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 FACIL: 50-316 Donald C. Cook Nuclear Power Plant, Unit 2, Indiana & 05000316  
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 HERING, R. F. Indiana & Michigan Electric Co.  
 RECIP. NAME: RECIPIENT AFFILIATION:  
 DENTON, H. R. Office of Nuclear Reactor Regulation, Director

SUBJECT: Forwards results of Exxon Nuclear Co. review of safety analyses. Util concurs w/vendor that analyses in compliance w/NRC requirements for development & application of computer codes used in performing safety analyses.

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# INDIANA & MICHIGAN ELECTRIC COMPANY

P.O. BOX 16631  
COLUMBUS, OHIO 43216

June 4, 1984  
AEP:NRC:0860P

Donald C. Cook Nuclear Plant Unit No. 2  
Docket No. 50-316  
License No. DPR-74  
SAFETY ANALYSES PERFORMED BY EXXON NUCLEAR COMPANY


Mr. Harold R. Denton, Director  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Dear Mr. Denton:

During an audit performed from April 3-5, 1984 at Exxon Nuclear Company's facility in Richland, the NRC identified a number of items of apparent non-compliance with NRC requirements for the development and application of computer codes used in performing safety analysis. The Exxon response to this audit was submitted to your Mr. Uldis Potapous on May 24, 1984. Exxon has also reviewed the analyses that they made in support of our license amendment application to the Donald C. Cook Nuclear Plant Unit No. 2 Appendix A Technical Specifications which was initially submitted on March 1, 1984, reference AEP:NRC:0860. The results of this review are included as an attachment. Corporate QA and technical personnel have reviewed the attachment and discussed its contents with Exxon personnel. On the basis of the attached letter, we concur with Exxon's conclusion that their analyses were in compliance with NRC requirements.

This document has been prepared following corporate procedures which incorporate a reasonable set of controls to ensure its accuracy and completeness prior to signature by the undersigned.

Very truly yours,

  
R.F. Hering  
Vice President

bjs

Attachment

8406080228 840604  
PDR ADDCK 05000316  
PDR

cc: John E. Dolan  
W.G. Smith, Jr. - Bridgman  
R.C. Callen  
G. Charnoff  
E.R. Swanson, NRC Resident Inspector - Bridgman

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**EXXON NUCLEAR COMPANY, Inc.**

600 - 108th Avenue N.E., C-00777, Bellevue, Washington 98009, Telephone (206) 453-4300

May 31, 1984  
ENC-AEP-0357

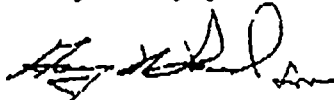
Mr. George John, Sr. Engineer  
Indiana & Michigan Electric Company  
c/o American Power Electric Power Service Corp.  
One Riverside Plaza  
Columbus, Ohio 43215

Dear George:

As a result of an audit on April 3-5, 1984, the NRC identified a number of items of apparent non-conformance with the NRC requirements regarding Exxon Nuclear's development and application of computer codes used for safety analyses. As you requested during our phone conversation on May 29, 1984, we have reviewed the safety analyses performed by Exxon Nuclear for D.C. Cook Unit 2 Cycle 5 in respect to each of the items listed in the audit report. Our conclusion is that the analysis is in compliance with the NRC requirements. The results of our review for each of the items of apparent non-conformance are given in the Attachment to this letter.

Please contact me if you have further questions regarding this matter.

Very truly yours,



H. G. Shaw  
Contract Administrator

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Finding:

- A. Criterion V of Appendix B to 10 CFR Part 50 states, in part, "Activities affecting quality ... shall be accomplished in accordance with ... instructions, procedures, or drawings ..."

Section 5 of the Exxon Nuclear Company (ENC) Topical Report No. XN-NF-1A (Rev. 6) states that the quality assurance program and associated quality-related design and procurement activities are prescribed by documented instruction, procedures, and drawings, as appropriate, to assure adequate definition of the instruction for satisfactory completion of activities. In addition, Item 4 of Appendix I commits to compliance with Regulatory Guide 1.64 and ANSI N45.2.11-1974.

Contrary to the above, ENC failed to prescribe adequate definition of the instruction for satisfactory completion of safety-related computer code activities as follows:

1. The main document governing the development and use of computer codes is XN-NF-608, "Guide for Use and Control of Computer Codes within Exxon Nuclear Company for Engineering and Design Calculations," which identifies "guidelines" to be used that have an optional connotation versus mandatory.

ENC Response

The analyses performed in support of Cycle 5 operation of D.C. Cook Unit 2 were in compliance with the guidelines and requirements of XN-NF-608, which is interpreted as mandatory for ENC design analyses.

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Finding:

2. There is no procedure or "guideline" which requires code input data to be independently verified.

ENC Response

Procedures which are required for design calculations are contained in XN-NF-P00,002, which has been in effect at ENC for several years. This document identifies a number of acceptable methods for assuring that design calculations have been performed using correct input and appropriate methods. Checking of calculations by a second qualified individual is one of these acceptable alternatives. The other allowable methods are independent (audit) calculations and design testing. As a part of ENC's approved Quality Assurance program, compliance with XN-NF-P00,002 is mandatory.

When the independent checking of calculations is used as the means of assuring analytical accuracy, verification may involve internal checks, comparison with experimental data, comparison with results of other fuel and NSSS suppliers, comparison with previous performance test results, or comparison with results from a similar analysis. These options are allowed to provide flexibility in determining the most effective method of verification. Because the emphasis is placed on an overall review of the analysis and the results thereof, it is not always appropriate to require independent checking of computer code input.

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The analyses performed in support of Cycle 5 operation of D.C. Cook Unit 2 conform to the requirements of XN-NF-P00,002. In complying with this procedure, the ENC technical staff performed and documented detailed, independent overchecks of the calculations supporting the license amendment request.

Input parameters employed for the D.C. Cook Unit 2 LOCA/ECCS and plant transient analyses are reported in XN-NF-81-60, Revision 1, "D.C. Cook Unit 2 Primary Design Parameters for ECCS and PTS Analysis," dated December 1981. These data were reviewed and confirmed by American Electric Power prior to the cycle 4 analyses. Minor changes to the data to reflect steam generator plugging were made for the cycle 5 calculations. These changes have been independently reviewed as to appropriateness and accuracy by ENC technical staff. Reviewers' notes appear in the appropriate calculational workbooks. NRC Staff auditors had the plant transient analysis workbook in hand during the NRC's April 3-5 computer code audit; whether a review was performed by the NRC auditor is not known. No discrepancies were cited concerning the workbook.

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*George John*



Finding:

3. Neither procedures nor "guidelines" address Section 9, "Corrective Action," of ANSI N45.2.11-1974 concerning actions to be taken.

ENC Response

Corrective action requirements for computer code development activities and design calculations are defined in Quality Assurance Procedure No. 16 of XN-NF-1, which covers review and verification of product design. Beyond these requirements, however, it has been ENC's practice to evaluate corrective action independently for each occurrence to assure that the unique nature of each individual problem is taken into account in determining the corrective action.

The design analyses performed by Exxon Nuclear in support of Cycle 5 operation of D.C. Cook Unit 2 are in compliance with XN-NF-1, which includes QA Procedure 16.

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Finding:

4. The definitions contained in Sections 1.2.2, "Use Codes," and 1.2.3, "Special Codes," of XN-NF-608 are not specific with respect to testing requirements.

ENC Response

All computer codes used in ENC design analyses are verified under the requirements of Section 3.1.1.c of XN-NF-608, as described in the response to Finding A.5, below. All of the analyses performed by Exxon Nuclear in support of D.C. Cook Unit 2, Cycle 5 operation utilized computer codes which were verified in accordance with XN-NF-608.

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Finding:

5. Section 3.1.1.c, "Test Cases," of XN-NF-608, does not require that a test procedure be established prior to performing verification tests nor does it require user notification of any options that have not been tested.

ENC Response

Section 3.1.1.c currently requires that all test cases for code verification execute each major code path at least once. This requirement assures that there are no significant options which have not been tested. Because these procedures require that all major paths be exercised during the code verification process, a requirement that potential users be apprised of any options which have not been tested during code verification would rarely be exercised.

For the D.C. Cook Unit 2 Cycle 5 analysis, all of the major code paths were exercised and the results documented during the verification of the code versions which were used for the analysis.

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Finding:

6. Section 3.1.1.e, "Miscellaneous Requirements," of XN-NF-608, does not require identification of the computer type used in an analysis.

ENC Response

Design calculations are prefaced with an information block which includes the date, the code version, and the computer version used for the analysis. This information block is required by XN-NF-P00,002, which is a part of the ENC Quality Assurance Program.

All of the calculations performed by ENC in support of Cycle 5 operation of D.C. Cook Unit 2 include an identification of the computer used in the analysis.

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Finding:

7. Sections 3.1.1.f and 3.1.2.d of XN-NF-608 do not require that the Computer Code Council document the reasons for any disapproval votes.

ENC Response

In the development and approval of computer codes, sufficient coordination is scheduled that dissenting votes are not likely to occur. If a code council member has difficulty with some aspect of a computer code which is under evaluation, the developer endeavors to resolve his concern prior to the code council vote.

No dissenting votes were recorded during the review of the computer codes used in the analyses supporting Cycle 5 operation of D.C. Cook Unit 2.

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Finding:

8. Sections 3.4 and 3.5 of XN-NF-608 do not specifically require reporting of errors in ECCS evaluation models. An ECCS evaluation model that is/remains acceptable to the staff is one that does not contain a significantly known error. (Reference 10 CFR Part 50.46 and 10 CFR 50, Appendix K).

ENC Response

XN-NF-608 currently requires that errors in ECCS evaluation models be reported in conformance with 10 CFR Part 21.

No errors have been discovered in the ENC analyses supporting D.C. Cook Unit 2. In the event that errors which adversely impact the D.C. Cook Unit 2 analysis were to be discovered, they would be reported as required by 10 CFR 50.46 and Appendix K or 10 CFR Part 21, as appropriate.

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Finding:

8. ENC Quality Assurance Procedure XN-NF-P00,002, Revision 13, Section 3.5.3.2, states, in part, "Documentation providing a summary of the basis of the checks and comparisons performed shall be indicated on the engineering calculations sheet, ..., plus the signature and date of the checker."

Contrary to the above, no summary nor any signature or date of a checker was included in the backup calculation No. E-T122-969-1. Further, benchmark comparisons of calculated primary and system performances against available data were requested by NRC. This was submitted to NRC on December 16, 1983. The backup calculations were dated December 1, 1983 for this submittal.

ENC Response

The subject calculation (E-T122-969-1) was a preliminary benchmark calculation using PTSPWR2 to predict measured phenomena associated with a tube rupture event at the Prairie Island nuclear plant. As a preliminary analysis, E-T122-969-1 had not been reviewed for compliance with XN-NF-P00,002. This review will be performed as required prior to issuance of the report.

The D.C. Cook Unit 2 Cycle 5 analyses have been checked in compliance with XN-NF-P00,002.

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Finding:

- C. Section 1.2.7, "Software Development Record," (SDR) of XN-NF-608 (Revision 3), states that the SDR shall contain such things as: listings of the various versions of the code, summaries of modifications, verification and qualification records compiled to date, and approvals made to date for use of the code, and records of the review by an independent party of verification and qualification.

Contrary to the above, the SDRs for the REFLEX and TOODEE-2 computer codes were not complete with all versions of the codes, and contained updated sets that did not identify the preparer, purpose, or that they had been independently checked.

ENC Response

Both REFLEX and TOODEE2 were developed prior to the adoption of XN-NF-608 as the procedure for computer code development and are in compliance with computer code quality assurance procedures which were in effect at the time of their development. These programs provide equivalent assurance to that provided by compliance with XN-NF-608.

Use of these two codes, REFLEX and TOODEE2, for analysis of D.C. Cook Unit 2, Cycle 5 operation is supported by code verification and qualification in compliance with an earlier quality assurance program, which was acceptable for computer code applications when it was applied to REFLEX and TOODEE2.

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Finding:

- D. Criterion XVII, "Quality Assurance Records," of 10 CFR Part 50, Appendix B, states that sufficient records shall be maintained to furnish evidence of activities affecting quality and that the records shall include at least the results of reviews and tests and that the records shall be identifiable and retrievable.

Contrary to the above, ENC failed to provide the documentation of verification and qualification of the REFLEX and TOODEE-2 computer codes. The calculation notebooks, or copies thereof, that documented the original calculations and their independent checking could not be retrieved during the inspection.

ENC Response

The records of the verification and qualification of these two codes were not available during the audit because the code custodian was not available to retrieve them. The records have been subsequently retrieved and are available for future audit. Both of these codes have been in use at ENC for many years, and the records are not fully in compliance with the Software Development Record procedures in XN-NF-608. The available records are, however, in compliance with the programs which were in effect at the time their respective development programs were completed. These programs were judged to be in compliance with 10 CFR 50, Appendix B. Although compliance with XN-NF-608 will not be attained for some time, all of the development, qualification, and verification records required for SDR compliance are present in the records package.

The development and qualification records for REFLEX and TOODEE2 cover the versions of these codes used for the analysis of Cycle 5 operation of D.C. Cook Unit 2.

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