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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.

DOUG

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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).

**Enclosure 2 (Non-Proprietary) to WOG-03-563**

**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 ~~striketrough~~ 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.

1 UNITED STATES  
2 NUCLEAR REGULATORY COMMISSION  
3 WASHINGTON, D.C. 20555-0001  
4

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

10 1.0 INTRODUCTION

11 By letters dated December 13, 2002 and February 19, 2003, the Combustion Engineering  
12 Owners Group submitted Topical Report (TR) WCAP-15996-P, "Technical Description Manual  
13 ~~to~~ for the CENTS Code" (References 1 and 2), to the NRC staff for review and approval of the  
14 transient analysis methodology described therein for licensing applications with regard to both  
15 Combustion Engineering- (CE) and Westinghouse-designed pressurized water reactors  
16 (PWRs). By letter dated June 13, 2002, the Westinghouse Owners Group provided responses  
17 to the staff's request for additional information (Reference 3). WCAP-15996-P is an update of  
18 CENPD-282-P-A (Reference 24); the latter was previously reviewed and approved by the staff  
19 for application to CE-designed PWRs (Reference 35), and subsequently the staff extended this  
20 approval to Westinghouse-designed PWRs (Reference 46). Central to the methodology  
21 described and discussed at length in both submittals is the CENTS computer code. This review  
22 focuses on, although is not limited to, the changes made to the CENTS code, between the  
23 approved version described in CENPD-282-P-A and the improved version described in WCAP-  
24 15996-P. The changes were made to more accurately model plant systems and transient  
25 behavior of the reactor system. To assist the staff in the review, Westinghouse prepared a  
26 "Roadmap" that identifies the changes made to the original TR, CENPD-282-P-A, and the  
27 rationale for the changes. This review relies to a great extent, although not exclusively, on the  
28 submitted "Roadmap."

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



51 **2.0 REGULATORY EVALUATION**

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

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

64 **3.0 SUMMARY OF WCAP-15996-P**

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

69 In the former class are the editorial changes to the descriptions in CENPD-282-P-A with regard  
70 to the models of the bubble rise velocity used in the heat transfer coefficient for bubble  
71 condensation and the annulus bubble release rate. Both changes bring the text in the TR into  
72 conformance with the correct and previously approved coding in the CENTS code. The staff  
73 approves these changes. Westinghouse also requested a clarification of the restriction on the  
74 use of the CENTS code for application to control element assembly (CEA) ejection licensing  
75 analyses. With regard to CEA ejection licensing analyses, the safety evaluation for  
76 CENPD-282-P-A states, " ... CENTS is not approved for performing CEA ejection licensing  
77 analyses." The rationale for this restriction is stated as " Benchmarking for the CEA ejection  
78 transient has not been provided...". A sui generis application of the CENTS code to a CEA  
79 ejection event, submitted by Arizona Public Service Company for the Palo Verde Nuclear  
80 Generating Station Units 1, 2 and 3, has been reviewed and approved by the staff  
81 (Reference 67). The staff will continue to entertain, on a case-by-case basis, such analyses for  
82 review.

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

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

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

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

### 99 3.1 Model Changes

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

#### 106 3.1.1 Core Channel Heat Transfer Model Upgrade

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

#### 115 3.1.2 [ ]<sup>a,c</sup> Steam Generator (SG) Tube Nodalization Model with Sectional Coolant 116 Enthalpy

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

118 [ ]  
 119 [ ]<sup>a,c</sup>. Within each of the [ ]<sup>a,c</sup>-active-tube nodes of each SG tube, an internal  
 120 calculation tracks a detailed temperature profile for the coolant and the tubes. For this purpose,  
 121 each tube node is divided into multiple subsections; the number of sections in each tube node is  
 122 specified via input. This more detailed nodalization of the primary side of the SG is provided as  
 123 an option to support the enhanced channel-tube heat transfer model described above.

#### 124 3.1.3 Multiple Node Reactor Pressure Vessel (RPV) Downcomer Model

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

#### 133 3.1.4 Detailed Main Feedwater Model

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

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

141  
142 MFW and AFW systems. The models are predicated on the availability of a network of discrete  
143 MFW and AFW components and piping through user developed and specified input. Thus, the  
144 system network is adaptable to different plant designs.

145 4.0 EVALUATION

146 Benchmark testing consisted of code comparisons for six events:

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

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

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

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

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

172 4.1 Main Steam line Break

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

179

- 5 -

#### 180 4.2 Feedwater Line Break

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

#### 187 4.3 Control Element Assembly Withdrawal from Sub-critical Conditions

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

#### 193 4.4 Control Element Assembly Withdrawal from Hot Zero Power Conditions

194 As in the previous event, the only upgrade that has a significant effect on the results is the  
195 channel heat transfer model. The improved modeling of the core fluid heat capacity reduces the  
196 positive moderator temperature reactivity feedback, and, thereby, lowers the peak power from  
197 ~106 percent to ~101 percent of nominal. It is acceptable to the staff as described above.

#### 198 4.5 Reactor Coolant Pump Seized Rotor

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

#### 203 4.6 SG Tube Rupture

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

213 Although this review is based solely on the results of the above comparisons of benchmark  
214 calculations, Westinghouse has submitted results of a comparative analysis of a main steamline  
215 break event and a feedwater line break computed with CENTS with upgrades and  
216 RELAP5/MOD3 (Reference 78). The agreement is good, and, furthermore, gives some insight  
217 into the effectiveness of the model upgrades in the CENTS code. This comparison, although  
218 not definitive, adds some weight to material proffered in support of this review.

220 5.0 CONCLUSIONS

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

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

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

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

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

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

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

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

254 6.0 REFERENCES

255 10. Letter, G. S. Pavis (CEOG) to USNRC Document Control Desk, "Submittal of Combustion  
 256 Engineering Owners Group Reports: WCAP-15996-P, Rev. 0 (Proprietary), and WCAP-  
 257 15996-NP (Non-Proprietary), Volumes 1-3 entitled, "Technical Description Manual for the  
 258 CENTS Code", CEOG-02-256, December 13, 2002.

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

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

265 2-13. CENPD-282- A, Rev. 0, "Technical Description Manual for the CENTS Code."

- 266 3-14. Letter, M. J. Virgilio (NRC) to S. A. Toelle (ABB-CE) , "Acceptance for Referencing of  
267 Licensing Topical Report CENPD-282-P, 'Technical Manual for the CENTS Code'," March  
268 17 , 1994,
- 269 4-15. Letter, R. C. Jones (NRC) to S. A. Toelle (ABB-CE), " Acceptance for Referencing of  
270 Licensing Topical Report ~~CE-NPD~~-CENPD-282-P, Vol. 4, 'Technical Manual for the CENTS  
271 Code " February 25-24 1995.
- 272 16. Letter, L. R. Wharton (NRC) to G. R. Overbeck (APS), "Palo Verde Nuclear Generating  
273 Station, Units 1, 2, and 3 - Issuance of Amendments re: Various Administrative Controls  
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