Entergy

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November 16, 2001

2CAN110109

U. S. Nuclear Regulatory Commission
Document Control Desk
Mail Station OP1-17
Washington, DC 20555

Subject: Arkansas Nuclear One - Unit 2
Docket No. 50-368
License No. NPF-6
Response to Follow-up Request for Additional Information Concerning Peak Rod Axial Average Burnup and Codes/Methodologies used to Support ANO-2 Power Uprate

Gentlemen:

In a letter dated October 17, 2001 (2CAN100110), Entergy responded to a request for additional information from the NRC staff that contained 22 questions. The 22 questions concerned the license application dated December 19, 2000 (2CAN120001), to increase the authorized power level for Arkansas Nuclear One, Unit 2 (ANO-2). After reviewing the October 17, 2001, letter, the NRC staff had two additional questions regarding the license application. Proposed responses were discussed with the staff during a teleconference on November 1, 2001. Attachment 1, along with its sub-attachments, contains the response to NRC question 1. Attachment 2 contains the response to NRC question 2.

The information contained in Attachment 1-B is the proprietary information of Westinghouse Electric Company, LLC. An affidavit signed by Westinghouse, the owner of the information is provided in Attachment 1-C. The affidavit sets forth the basis on which the information may be withheld from public disclosure by the NRC and addresses the considerations listed in paragraph (b)(4) of Section 2.790 of *the Code of Federal Regulations*. Accordingly, it is respectfully requested that the information proprietary to Westinghouse be withheld from public disclosure in accordance with 10CFR2.790.

The affidavit applies to Attachment 1-B although the text of the affidavit references Enclosure 2 to LTR-OA-01-53. That reference in the affidavit applies to the letter from Westinghouse that transmitted the proprietary information to Entergy.

A P01

Correspondence regarding the proprietary aspects of the information contained in Attachment 1-B should be addressed to Mehran Golbabai, Project Manager, ANO-2 Power Uprate, Westinghouse Electric Company, CE Nuclear Power LLC, 2000 Day Hill Road, Windsor, CT 06095.

This submittal contains no regulatory commitments.

I declare under penalty of perjury that the foregoing is true and correct. Executed on November 16, 2001.

Very truly yours,

Glenn R Ashley

Glenn R. Ashley
Manager, Licensing

GRA/dwb
Attachments

cc: Mr. Ellis W. Merschoff
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Mr. Mehran Golbabai
Project Manager, ANO-2 Power Uprate Project
Westinghouse Electric Company
CE Nuclear Power, LLC
2000 Day Hill Road
Windsor, CT 06095

Attachment 1

Response to NRC Question 1 - Follow-up Request for Additional Information Concerning Codes/Methodologies Used to Support ANO-2 Power Uprate

NRC Question 1

Provide a tabulation to include: all transients and accidents analyzed to support the Power Uprate Licensing Report (PULR), the code and methodology used for each of the analyses, the approval status of each code and methodology, the restrictions and limitations of each code and methodology (stated in the topical report and staff's Safety Evaluation), describe how these restrictions and limitations are satisfied, and describe how the code and methodology is applicable for the event analyzed under the PULR conditions with the current plant configuration at ANO-2.

ANO Response

Consistent with the discussion during the teleconference with the NRC staff on November 1, 2001, the response to NRC question 1 is contained in Attachments 1-A through 1-D. The attachments contain a compilation of limitations and/or constraints imposed by the NRC via Safety Evaluation Reports (SERs) for the analysis methodologies employed in support of the ANO-2 power uprate amendment request. In addition, compliance also includes adherence to the unique requirements of specific methodology documentation (typically, but not always topical reports). To this end, Westinghouse's safety analysts are trained in the use of its analysis methodologies through the information presented in the methodology documentation, familiarity with previously prepared evaluations and mentoring from technology experts, as appropriate. Furthermore, part of the quality assurance independent review process is to assure that methodologies have been properly implemented (i.e., compliance with both methodology documentation and NRC SER limitation and/or constraints).

The following attachments contain additional information in response to the NRC staff's question:

Attachment 1-A contains a tabulation of codes and methodologies used in Sections 7.1 and 7.3 of the Power Uprate Licensing Report.

Attachment 1-B contains a tabulation of the NRC Safety Evaluation Report Limitations and/or Constraints and Conformance Associated with ANO-2 Power Uprate Submittal Safety Analyses (Submittal Sections 7.1 and 7.3). The information in this attachment is considered to be proprietary. Parentheses ( ) are used to annotate proprietary information.

Attachment 1-C contains a proprietary affidavit for the information in attachment 1-B pursuant to 10CFR2.790.

Attachment 1-D contains the non-proprietary version of the information contained in attachment 1-B. Parentheses ( ) are used to annotate where proprietary information has been removed.

Attachment 1-A

Tabulation of Codes and Methodologies Used in Sections 7.1 and 7.3 of the Power Uprate Licensing Report

A tabulation of codes and methodologies used in sections 7.1 and 7.3 of the power uprate licensing report is provided in this attachment. The following tables are included:

Table 1 presents the methodologies and Codes supporting the Large Break LOCA analysis (Section 7.1.3 of the Submittal), and identifies the relevant SER Limitations and/or Constraint Tables of Attachment 1-B.

Table 2 presents the methodologies and Codes supporting the Small Break LOCA analysis (Section 7.1.4 of the Submittal), and identifies the relevant SER Limitations and/or Constraint Tables of Attachment 1-B.

Table 3 presents the Codes supporting (non-LOCA) Accident Analyses (Section 7.3 of the Submittal), and identifies the relevant SER Limitations and/or Constraint Tables of Attachment 1-B.

Table 1

Topical Reports and Safety Evaluation Reports Supporting the LBLOCA Analysis (Section 7.1.3 of the Power Uprate Submittal)

Subject	Topical Report Reference No. in Submittal (Section 7.1.7)	Safety Evaluation Report Reference No. in Submittal (Section 7.1.7)	SER Compliance Table No. (Enclosure 2)
LBLOCA Evaluation Model (CENPD-132)	7.1-4	7.1-17	Table 1
Supplement 1	7.1-4	7.1-17	Table 1
Supplement 2	7.1-4	7.1-18	Table 2
Supplement 3	7.1-4	7.1-19	Table 3
Supplement 4	7.1-5	Note 1	Table 4
CEFLASH-4A (CENPD-133)	7.1-10	7.1-17	Table 1
Supplement 2	7.1-10	7.1-17	Table 1
Supplement 4	7.1-10	NA	Table 4
Supplement 5	7.1-10	7.1-19	Table 3
COMPERC-II (CENPD-134)	7.1-11	7.1-17	Table 1
Supplement 1	7.1-11	7.1-17	Table 1
Supplement 2	7.1-11	7.1-19	Table 3
STRIKIN-II (CENPD-135)	7.1-15	7.1-17	Table 1
Supplement 2	7.1-15	7.1-17	Table 1
Supplement 4	7.1-15	7.1-20	Table 7
Supplement 5	7.1-15	7.1-21	Table 8
PARCH (CENPD-138)	7.1-14	7.1-17	Table 1
Supplement 1	7.1-14	7.1-17	Table 1
Supplement 2	7.1-14	7.1-22	Table 9
HCROSS Appendix A to Enclosure 1 to LD-81-095	7.1-13	7.1-19	Table 3
COMZIRC Appendix C to Supplement 1 to CENPD-134	7.1-11	7.1-17	Table 1
Application of FLECHT Correlation to 16x16 Fuel Assemblies (CENPD-213)	7.1-12	7.1-23	Table 10
Application of NUREG-0630 Cladding Rupture and Swelling Models (Enclosure 1 to LD-81-095)	7.1-13	7.1-19	Table 3

Note 1: The SER for Supplement 4 was granted after the Power Uprate License Submittal was issued.

Table 2

Topical Reports and Safety Evaluation Reports Supporting the SBLOCA Analysis (Section 7.1.4 of the Power Uprate Submittal)

Subject	Topical Report Reference No. in Submittal (Section 7.1.7)	Safety Evaluation Report Reference No. in Submittal (Section 7.1.7)	SER Compliance Table No. (Enclosure 2)
SBLOCA Evaluation Model (CENPD-137)	7.1-27	7.1-17	Table 1
Supplement 1	7.1-27	7.1-28	Table 5
Supplement 2	7.1-27	7.1-29	Table 6
CEFLASH-4AS			
Supplement 1 to CENPD-133	7.1-30	7.1-17	Table 1
Supplement 3 to CENPD-133	7.1-30	7.1-28	Table 5
COMPERC-II (CENPD-134)	7.1-11	7.1-17	Table 1
STRIKIN-II (CENPD-135)	7.1-15	7.1-17	Table 1
Supplement 2	7.1-15	7.1-17	Table 1
Supplement 4	7.1-15	7.1-20	Table 7
Supplement 5	7.1-15	7.1-21	Table 8
PARCH (CENPD-138)	7.1-14	7.1-17	Table 1
Supplement 1	7.1-14	7.1-17	Table 1
Supplement 2	7.1-14	7.1-22	Table 9

Table 3

ANO-2 Power Uprate Analysis Codes and Applicable SERs for Submittal Section 7.3

Submittal Section	Event	Code(s)	Submittal Section Citation	Applicable Table No. (Enclosure 2)
7.3.1	Uncontrolled CEA Withdrawal from Subcritical Conditions	CENTS CETOP	per Section 7.3.1.4	Table 12 Table 13
7.3.2	Uncontrolled CEA Withdrawal from Critical Conditions	CENTS CETOP	per Section 7.3.2.4	Table 12 Table 13
7.3.3	CEA Misoperation	NA		
7.3.4	Uncontrolled Boron Dilution Incident	NA		
7.3.5.1	Loss of Reactor Coolant Flow Resulting from an Electrical Failure	HERMITE CENTS CETOP	per Section 7.3.5.1.4	Table 14 Table 12 Table 13
7.3.5.2	Loss of Reactor Coolant Flow Resulting from a Pump Shaft Seizure	CENTS CETOP TORC	per Section 7.3.5.2.4	Table 12 Table 13 Tables 15 &16
7.3.6	Loss of External Load and/or Turbine Trip	CENTS	Note 1	Table 12
7.3.7	Loss of Normal Feedwater Flow	CENTS	Note 1	Table 12
7.3.8	Loss of all Normal and preferred AC Power to the Station Auxiliaries	NA		
7.3.9.1	Feedwater System Malfunction	CENTS CETOP	Note 1	Table 12 Table 13
7.3.9.2	Main Steam System Valve Malfunction	CENTS CETOP	Note 1	Table 12 Table 13
7.3.10	LOCA Dose Analysis	AFCON96 TACT5	Per Section 7.3.10.4	NA NA
7.3.11.1	Steam Line Break Accident with or without Concurrent Loss of AC Power Evaluated for Post-trip Return to Power	CENTS HRISE ROCS HERMITE RELAP/ MOD3.1	Note 1	Table 12 NA Table 17 Table 14 NA
7.3.11.2	Feedwater Line Break Accident	CENTS NOTRUMP	per Section 7.3.11.2.4	Table 12 NA
7.3.12	Inadvertent Loading of a Fuel Assembly into the Improper	ROCS	per Section 7.3.12.4	Table 17

Table 3

ANO-2 Power Uprate Analysis Codes and Applicable SERs for Submittal Section 7.3

Submittal Section	Event	Code(s)	Submittal Section Citation	Applicable Table No. (Enclosure 2)
	Position			
7.3.13	Steam Generator Tube Rupture with or without a Concurrent Loss of AC Power	CENTS	per Section 7.3.13.4	Table 12
7.3.14	Control Element Assembly Ejection	STRIKIN II	per Section 7.3.14.4	Table 18
7.3.15	Fuel Handling Accident	ORIGIN-II ARCON96	per Section 7.3.15.4	NA NA
7.3.16	Control Room Uninhabitility	NA		
7.3.17	Instantaneous Closure of a Single MSIV	CENTS CETOP	Note 1	Table 12 Table 13
7.3.18	CPC Dynamic Filters Analysis	CENTS CETOP	Note 1	Table 12 Table 13

Note 1: These Transients were previously reanalyzed at a rated Power of 3026 MWt and submitted as part of the RSG project.

Attachment 1-C

Affidavit Pursuant to 10CFR2.790
for the Proprietary Information Contained in Attachment 1-B

AFFIDAVIT PURSUANT TO 10 CFR 2.790

I, Philip W. Richardson, depose and say that I am the Licensing Project Manager, of Westinghouse Electric Company LLC (WEC), 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 and in conjunction with the application of ENTERGY Operations, Inc. for withholding this information.

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

> Enclosure 2 to LTR-OA-01-53, "Assessment of Compliance of ANO-2 Power Uprate Submittal Safety Analyses (Sections 7.1 and 7.3) with Limitations and/or Constraints Imposed in Relevant NRC Safety Evaluation Reports", November 13, 2001

This document has been appropriately designated as proprietary.

I have personal knowledge of the criteria and procedures utilized by WEC in designating information as a trade secret, privileged or as confidential commercial or financial information.

Pursuant to the provisions of Section 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 WEC. It consists of the collection of SER limitations and/or constraints applicable to NRC approved WEC reload analysis methodologies in the aggregate.
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 WEC.
3. The information is of a type customarily held in confidence by WEC and not customarily disclosed to the public. WEC 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 WEC because:
   a. A similar product is manufactured and sold by major pressurized water reactor competitors of WEC.
   b. WEC invested substantial funds and engineering resources in the development of this information. 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 an equivalent compilation of SER limitations and/or constraints.
   d. The information consists of the collection of SER limitations and/or constraints applicable to NRC approved WEC reload analysis methodologies in the aggregate, 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 WEC, take marketing or other actions to improve their product's position or impair the position of WEC's product, and avoid developing similar data and analyses in support of their processes, methods or apparatus.
   e. In pricing WEC's products and services, significant research, development, engineering, analytical, manufacturing, licensing, quality assurance and other costs and expenses must be included. The ability of WEC'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 WEC 's potential for obtaining or maintaining foreign licensees.

Further the deponent sayeth not.

Philip W. Richardson
Licensing Project Manager

Sworn to before me
this 13 day of November, 2001

Notary Public
My commission expires: 3/31/04

Attachment 1-D

Tabulation of the NRC Safety Evaluation Report Limitations and/or Constraints and Conformances Associated with ANO-2 Power Uprate Submittal Safety Analyses (Submittal Sections 7.1 and 7.3)

(Non-Proprietary Version)

A tabulation of NRC SER Limitations and/or Constraints and Conformance associated with the ANO-2 power uprate safety analyses are provided in this attachment. Attachment 1-A Tables 1, 2, and 3 provide a mapping of SERs in this attachment to the safety analyses. Additionally, Tables 11, 19, 20, and 21 contain supporting SERs. Table 11 of Attachment 1-B is the SER Limitations and/or Constraints Table supporting the Long Term-ECCS Performance (Section 7.1-5 of the Submittal). The relevant methodology is Reference 7.1-31 of Section 7.1.7 of the Submittal. Tables 19, 20 and 21 of Attachment 1-B present SER Limitations and/or Constraints supporting the FATES3B code which was cited in Sections 7.1.3.1 and 7.1.4.1 of the Submittal.

TABLE 1

Implementation Limitations and/or Constraints Identified in NRC SER

O.D. Parr (NRC) to F.M. Stern (C-E), June 13, 1975

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 1

Implementation Limitations and/or Constraints Identified in NRC SER

O.D. Parr (NRC) to F.M. Stern (C-E), June 13, 1975

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

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TABLE 1

Implementation Limitations and/or Constraints Identified in NRC SER

O.D. Parr (NRC) to F.M. Stern (C-E), June 13, 1975

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 2

Implementation Limitations and/or Constraints Identified in NRC SER

O.D. Parr (NRC) to A.E. Scherer (C-E), December 9, 1975

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 3

Implementation Limitations and/or Constraints Identified in NRC SER

D.M. Crutchfield (NRC) to A.E. Scherer (C-E), July 31, 1986

Safety Evaluation of Combustion Engineering ECCS Large Break Evaluation Model and Acceptance for Referencing of Related Licensing Topical Reports

No.	NRC SER Constraint	Applicability LBLOCA	Conformance [Yes/No]	Comments

TABLE 3

Implementation Limitations and/or Constraints Identified in NRC SER

D.M. Crutchfield (NRC) to A.E. Scherer (C-E), July 31, 1986

Safety Evaluation of Combustion Engineering ECCS Large Break Evaluation Model and Acceptance for Referencing of Related Licensing Topical Reports

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Implementation Limitations and/or Constraints Identified in NRC SER

D.M. Crutchfield (NRC) to A.E. Scherer (C-E), July 31, 1986

Safety Evaluation of Combustion Engineering ECCS Large Break Evaluation Model and Acceptance for Referencing of Related Licensing Topical Reports

No.	NRC SER Constraint	Applicability LBLOCA	Conformance [Yes/No]	Comments

TABLE 4

Implementation Limitations and/or Constraints Identified in NRC SER

S.A. Richards (NRC) to P.W. Richardson (Westinghouse)

"Safety Evaluation of Topical Report CENPD-132, Supplement 4, Revision 1, Calculative Methods for the C-E Nuclear Power Large Break LOCA Evaluation Model (TAC No. MA5660)," December 15, 2000

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 4

Implementation Limitations and/or Constraints Identified in NRC SER

S.A. Richards (NRC) to P.W. Richardson (Westinghouse)

"Safety Evaluation of Topical Report CENPD-132, Supplement 4, Revision 1, Calculative Methods for the C-E Nuclear Power Large Break LOCA Evaluation Model (TAC No. MA5660)," December 15, 2000

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 4

Implementation Limitations and/or Constraints Identified in NRC SER

S.A. Richards (NRC) to P.W. Richardson (Westinghouse)

"Safety Evaluation of Topical Report CENPD-132, Supplement 4, Revision 1, Calculative Methods for the C-E Nuclear Power Large Break LOCA Evaluation Model (TAC No. MA5660)," December 15, 2000

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 5

Implementation Limitations and/or Constraints Identified in NRC SER

K. Kniel (NRC) to A.E. Scherer (C-E), September 27, 1977

"Evaluation of Topical Reports CENPD-133, Supplement 3-P and CENPD-137, Supplement 1P," September 27, 1977

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 6
Implementation Limitations and/or Constraints Identified in NRC SER

T.H. Essig (NRC) to I.C. Rickard (ABB C-E)

"Acceptance for Referencing of the Topical Report CENPD-137(P), Supplement 2, Calculative Methods for the C-E Small Break LOCA Evaluation Model (TAC No. M95687)," December 16, 1997.

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 7

Implementation Limitations and/or Constraints Identified in NRC SER

K. Kniel (NRC) to A.E. Scherer (C-E)

"Combustion Engineering Emergency Core Cooling System Evaluation Model," November 12, 1976

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 8

Implementation Limitations and/or Constraints Identified in NRC SER

R.L. Baer (NRC) to A.E. Scherer (C-E)

"Evaluation of Topical Report CENPD-135 Supplement 5," September 6, 1978

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 9

Implementation Limitations and/or Constraints Identified in NRC SER

K. Kniel (NRC) to A.E. Scherer (C-E)

"Evaluation of Topical Report CENPD-138, Supplement 2-P," April 10, 1978

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 10

Implementation Limitations and/or Constraints Identified in NRC SER

K. Kniel (NRC) to A.E. Scherer (C-E), August 2, 1976

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 11

Implementation Limitations and/or Constraints Identified in NRC SER

R.L. Baer (NRC) to A.E. Scherer (C-E)

"Staff Evaluation of Topical Report CENPD-254-P," July 30, 1979

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 12

Implementation Limitations and/or Constraints Identified in NRC SER

NRC letter, M.J. Virgilio (NRC) to S.A. Toelle (C-E)

"Acceptance for Referencing of Licensing Topical Report CE-NPD 282-P, Technical Manual for the CENTS Code, (TAC No. M82718)," March 17, 1994

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 13

Implementation Limitations and/or Constraints Identified in NRC SER

Safety Evaluation by the Office of Nuclear Reactor Regulation Supporting Amendment No. 26 to Facility Operating License No. NPF-6

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 14

Implementation Limitations and/or Constraints Identified in NRC SER

NRC letter, O.D. Parr (NRC) to A.E. Scherer, June 10, 1976.

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 15

NRC Imposed Safety Evaluation Report Limitations and/or Constraints

Letter, Karl Kniel (NRC) to A.E. Scherer (C-E)

"Evaluation of Topical Report CENPD-161-P, entitled TORC Code – A Computer Code for Determining the Thermal Margin of a Reactor Core, Amendment 1-P to CENPD-161-P, and the nonproprietary versions thereof," September 14, 1976.

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 15

NRC Imposed Safety Evaluation Report Limitations and/or Constraints

Letter, Karl Kniel (NRC) to A.E. Scherer (C-E)

"Evaluation of Topical Report CENPD-161-P, entitled TORC Code – A Computer Code for Determining the Thermal Margin of a Reactor Core, Amendment 1-P to CENPD-161-P, and the nonproprietary versions thereof," September 14, 1976.

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 15

NRC Imposed Safety Evaluation Report Limitations and/or Constraints

Letter, Karl Kniel (NRC) to A.E. Scherer (C-E)

"Evaluation of Topical Report CENPD-161-P, entitled TORC Code – A Computer Code for Determining the Thermal Margin of a Reactor Core, Amendment 1-P to CENPD-161-P, and the nonproprietary versions thereof," September 14, 1976.

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 15

NRC Imposed Safety Evaluation Report Limitations and/or Constraints

Letter, Karl Kniel (NRC) to A.E. Scherer (C-E)

"Evaluation of Topical Report CENPD-161-P, entitled TORC Code – A Computer Code for Determining the Thermal Margin of a Reactor Core, Amendment 1-P to CENPD-161-P, and the nonproprietary versions thereof," September 14, 1976.

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 15

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Letter, Karl Kniel (NRC) to A.E. Scherer (C-E)

"Evaluation of Topical Report CENPD-161-P, entitled TORC Code – A Computer Code for Determining the Thermal Margin of a Reactor Core, Amendment 1-P to CENPD-161-P, and the nonproprietary versions thereof," September 14, 1976.

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

Note:

Associated Methodology Documentation (AMD):

1. CENPD-161-P-A, "TORC Code – A Computer Code for Determining the Thermal Margin of a Reactor Core," April 1986.
2. CENPD-206-P-A, "TORC Code Verification and Simplified Modeling Methods," June 1981.
3. Letter, R.L. Tedesco (NRC) to A.E. Scherer (C-E), "Acceptance for Referencing of Topical Report CENPD-206 (P), TORC Code Verification and Simplified Modeling Methods," December 11, 1980.

TABLE 16

Implementation Limitations and/or Constraints Identified in NRC SER

Letter, R.L. Tedesco (NRC) to A.E. Scherer (C-E)

"Acceptance for Referencing of Topical Report CENPD-206(P), TORC Code Verification and Simplified Modeling Methods," December 11, 1980.

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 16

Implementation Limitations and/or Constraints Identified in NRC SER

Letter, R.L. Tedesco (NRC) to A.E. Scherer (C-E)

"Acceptance for Referencing of Topical Report CENPD-206(P), TORC Code Verification and Simplified Modeling Methods," December 11, 1980.

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 16

Implementation Limitations and/or Constraints Identified in NRC SER

Letter, R.L. Tedesco (NRC) to A.E. Scherer (C-E)

"Acceptance for Referencing of Topical Report CENPD-206(P), TORC Code Verification and Simplified Modeling Methods," December 11, 1980.

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 16

Implementation Limitations and/or Constraints Identified in NRC SER

Letter, R.L. Tedesco (NRC) to A.E. Scherer (C-E)

"Acceptance for Referencing of Topical Report CENPD-206(P), TORC Code Verification and Simplified Modeling Methods," December 11, 1980.

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 16

Implementation Limitations and/or Constraints Identified in NRC SER

Letter, R.L. Tedesco (NRC) to A.E. Scherer (C-E)

"Acceptance for Referencing of Topical Report CENPD-206(P), TORC Code Verification and Simplified Modeling Methods," December 11, 1980.

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

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TABLE 16

Implementation Limitations and/or Constraints Identified in NRC SER

Letter, R.L. Tedesco (NRC) to A.E. Scherer (C-E)

"Acceptance for Referencing of Topical Report CENPD-206(P), TORC Code Verification and Simplified Modeling Methods," December 11, 1980.

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

Note:

Associated Methodology Documentation (AMD):

1. CENPD-206-P-A, "TORC Code Verification and Simplified Modeling Methods," June, 1981.
2. CENPD-162-P-A, "C-E Critical Heat Flux, Critical Heat Flux Correlation for C-E Fuel Assemblies with Standard Spacer Grids, Part 1, Uniform Axial Power Distribution," September 1976.

3. CENPD-207-P-A, "C-E Critical Heat Flux, Critical Heat Flux Correlation for C-E Fuel Assemblies with Standard Spacer Grids, Part 2, Nonuniform Axial Power Distribution," December, 1984.
4. Letter, C. O. Thomas (NRC) to A. E. Scherer (C-E), "Acceptance for Referencing of Licensing Topical Report CENPD-207(P/NP), C-E Critical Heat Flux: Critical Heat Flux Correlation for C-E Fuel Assemblies with Standard Spacer Grids, Part 2, Nonuniform Axial Power Distribution," November 2, 1984.
5. CEN-356(V)-P-A, Rev. 01-P-A, "Modified Statistical Combination of Uncertainties," May, 1988.
6. CEN-139(A)-P, "Statistical Combination of Uncertainties; Combination of System Parameter Uncertainties in Thermal Margin Analyses for Arkansas Nuclear One – Unit 2," November, 1980.

TABLE 17

Implementation Limitations and/or Constraints Identified in NRC SER

NRC letter, C.O. Thomas (NRC) to A.E. Scherer (C-E), "Acceptance for Referencing of Licensing Topical Report CENPD-266-P, CENPD-266-NP, The ROCS and DIT Computer Codes for Nuclear Design," April 4, 1983

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 18

Implementation Limitations and/or Constraints Identified in NRC SER

NRC letter, O.D. Parr (NRC) to A.E. Scherer (C-E), June 10, 1976

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

Note: There are no SER Limitations/Constraints with respect to use of STRIKIN-II in Non-LOCA Safety Analysis.

TABLE 19

Implementation Limitations and/or Constraints Identified in NRC SER

NRC letter, A.C. Thadani (NRC) to A.E. Scherer (C-E), "Generic Approval of C-E Fuel Performance Code FATES 3B (CEN-161(B)-P, Supplement 1-P) (TAC No. M81769)," November 6, 1991

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 20

Implementation Limitations and/or Constraints Identified in NRC SER

A. Clark (NRC) to A.E. Lundvall (BGE)

"Safety Evaluation of CEN-161 (FATES-3)," March 31, 1983.

A.C. Thadoni (NRC) to A.E. Scherer (C-E)

"Acceptance for Generic Referencing of the Topical Report CEN-161, Improvements to Fuel Evaluation Model (FATES 3)," May 22, 1989.

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 20

Implementation Limitations and/or Constraints Identified in NRC SER

A. Clark (NRC) to A.E. Lundvall (BGE)

"Safety Evaluation of CEN-161 (FATES-3)," March 21, 1983.

A.C. Thadoni (NRC) to A.E. Scherer (C-E)

"Acceptance for Generic Referencing of the Topical Report CEN-161, Improvements to Fuel Evaluation Model (FATES 3)," May 22, 1989.

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 21

Implementation Limitations and/or Constraints Identified in NRC SER

NRC letter, O.D. Parr (NRC) to F.M. Stern (C-E), December 4, 1974

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

TABLE 21

Implementation Limitations and/or Constraints Identified in NRC SER

NRC letter, O.D. Parr (NRC) to F.M. Stern (C-E), December 4, 1974

No.	NRC SER Constraint	Applicability	Conformance [Yes/No]	Comments

Attachment 2

Response to NRC Question 2 - Follow-up Request for Additional Information Concerning Peak Rod Axial Average Burnup

NRC Question 2

In your response to Question 8, you indicate that we requested a list of all safety analysis that are affected by the assumption of peak rod axial average burnup of 67,300 MWD/MTU, and we requested information to show that the analyses are conservative. You did not provide a list of all safety analysis. Instead, you only provided a list of the key fuel rod design criteria in Section 8.3. In addition, you did not provide information that shows that the analyses are conservative. Instead, you only stated that all the fuel mechanical design calculations yield worse results with increased burnup. Please provide information that addresses all safety analysis affected by the assumption of 67,300 MWD/MTU, and information that shows that the analyses are conservative.

ANO Response

Consistent with the discussion during the teleconference with the NRC staff on November 1, 2001, Table 8.3-1, "Summary of ANO-2 Uprating Parameters Analyzed in Fuel Rod Design Evaluation," of the Power Uprate Licensing Report (Enclosure 5 to letter 2CAN120001 dated December 19, 2000) has been revised. The peak rod axial average burnup value of 67,300 megawatt days/metric ton uranium (MWD/MTU) reported in the original table has been replaced with 60,000 MWD/MTU. The following note has been added for clarification:

> "A higher analytical burnup value was conservatively used as input to calculations which support Sections 8.3.1.2 through 8.3.1.4. In all cases, the applicability of the analyses remains limited to the 60,000 MWD/MTU licensed burnup limit."

Page 8-10 of Enclosure 5 is reproduced in its entirety on the following page. Revisions are annotated with a vertical line in the right margin adjacent to each change.

Additionally, the response to NRC question 8 in letter dated October 17, 2001, "Response to First Request for Additional Information from the NRC Reactor Systems Branch Regarding the ANO-2 Power Uprate License Application," is revised accordingly. The peak rod axial average burnup value of 67,300 MWD/MTU reported in the summary table has been replaced with 60,000 MWD/MTU. The same note has been added for clarification. The new note has been inserted as Note 1 and the previous Note 1 became Note 2. The NRC question and ANO response are reproduced in their entirety and included on page 3 of Attachment 2 of this letter. Revisions are annotated with a vertical line in the right margin adjacent to each change.

Table 8.3-1

Summary of ANO-2 Uprating Parameters Analyzed in Fuel Rod Design Evaluation

Parameter	Current Condition	Uprated Condition
Max fuel rod axially average fluence (10^{21}, n/cm^2)	13.0	13.0
Core inlet temperature (degree F)	554.7	554.7
Minimum flow rate (10^6, lbm/hr)	118.0	118.0
System pressure (psia)	2200	2200
Peak rod axial average burnup (MWD/MTU)	60,000*	60,000*
Residence time (EFPH)	41,200	41,200
Fuel design considered	Batches J-T	Batches M through U
Peak linear heat rate (kW/ft)	13.5	13.7 (Rods ≤ 50 GWD/MTU) 13.0 (Rods > 50 GWD/MTU)

* A higher analytical burnup value was conservatively used as input to calculations which support Sections 8.3.1.2 through 8.3.1.4. In all cases, the applicability of the analyses remains limited to the 60,000 MWD/MTU licensed burnup limit.

NRC Question 8

Table 8.3-1 of the PULR states that the peak rod axial average burnup is 67,300 megawatt days per metric ton uranium (MWD/MTU). This value is greater than the NRC-approved burnup limit for your fuel and is outside that range of approval and validity of your fuel rod evaluation codes. Please provide a list of all safety analyses that are affected by this assumption and provide information to show that the analyses are conservative when they are done within the valid limits of fuel burnups.

ANO Response (revised)

The fuel mechanical design calculations: stress, strain, fatigue, clad collapse, shoulder gap, and hold down margin all yield worse results with increased burnup. The results based on 67,300 MWD/MTU are more conservative than if the burnup limit of 60,000 MWD/MTU was used. The 67,300 MWD/MTU limit was obtained from a generic analysis which calculated the maximum burnup achievable before reaching the criteria limits. The limit for clad strain was the first limit reached at 67,300 MWD/MTU.

The following is a summary of the burnup used for various analyses:

Topic	Report Section	Burnup (MWD/MTU)
Cladding Collapse	8.3.1.1	60,000(1)
Clad Fatigue	8.3.1.2	60,000(1)
Clad Stress	8.3.1.3	60,000(1)
Clad Strain	8.3.1.4	60,000(1)
Rod Maximum Internal Pressure	8.3.1.5	60,000 (2)
Waterside Corrosion	8.3.1.6	60,000

Note 1: A higher analytical burnup value was conservatively used as input to calculations which support Sections 8.3.1.2 through 8.3.1.4. In all cases, the applicability of the analyses remains limited to the 60,000 MWD/MTU licensed burnup limit.

Note 2: The rod maximum internal pressure analysis was performed to rod average burnups of 65,000 MWD/MTU. The analysis was performed to rod average burnup of 60,000 MWD/MTU per the burnup topical, with extra time steps added to achieve a rod average burnup of 65,000 MWD/MTU in anticipation that higher burnups may be allowed in the future. For the present, however, the licensed burnup for ANO-2 fuel remains at 60,000 MWD/MTU.