October 31, 2003
WOG-03-563

WCAP-15996-P Rev. 0
WCAP-15996-NP Rev. 0
Project Number 694

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

Attn: Chief, Information Management Branch
Division of Program Management

Subject: **Comments on Draft Safety Evaluation for WCAP-15996-P, Rev. 0, "Technical Description Manual for the CENTS Code"**

References:

1. NRC Letter, S. Dembek (NRC) to G. Bischoff (Westinghouse), "Draft Safety Evaluation for Topical Report WCAP-15996-P, Technical Description Manual for the CENTS Code, (TAC No. MB6982)," October 6, 2003

2. WOG Letter, G. S. Pavis to USNRC Document Control Desk, "Submittal of Combustion Engineering Owners Group Reports: WCAP-15996-P (Proprietary) and WCAP-15996-NP (Non-Proprietary), entitled Technical Description Manual for the CENTS Code," CEOG-02-256, December 13, 2002

On October 6, 2003, the Nuclear Regulatory Commission (NRC) issued a draft Safety Evaluation (SE) for WCAP-15996-P, "Technical Description Manual for the CENTS Code the CENTS," for review and comment (Ref. 1). Westinghouse Electric Company LLC (Westinghouse) on behalf of the Westinghouse Owners Group (WOG) has reviewed the draft SE. Comments on the draft SE are provided in Enclosure 1 (proprietary) and 2 (non-proprietary).

Enclosure 1 contains information proprietary to Westinghouse and it is requested that this information be withheld from public disclosure pursuant to 10 CFR 2.790. The reasons for withholding this proprietary information are contained in the affidavit provided with the submittal of WCAP-15996-P (Ref. 2). Correspondence with respect to the proprietary information or the Westinghouse affidavit should be addressed to Mr. John Galembush, Acting Manager, Manager of Regulatory Compliance and Plant Licensing, Westinghouse Electric Company LLC, P. O. Box 355, Pittsburgh, Pennsylvania 15230-0355.

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All correspondence and invoices related to the review of WCAP-15996-P should be addressed to:

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If you require further information, please contact Mr. Jim Molkenthin in the Owners Group Program Management Office at (860) 731-6727

Sincerely,

Frederick P. "Ted" Schiffley, II
Chairman, Westinghouse Owners Group

Enclosures

cc: Management Committee
Analysis Subcommittee
Project Management Office
C. B. Brinkman, Westinghouse
H. A. Sepp, Westinghouse
J. S. Galembush, Westinghouse
M. C. Janke, Westinghouse
V. A. Paggen, Westinghouse
E. J. Schulz, Westinghouse
S. Dembek, NRC, Westinghouse
D. G. Holland, NRC (via Federal Express)

Proprietary Information Notice

Transmitted herewith are proprietary and non-proprietary versions of documents furnished to the NRC in connection with requests for generic and/or plant-specific review and approval.

In order to conform to the requirements of 10 CFR 2.790 of the Commission's regulations concerning the protection of proprietary information so submitted to the NRC, the information which is proprietary in the proprietary versions is contained within brackets, and where the proprietary information has been deleted in the non-proprietary versions, only the brackets remain (the information that was contained within the brackets in the proprietary versions having been deleted).

Comments on Draft Safety Evaluation for WCAP-15996-P, Rev. 0, "Technical Description Manual for the CENTS Code"

Comments on Draft Safety Evaluation for WCAP-15996-P, Rev. 0, "Technical Description Manual for the CENTS Code"

Westinghouse Electric Company LLC (Westinghouse) on behalf of the Westinghouse Owners Group (WOG) has reviewed the Nuclear Regulatory Commission (NRC) draft Safety Evaluation (SE) for WCAP-15996-P, "Technical Description Manual for the CENTS Code the CENTS." Comments have been captured in a markup of the draft SE which is provided on the following pages. In order to make any discussion of the comments more efficient, line numbers have been incorporated in the right hand margin of the SE. In general, comments are provided in the form of suggested text changes or as clarification questions incorporated within {brackets}. These comments suggesting text additions or clarification questions show up as underlined text. Comments suggesting text deletions show up as ~~strikethrough~~ text. Several comments relate to rewording of the text to eliminate proprietary information which was inadvertently incorporated in the draft SE. Proprietary text which needs to be expunged from the SE is enclosed in bold **[**brackets**]**. In all cases, where the SE has been altered in some way, change bars are provided in the left hand margin (as shown here).

CENTS Draft SE Comment Summary

Line Number	Comment Description
11, 13	Suggest incorporating reference for submittal of CENTS Volume 4.
17	Suggest incorporating reference for submittal of CENTS RAI responses.
18, 19, 20	Update reference numbers due to previous incorporation of additional references.
31 - 33	Request for clarification of the intent of the word "supercede" on Line #29.
36 - 40	Suggest incorporating a more specific statement regarding CENTS usage with respect to analysis of loss-of-coolant accidents (LOCAs).
41	Editorial
43, 44	Suggest incorporating a more complete statement regarding staff-approved design codes against which CENTS was originally benchmarked. Also, suggest deleting reference.
60	Editorial
62	Suggest incorporating a more specific statement regarding CENTS usage.
79 - 81	Suggest incorporating specific reference to the sui generis application the SER refers to and also update reference number.
83 - 87	Suggest incorporating a more specific constraint clarification regarding use of CENTS for a portion of a CEA Ejection evaluation, as indicated.
103, 104	Suggest incorporating a more specific statement regarding the dose model assessment.
106	Suggest incorporating a more specific section title.
115	Suggest changing section title to eliminate proprietary information.
118, 119	Suggest deleting text to eliminate proprietary information.
123	Change "channel" to "tube" to clarify that it is steam generator and not core heat transfer that is being discussed.
130 - 132	If SER statement is an limitation, it would seem to follow that it should be included in the Conclusion section where the NRC lists limitations.
161	Suggest incorporating a more specific clarification regarding use of updated CENTS version in a manner which replicates the previously accepted version of the code.
164	Editorial
211 - 212	Suggest incorporating a more specific statement regarding the dose model assessment.
216	Update reference number.
227 - 228	Suggest incorporating a more specific statement regarding the dose model assessment.
238 - 242	Suggest incorporating a more specific statement regarding CENTS usage with respect to analysis of loss-of-coolant accidents (LOCAs).

CENTS Draft SE Comment Summary

Line Number	Comment Description
249 - 253	Suggest incorporating a more specific constraint clarification regarding use of CENTS for a portion of a CEA Ejection evaluation, as indicated.
255 - 258	Correction of submittal reference.
259 - 261	Incorporation of submittal reference for CENTS Volume 4.
262 - 264	Incorporation of submittal reference for CENTS RAI responses.
265	Update reference number.
266	Update reference number.
269 - 271	Update reference number and correct document number.
272 - 274	Incorporate reference for CEA Ejection Event sui generis application.
275	Incorporate reference for RELAP5/MOD3.
276 - 277	Incorporate reference for CENPD-190-A, CEA Ejection methodology.
279 - 280	Delete incorrect reference to CEFLASH-4AS.
281	RELAP5/MOD3 reference is now Reference 8.

UNITED STATES

NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
TOPICAL REPORT WCAP-15996-P, "TECHNICAL DESCRIPTION MANUAL FOR THE CENTS CODE"
WESTINGHOUSE OWNERS GROUP
PROJECT NO, 694

1.0 INTRODUCTION

By letters dated December 13, 2002 and February 19, 2003, the Combustion Engineering Owners Group submitted Topical Report (TR) WCAP-15996-P, "Technical Description Manual ~~to~~ for the CENTS Code" (References 1 and 2), to the NRC staff for review and approval of the transient analysis methodology described therein for licensing applications with regard to both Combustion Engineering- (CE) and Westinghouse-designed pressurized water reactors (PWRs). By letter dated June 13, 2002, the Westinghouse Owners Group provided responses to the staff's request for additional information (Reference 3). WCAP-15996-P is an update of CENPD-282-P-A (Reference ~~2~~4); the latter was previously reviewed and approved by the staff for application to CE-designed PWRs (Reference ~~3~~5), and subsequently the staff extended this approval to Westinghouse-designed PWRs (Reference ~~4~~6). Central to the methodology described and discussed at length in both submittals is the CENTS computer code. This review focuses on, although is not limited to, the changes made to the CENTS code, between the approved version described in CENPD-282-P-A and the improved version described in WCAP-15996-P. The changes were made to more accurately model plant systems and transient behavior of the reactor system. To assist the staff in the review, Westinghouse prepared a "Roadmap" that identifies the changes made to the original TR, CENPD-282-P-A, and the rationale for the changes. This review relies to a great extent, although not exclusively, on the submitted "Roadmap."

The Westinghouse TR WCAP-15996-P will, on approval, supercede CENPD-282-P-A; the latter was previously found acceptable by the staff for referencing in licensing actions with respect to the calculation of transient behavior in PWRs. {Does "supercede" mean the documentation or the implementation? Westinghouse assumes that the new CENTS version can still be used in the manner described in CENPD-282-P-A, Rev. 0. That is, with the new models turned off.} In particular, the evaluation and approval of the models in the CENTS code, central to the CENPD-282-P-A methodology, are limited to non-loss-of-coolant accident (LOCA) licensing analyses. That is, CENTS is not approved for demonstrating compliance to 10CFR50.46 acceptance criteria. It is, however, acceptable when used to model small breaks in the primary system, that can be classified as LOCAs, for the purpose of demonstrating compliance to non-LOCA regulatory acceptance criteria. For example, CENTS is used to evaluate the dose consequences of Steam Generator Tube Rupture and Letdown Line Break events. The qualification of the previous versions of the CENTS code~~, to this end,~~ was based on CENTS predictions of startup measurements, operating transients, and comparisons to calculations made with other staff-approved design codes (e.g., CESEC, CEFLASH-4AS, RELAP5/MOD3) ~~(Reference 5)~~. Since model upgrades to the CENTS code are under review, the staff evaluated differences in the predictions of the originally approved code version and those of the upgraded CENTS version described in WCAP-15996-P for the most limiting design basis events. The basis for the approval of WCAP-15996-P is that any variance from previous results due to the model changes precludes exceeding the safety-related limits on which the approved CENPD-282-P-A methodology was based.

2.0 REGULATORY EVALUATION

Section 50.34 of Title 10 of the Code of Federal Regulations (10 CFR) contains requirements for the analysis of abnormal plant operating events by licensees. NUREG-0800, "Review of Safety Analysis Reports for Nuclear Power Plants," provides guidelines to licensees and the staff for evaluating these types of events. Section 50.71 requires licensees to update the final safety analysis report (FSAR) for a given site periodically. Included in the FSAR are the descriptions of abnormal events and accidents for which a given plant is analyzed. These are typically referred to as Chapter 15 analyses, corresponding to Chapter 15 of NUREG-0800.

The CENTS code is intended to provide analysis capability in the areas of engineering, operations and training. It also is intended to provide evaluation capabilities for transient~~s~~ events, accidents, operator actions, design and scoping studies. Under this review, it is specifically being evaluated for demonstration of compliance to acceptance criteria for non-LOCA Chapter 15 analyses for PWRs.

3.0 SUMMARY OF WCAP-15996-P

The Westinghouse submittals identified the specific changes that have been incorporated into the CENTS code since its previous approval. These modifications can be grouped into two classes: those that do not have an impact on the computed results and those that do affect the computed results.

In the former class are the editorial changes to the descriptions in CENPD-282-P-A with regard to the models of the bubble rise velocity used in the heat transfer coefficient for bubble condensation and the annulus bubble release rate. Both changes bring the text in the TR into conformance with the correct and previously approved coding in the CENTS code. The staff approves these changes. Westinghouse also requested a clarification of the restriction on the use of the CENTS code for application to control element assembly (CEA) ejection licensing analyses. With regard to CEA ejection licensing analyses, the safety evaluation for CENPD-282-P-A states, " ... CENTS is not approved for performing CEA ejection licensing analyses." The rationale for this restriction is stated as " Benchmarking for the CEA ejection transient has not been provided...". A sui generis application of the CENTS code to a CEA ejection event, submitted by Arizona Public Service Company for the Palo Verde Nuclear Generating Station Units 1, 2 and 3, has been reviewed and approved by the staff (Reference ~~6~~7). The staff will continue to entertain, on a case-by-case basis, such analyses for review.

Suggest the following wording change for your consideration with respect to CEA Ejection:

CEA Ejection Analyses: CENTS is acceptable for analyzing the NSSS thermal hydraulic response aspects of the CEA Ejection event. CENTS is not approved for evaluation of the fuel failure aspect of the CEA ejection accident. This aspect must be evaluated using STRIKIN-II as documented in Reference 9.

Westinghouse has added a new dose assessment model to the CENTS computer code that has the capability to calculate offsite dose due to an accident condition. Westinghouse has indicated that this model is essentially the same as the currently employed hand-calculated assessments used to determine dose consequences. Westinghouse has indicated that the benefit offered by the incorporation of the new dose model is the improved accuracy afforded by performing more exact iodine tracking and release calculations.

NRC review of this new dose assessment model is ongoing. Pending final approval, applicants may use the new model. Until such time as the new CENTS dose assessment model is approved by the NRC, the NRC will review each licensee's dose assessment on a case-by-case basis.

3.1 Model Changes

To technically justify those upgrades to the CENTS code that provide new modeling capabilities or provide more detail and accuracy for existing models, and, thereby have an impact on the computed results, Westinghouse performed benchmark testing. There are four such modifications to the CENTS code considered in this review; review of the fifth, a modification in the dose model, ~~has not been reviewed by the staff~~ is ongoing as discussed in Section 3.0. The specific models reviewed include:

3.1.1 Core Channel Heat Transfer Model Upgrade

The original channel enthalpy model ignores the heat capacity of the fluid, and is based on the assumption that the change in the enthalpy over a computational section is negligible relative to the transport-time constant over the section. The new version of the CENTS code allows for a time-dependent change in the enthalpy in a computational section by taking into account the heat capacity of the liquid. The differential equation for the rate of change of enthalpy in a computational section is solved analytically. Thus, this new option not only takes into account the heat capacity of the fluid, but also precludes any numerical instability that might be introduced through a finite-difference solution for large time steps.

3.1.2 [ ]^{a,c} Steam Generator (SG) Tube Nodalization Model with Sectional Coolant Enthalpy

The updated SG model consists of an increase in the number of active-tube nodes per SG [

]^{a,c}. Within each of the [ ]^{a,c}-active-tube nodes of each SG tube, an internal calculation tracks a detailed temperature profile for the coolant and the tubes. For this purpose, each tube node is divided into multiple subsections; the number of sections in each tube node is specified via input. This more detailed nodalization of the primary side of the SG is provided as an option to support the enhanced ~~channel~~ tube heat transfer model described above.

3.1.3 Multiple Node Reactor Pressure Vessel (RPV) Downcomer Model

The updated CENTS code contains an option for a more detailed nodalization in the reactor vessel downcomer. This modification, by introducing both axial and azimuthal nodalization, improves the simulation of the asymmetric effects in the loops of the reactor coolant system (RCS). The form loss coefficients between azimuthal sections are user input and must adhere to the modeling approach used in the demonstration plant supporting approval of this methodology.{This last sentence seems to be an SER imposed limitation. If this is indeed a limitation, it would seem to follow that it should be included in the Conclusion section where the NRC lists limitations.}

3.1.4 Detailed Main Feedwater Model

For the previously approved simplified feedwater line model, the feedwater flowrate delivered by the pumps is specified directly by the control system for each SG. The model feeds the indicated flows to the SGs unless a feedwater line break has occurred. In the latter case, the break flow from the feedwater lines is calculated by the homogeneous equilibrium model, or if the flow is choked, by the Henry-Fauske correlation.

The updated CENTS code allows discrete main feedwater (MFW) and auxiliary feedwater (AFW) models. This capability enables accurate, time-dependent transient simulation of the

MFW and AFW systems. The models are predicated on the availability of a network of discrete MFW and AFW components and piping through user developed and specified input. Thus, the system network is adaptable to different plant designs.

4.0 EVALUATION

Benchmark testing consisted of code comparisons for six events:

7. Main Steam Line Break
8. Feedwater Line Break
9. Control Element Assembly Withdrawal from Sub-critical Conditions
10. Control Element Assembly Withdrawal from Hot Zero Power Conditions
11. Reactor Coolant Pump Seized Rotor
12. SG Tube Rupture

These are viewed as the most limiting design basis events in this review.

To test that all the minor code modifications and error corrections made since 1994 have not had a significant net effect, the above six cases were run with the new version of the CENTS code with the upgrade models described above deactivated. No significant variances in the results were observed when compared to the results from the previously approved version. They are judged to preclude exceeding the safety-related limits on which the approval of the CENPD-282-A methodology is based. The staff accepts that the new version of the CENTS code (with the model upgrades described above deactivated) is comparable to the previously accepted version and that it continues to be acceptable to use CENTS in this manner.

The model upgrades in the new version of the code consist, as a whole, of a more realistic description of physical phenomena and a more detailed description of system components which ~~, such, they will~~ leads to more realistic and accurate results. These results may be noticeably different from those obtained with the previously approved version. To demonstrate that the new models lead to correct results, a second set of comparisons for the same general scenarios was made with all the CENTS upgrade models activated. To isolate the effect of the individual upgrades and evaluate their phenomenological behavior, the upgrades were also separately activated.

The new models in the CENTS code induce the following main changes in the results of the six benchmark cases:

4.1 Main Steam line Break

The new models cause a slightly more severe and rapid blowdown of the affected SG which results in a deeper drop in the core temperatures. This drop in core temperature has a reactivity worth of $+0.002311\Delta\rho$ compared to the upgraded version with model changes deactivated. This change in reactivity is far from sufficient to induce a return to power; it is conservative. The staff accepts that the CENTS code with the new models continues to give conservative results for this event.

4.2 Feedwater Line Break

The upgrade models, together and individually, result in greater system flow to the intact SG. This results in lower long-term RCS temperatures, pressures and less swell into the pressurizer. The regulatory acceptance criterion for this event, with a limiting single failure, is that the peak RCS pressure must be less than 120 percent of the RCS design pressure. The staff accepts that the CENTS code with the new models continues to give conservative results with respect to this criterion for this event.

4.3 Control Element Assembly Withdrawal from Sub-critical Conditions

The only upgrade that has a significant effect on the results in this event is the channel heat transfer model. The improved modeling of the core fluid heat capacity reduces the positive moderator temperature reactivity feedback, and, thereby, lowers the peak power from ~119 percent to ~105 percent of nominal. The improved modeling reduces the code conservatism, however, it is physically based and is acceptable to the staff.

4.4 Control Element Assembly Withdrawal from Hot Zero Power Conditions

As in the previous event, the only upgrade that has a significant effect on the results is the channel heat transfer model. The improved modeling of the core fluid heat capacity reduces the positive moderator temperature reactivity feedback, and, thereby, lowers the peak power from ~106 percent to ~101 percent of nominal. It is acceptable to the staff as described above.

4.5 Reactor Coolant Pump Seized Rotor

The comparison of results between the upgraded CENTS code with models deactivated and activated shows good agreement, and, thereby, precludes exceeding safety-related limits on which the approved CENPD-282-P-A methodology was based. It is therefore acceptable to the staff.

4.6 SG Tube Rupture

The SG tube rupture event is a penetration of the barrier between the RCS and the main steam system due to the failure of a steam generator U-tube. The integrity of the barrier between the RCS and the main steam system is significant from the radiological release standpoint. The limiting event considered is a double-ended rupture of a SG tube with concurrent loss of alternating current (AC) power. Both phenomenologically and quantitatively, the comparison of thermal-hydraulic plant response parameters between the CENTS code with and without the upgraded model is excellent. The safety-related consequences for this event are mainly predicated on the dose model. The dose model review is ongoing as discussed in Section 3.0 ~~was not reviewed by the staff~~.

Although this review is based solely on the results of the above comparisons of benchmark calculations, Westinghouse has submitted results of a comparative analysis of a main steamline break event and a feedwater line break computed with CENTS with upgrades and RELAP5/MOD3 (Reference ~~7~~8). The agreement is good, and, furthermore, gives some insight into the effectiveness of the model upgrades in the CENTS code. This comparison, although not definitive, adds some weight to material proffered in support of this review.

5.0 CONCLUSIONS

The staff has reviewed TR WCAP-15996-P and the supporting documentation sent in response to the staff's request for additional information. On the basis of this review, the staff approves the transient methodology described in WCAP-15996-P for referencing in licensing actions with respect to the calculation of transient behavior in PWRs designed by CE and by Westinghouse subject to the limitations stated below. These limitations were placed on the approval of the CENPD-282-P-A methodology and apply to WCAP-15996-P methodology, approved herein. This does not include approval of the CENTS code dose model at this time. The CENTS code dose model review is ongoing as discussed in Section 3.0 and will be approved in a separate safety evaluation.

6. CENTS departure from nucleate boiling ratio (DNBR) analysis: The CENTS DNBR calculation for determining overall trends in thermal margin should not be used for licensing analyses. The DNBR licensing analyses should be performed with the presently approved CE DNBR methods.

7. Limitation to CE and Westinghouse Type Plants: The application of CENTS is limited to PWRs of CE and Westinghouse design.

8. LOCA and Severe Accident Analysis : Adequate benchmarking of the CENTS LOCA and severe accident capabilities has not been provided. Consequently, CENTS should not be used for performing LOCA or severe accident licensing analyses. That is, CENTS is not approved for demonstrating compliance to 10CFR50.46 acceptance criteria. It is, however, acceptable for use in modeling small breaks in the primary system, that can be classified as LOCAs, for the purpose of demonstrating compliance to non-LOCA regulatory acceptance criteria.

9. Three-Dimensional Core Neutronics : Benchmarking for the CENTS three-dimensional core neutronics capability has not been provided. Consequently, licensing applications of CENTS should be based on a point kinetics model.

10. CEA Ejection Analyses: This review does not give general approval for the application of CENTS simulations of a CEA ejection transient for licensing analyses. The staff will consider and review such requests on a case-by-case basis.

    Suggest the following wording change for your consideration with respect to CEA Ejection:

    CEA Ejection Analyses: CENTS is acceptable for analyzing the NSSS thermal hydraulic response aspects of the CEA Ejection event. CENTS is not approved for evaluation of the fuel failure aspect of the CEA ejection accident. This aspect must be evaluated using STRIKIN-II as documented in Reference 9.

6.0 REFERENCES

10. Letter, G. S. Pavis (CEOG) to USNRC Document Control Desk, "Submittal of Combustion Engineering Owners Group Reports: WCAP-15996-P, ~~Rev. 0~~(Proprietary), and WCAP-15996-NP (Non-Proprietary),~~Volumes 1 – 3~~entitled~~,~~ "Technical Description Manual for the CENTS Code", CEOG-02-256, December 13, 2002.

11. Letter, G. S. Pavis (CEOG) to USNRC Document Control Desk, "Submittal of Combustion Engineering Owners Group Reports: WCAP-15996-P, Volume 4 (Proprietary), and WCAP-15996-NP, Volume 4 (Non-Proprietary), entitled "Technical Description Manual for

12. Letter, R. H. Bryan (WOG) to USNRC Document Control Desk, "Response to Request for Additional Information Related to the Westinghouse CENTS Topical Report (WCAP-15996-P)", WOG-03-305, June 13, 2003

~~2.~~13. CENPD-282- A, Rev. 0, "Technical Description Manual for the CENTS Code."

~~3.~~14. Letter, M, J. Virgilio (NRC) to S. A. Toelle (ABB-CE)) , "Acceptance for Referencing of Licensing Topical Report CENPD-282-P, 'Technical Manual for the CENTS Code'," March 17 , 1994,

~~4.~~15. Letter, R. C. Jones (NRC) to S. A, Toelle (ABB-CE), " Acceptance for Referencing of Licensing Topical Report ~~CE-NPD~~-CENPD-282-P, Vol. 4, 'Technical Manual for the CENTS Code " February ~~25~~-24 1995.

16. Letter, L. R. Wharton (NRC) to G. R. Overbeck (APS), "Palo Verde Nuclear Generating Station, Units 1, 2, and 3 - Issuance of Amendments re: Various Administrative Controls (TAC Nos. ME1668, MB1669, and MB1670)", October 15, 2001

17. RELAP5/MOD3 Code Manual " NUREG/CR5535, INEL-95/0174, Vol. 1.

18. CENPD-190-A, "C-E Method for Control Element Assembly Ejection Analysis," January, 1976.

~~13.CEFLASH-4AS, A Computer Program for the Reactor Blowdown Analysis of the Small Break Loss of Coolant Accident " CENPD-138, Supplement 1 (Non-proprietary), August 1974.~~

~~14.RELAP5/MOD3 Code Manual " NUREG/CR5535, INEL-95/0174, Vol. 1.~~

Principal Contributor: Yuri Orechwa

Date:

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