightly different than that calculated in the 1985 EM reference case, which is characterized by a conservative representation of these effects. The PCTs for the 1999 EM worst single failure cases were [ ] with the largest difference being [.] Other plant configuration combinations of containment size and ECCS delivery rates, may lead to a different conclusion, therefore, the worst single failure analysis will be performed for each application of the 1999 EM. The worst single failure of an ECCS component must include consideration of the most limiting value of the RWST temperature as described in Section 3.3.1.

Appendix A

Input and Output Descriptions for the 1999 EM Automated/Integrated Code System

A.1 The User Control Interface Input File

The User Control Interface (UCI) file is a single file containing input variables that control model options in CEFLASH-4A (Reference A-1), COMPERC-II (Reference A-2), STRIKIN-II (Reference A-3), PARCH (Reference A-4), and HCROSS (Reference A-5). The UCI file consists of line entries in free format. The first entry of each line describes the model option identifier (an alphanumeric variable without blanks). The second entry is a numeric variable identifying the option. Trailing comments are optional. The list of UCI variables is given in Table A-1. If a UCI input variable is not entered in the file, then its value will default to either zero or to the default value indicated in Table A-1.

Table A-1 also lists required and optional input options for executing the LBLOCA computer codes in one of the following three modes:

- 1985 EM consistent with currently approved EM
- 1985 EM with process improvements documented in this topical report consistent with currently approved EM
- 1999 EM as described by this topical report.

Table A-4

Interface File Content for

cml.htcof.jobid

[

Line ID	Typical Value	Code	Description	Units

]

Table A-6

Interface File Content for

fre.htcof.jobid

[

]

Interface File Content for

fre.cmz.jobid

[

]

$= \rho^2 \beta g L^3 \Delta T / \mu^2$

L	= *Characteristic length (ft)*
Pr_L	= *Prandtl number*
ρ	= *Density (lbm/ft³)*
β	= *Thermal expansion coefficient (1/°F)*
g	= $32.17\ (ft/sec^2)$
ΔT	= $T_{tube} - T_{sec}$ (°F)
μ	= *Viscosity (lbm/sec ft)*
D	= *Hydraulic diameter (riser region, ft)*

This part of the RAI response will explain the merit of using Equation (2.4.1.3-1) instead of the Eckert-Jackson correlation in the 1999 EM.

Equation (2.4.1.3-1) is the model used in several instances for modeling free convection in the ABB CENP large break and small break evaluation models. It was used in the 1999 EM for consistency and convenience. Its choice for the 1999 EM was justified on Page 2.4-35 in Section 2.4.4.iii.a.

In order to evaluate the merit of using Equation (2.4.1.3-1) vs. the Eckert-Jackson correlation, the correlations were compared over a wide range of conditions that included approximately 900 points, with pressure ranging from 500 to 1000 psia, liquid temperatures from saturation to 100 °F subcooling and wall-to-liquid delta temperatures ranging from 0 °F to 50 °F. The results of this comparison are shown in Figure D.2-1. The Eckert-Jackson correlation was derived from heat transfer data that was in good agreement with experimental data in the range of Grashof numbers from 10^{10} to 10^{12}. The formula may be used for higher Grashof numbers (Reference D.2-2). Grashof numbers used for the above comparison range from 10^{12} to 10^{14}.

The Eckert-Jackson correlation and Equation (2.4.1.3-1) are of [

]

The COMPERC-II FLECHT-SEASET simulation described in Sections 2.4.2.2 and 2.4.2.3.2 used Equation (2.4.1.3-1) to calculate the secondary side free-convection heat transfer coefficients. The COMPERC-II results for FLECHT-SEASET Test 22920 (Section 2.4.2.2 (iv)) demonstrate the adequacy of Equation (2.4.1.3-1) used for the secondary side. This test is a pure steam test at the SG tube inlet and shows that the COMPERC-II SG model realistically calculates the results of the test including the secondary side temperature distribution and heat transfer (see Figures 2.4.2.2-11 and 2.4.2.2-12).

(The COMPERC-II simulation of the other FLECHT-SEASET tests (Sections 2.4.2.2 (ii) and (iii)) are [

CE NUCLEAR POWER LLC

CHANGE PAGES FOR CENPD-132, SUPPLEMENT 4-P, REVISION 1 CALCULATIVE METHODS FOR THE CE NUCLEAR POWER LARGE BREAK LOCA EVALUATION MODEL

PROPRIETARY AFFIDAVIT

Affidavit Pursuant To 10 CFR 2.790

I, Philip W. Richardson, depose and say that I am the Manager, Windsor Nuclear Licensing, of CE Nuclear Power LLC (CENP), duly authorized to make this affidavit, and have reviewed or caused to have reviewed the information which is identified as proprietary and referenced in the paragraph immediately below. I am submitting this affidavit in conformance with the provisions of 10 CFR 2.790 of the Commission's regulations for withholding this information.

The information for which proprietary treatment is sought is contained in the following document:

CENPD-132, Supplement 4-P, Revision 1, "Calculative Methods for the CE Nuclear Power Large Break LOCA Evaluation Model", August 2000

This document has been appropriately designated as proprietary.

I have personal knowledge of the criteria and procedures utilized by CENP in designating information as a trade secret, privileged or as confidential commercial or financial information. Pursuant to the provisions of 10 CFR 2.790(b)(4) of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure, included in the above referenced document, should be withheld.

1. The information sought to be withheld from public disclosure, is owned and has been held in confidence by CENP. It consists of the methodology for the evaluation of LOCA pursuant to 10 CFR 50, Appendix K, comparisons to experimental data for model verification and comparison to the previously approved methodology.
2. The information consists of test data or other similar data concerning a process, method or component, the application of which results in substantial competitive advantage to CENP.
3. The information is of a type customarily held in confidence by CENP and not customarily disclosed to the public. CENP has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence.
4. The information is being transmitted to the Commission in confidence under the provisions of 10 CFR 2.790 with the understanding that it is to be received in confidence by the Commission.
5. The information, to the best of my knowledge and belief, is not available in public sources, and any disclosure to third parties has been made pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence.
6. Public disclosure of the information is likely to cause substantial harm to the competitive position of CENP because:
   a. A similar product is manufactured and sold by major pressurized water reactor competitors of CENP.
   b. Development of this information by CENP required hundreds of thousands of dollars and thousands of man-hours of effort. A competitor would have to undergo similar expense in generating equivalent information.
   c. In order to acquire such information, a competitor would also require considerable time and inconvenience to develop methodology for the evaluation of LOCA pursuant to 10 CFR 50, Appendix K, comparisons to experimental data for model verification and comparison to the previously approved methodology.
   d. The information consists of methodology for the evaluation of LOCA pursuant to 10 CFR 50, Appendix K, comparisons to experimental data for model verification and comparison to the previously approved methodology, the application of which provides a competitive economic advantage. The availability of such information to competitors would enable them to modify their product to better compete with CENP, take marketing or other actions to improve their product's position or impair the position of CENP's product, and avoid developing similar data and analyses in support of their processes, methods or apparatus.
   e. In pricing CENP's products and services, significant research, development, engineering, analytical, manufacturing, licensing, quality assurance and other costs and expenses must be included. The ability of CENP's competitors to utilize such information without similar expenditure of resources may enable them to sell at prices reflecting significantly lower costs.
   f. Use of the information by competitors in the international marketplace would increase their ability to market nuclear steam supply systems by reducing the costs associated with their technology development. In addition, disclosure would have an adverse economic impact on CENP 's potential for obtaining or maintaining foreign licensees.

Further the deponent sayeth not.

Philip W. Richardson
Manager, Windsor Nuclear Licensing

Sworn to before me
this 30th day of August, 2000

Laurie J. White
Notary Public
My commission expires: 8/31/04

AFFIDAVIT PURSUANT TO 10 CFR 2.790

I, Philip W. Richardson, depose and say that I am the Manager, Windsor Nuclear Licensing, of CE Nuclear Power LLC (CENP), duly authorized to make this affidavit, and have reviewed or caused to have reviewed the information which is identified as proprietary and referenced in the paragraph immediately below. I am submitting this affidavit in conformance with the provisions of 10 CFR 2.790 of the Commission's regulations for withholding this information.

The information for which proprietary treatment is sought is contained in the following document:

Enclosure 1-P to LD-2000-0057, "Response to Questions Regarding CENPD-132, Supplement 4-P, Rev. 1", November 2000

This document has been appropriately designated as proprietary.

I have personal knowledge of the criteria and procedures utilized by CENP in designating information as a trade secret, privileged or as confidential commercial or financial information. Pursuant to the provisions of 10 CFR 2.790(b)(4) of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure, included in the above referenced document, should be withheld.

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   d. The information consists of methodology for the evaluation of LOCA pursuant to 10 CFR 50, Appendix K, comparisons to experimental data for model verification and comparison to the previously approved methodology, the application of which provides a competitive economic advantage. The availability of such information to competitors would enable them to modify their product to better compete with CENP, take marketing or other actions to improve their product's position or impair the position of CENP's product, and avoid developing similar data and analyses in support of their processes, methods or apparatus.
   e. In pricing CENP's products and services, significant research, development, engineering, analytical, manufacturing, licensing, quality assurance and other costs and expenses must be included. The ability of CENP's competitors to utilize such information without similar expenditure of resources may enable them to sell at prices reflecting significantly lower costs.
   f. Use of the information by competitors in the international marketplace would increase their ability to market nuclear steam supply systems by reducing the costs associated with their technology development. In addition, disclosure would have an adverse economic impact on CENP 's potential for obtaining or maintaining foreign licensees.

Further the deponent sayeth not.

Philip W. Richardson
Licensing Project Manager, Windsor Nuclear Licensing

Sworn to before me
this 10th day of November, 2000

Catherine P. McCarthy
Notary Public
My commission expires: 1/31/03