

NRC FORM 173
(2-78)

U.S. NUCLEAR REGULATORY COMMISSION

ORDER NUMBER

20-81-330

STANDARD ORDER FOR DOE WORK

DATE

7/9/81

ISSUED TO: (DOE Office)

Albuquerque Operations Office
Department of Energy

ISSUED BY: (NRC Office)

Office of Nuclear Reactor
Regulation, DL

ACCOUNTING CITATION

APPROPRIATION SYMBOL

31X0200.201

B&R NUMBER

20-19-04-08

FIN NUMBER

A-7254-1

PERFORMING ORGANIZATION AND LOCATION

Los Alamos National Laboratory
Los Alamos, New Mexico

WORK PERIOD - THIS ORDER

FIXED

ESTIMATED

FROM:

5/18/81

TO:

9/30/83

FIN TITLE

Engineering Evaluation Assistance for Non-Power Reactors

OBLIGATION AVAILABILITY PROVIDED BY:

A. THIS ORDER

\$ 150,000

B. TOTAL OF ORDERS PLACED PRIOR TO THIS DATE WITH THE PERFORMING ORGANIZATION UNDER THE SAME "APPROPRIATION SYMBOL" AND THE FIRST FOUR DIGITS OF THE "B&R NUMBER" CITED ABOVE.

\$ 1,177,000

C. TOTAL ORDERS TO DATE

(TOTAL A & B)

\$ 1,327,000

D. AMOUNT INCLUDED IN "C" APPLICABLE TO THE "FIN NUMBER" CITED IN THIS ORDER.

\$ 250,000

FINANCIAL FLEXIBILITY:

FUNDS WILL NOT BE REPROGRAMMED BETWEEN FINIS. LINE D CONSTITUTES A LIMITATION ON OBLIGATIONS AUTHORIZED.

FUNDS MAY BE REPROGRAMMED NOT TO EXCEED ± 10% OF FIN LEVEL UP TO \$50K. LINE C CONSTITUTES A LIMITATION ON OBLIGATIONS AUTHORIZED.

STANDARD TERMS AND CONDITIONS PROVIDED DOE ARE CONSIDERED PART OF THIS ORDER UNLESS OTHERWISE NOTED.

ATTACHMENTS:

THE FOLLOWING ATTACHMENTS ARE HEREBY MADE A PART OF THIS ORDER:

- STATEMENT OF WORK
- ADDITIONAL TERMS AND CONDITIONS
- OTHER

SECURITY:

- WORK ON THIS ORDER IS NOT CLASSIFIED.
- WORK ON THIS ORDER INVOLVES CLASSIFIED INFORMATION. NRC FORM 187 IS ATTACHED.

REMARKS:

This order provides for acceptance of the LANL proposal dated May 12, 1981, as revised June 4, 1981 and provides incremental funding for continuation of work.

After acceptance, please send to the NRC Office of the Controller, ATTN: D. Dandois, and provide a copy to the Office of Nuclear Reactor Regulation, ATTN: D. Corley.

ISSUING AUTHORITY

ACCEPTING ORGANIZATION

SIGNATURE

Bernard L. Grenier

7/9/81

SIGNATURE

TITLE

Technical Assistance Program Manager

TITLE

DATE

NRC FORM 173 (2-78)

PROGRAM AND BUDGET PROPOSAL
NUCLEAR REACTOR REGULATION PROGRAM

LASL #P NP-F81-15
LASL #R 649

FIN/189a NO.: A7254
DATE: May 12, 1981
Revised June 4, 1981

<p>1. BUDGET ACTIVITY NO.:</p> <p>20-19-04-08</p>	<p>2. OFFICE:</p> <p>Albuquerque Operations (ALO)</p>	<p>3. PROJECT TITLE:</p> <p>ENGINEERING EVALUATION ASSISTANCE FOR NONPOWER REACTORS</p>			
<p>4. METHOD OF REPORTING:</p> <p><input checked="" type="checkbox"/> 1. Monthly Ltr. <input type="checkbox"/> 4. Annual <input type="checkbox"/> 2. Quarterly <input type="checkbox"/> 5. Other: <input type="checkbox"/> 3. Semi-Annual</p>		<p>5. PERSON IN CHARGE: PRINCIPAL INVESTIGATOR(S)</p> <p>R. A. Haarman (843-1211) A. Blackstock (843-3679)</p> <p>J. J. Koelling (843-6231)</p> <p><i>J. J. Koelling</i></p>			
<p>6. CONTRACTOR:</p> <p>University of California</p>		<p>7. WORKING LOCATION-CITY:</p> <p>Los Alamos</p>	<p>8. STATE:</p> <p>New Mexico</p>		
<p>9. TYPE:</p> <p><input type="checkbox"/> 1. Industrial <input type="checkbox"/> 4. Government <input checked="" type="checkbox"/> 2. Doe Lab <input type="checkbox"/> 5. Other Non- <input type="checkbox"/> 3. Educational Profit</p>		<p>10. CONTRACT NO.:</p> <p>W-7405-Eng-36</p>		<p>11. TASK NO.:</p>	
<p>12. CONTRACT TERM-BEGIN:</p> <p>MONTH DAY YEAR</p> <p>FROM <input type="text" value="05"/> <input type="text" value="18"/> <input type="text" value="81"/></p>		<p>13. CONTRACT TERM-EMD:</p> <p>MONTH DAY YEAR</p> <p>TO <input type="text" value="12"/> <input type="text" value="30"/> <input type="text" value="83"/> ?</p> <p style="font-size: small; margin-left: 20px;"><i>Per Ph. Haarman w/ R.A. Haarman 6/29/81</i></p>		<p>14. TERMINATION DATE OF FUNDING:</p> <p>MONTH DAY YEAR</p> <p><input type="text"/> <input type="text"/> <input type="text"/></p>	
<p>15. MAN YEARS</p> <p>Scientific</p> <p>Other Direct</p> <p>Total Direct</p>		<p>FY 1981</p> <p>2.1</p> <p>0.5</p> <p>2.6</p>	<p>FY 1982</p> <p>6.0</p> <p>1.2</p> <p>7.2</p>	<p>FY 1983</p> <p>5.0</p> <p>1.2</p> <p>6.2</p>	
<p>16a PROGRAM SUPPORT OBLIGATIONS</p> <p>A. Direct Salaries</p> <p>B. Materials & Services</p> <p>C. Subcontracts</p> <p>D. Other Direct (Computer Costs)</p> <p>Total Direct Costs</p> <p>E. Indirect Costs</p> <p>F. Fee</p> <p>Total (In Thousands)</p>		<p>105.0</p> <p>13.8</p> <p>0</p> <p>5.0</p> <p>123.8</p> <p>76.2</p> <p>0</p> <p>200.0</p>	<p>334.5</p> <p>41.3</p> <p>0</p> <p>15.0</p> <p>390.8</p> <p>259.2</p> <p>0</p> <p>650.0</p>	<p>318.6</p> <p>41.3</p> <p>0</p> <p>15.0</p> <p>374.9</p> <p>250.1</p> <p>0</p> <p>625.0</p>	
<p>16b EQUIPMENT FIN/189a NO. _____</p> <p>LASL #R _____</p> <p>Equipment Obligations (In Thousands) _____</p>					

17. Planned monthly rate of cost (\$k)

FY 1981

	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>September</u>
Month	20.0	45.0	45.0	45.0	45.0
Cumulative	20.0	65.0	110.0	155.0	200.0

FY 1982

	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>
Month	54.1	54.1	54.1	54.1	54.2	54.2
Cumulative	54.1	108.2	162.3	216.4	270.6	324.8

	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>
Month	54.2	54.2	54.2	54.2	54.2	54.2
Cumulative	379.0	433.2	487.4	541.6	595.8	650.0

FY 1983

	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>
Month	52.0	52.0	52.1	52.1	52.1	52.1
Cumulative	52.0	104.0	156.1	208.2	260.3	312.4

	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>
Month	52.1	52.1	52.1	52.1	52.1	52.1
Cumulative	364.5	416.6	468.7	520.8	572.9	625.0

8. Statement of Work

Technical Monitor: Harold Bernard (FTS 492-8357)

Cognizant Branch Chief: James R. Miller (FTS 492-7014)

A. Program Background

For the past 6 yr, the Los Alamos National Laboratory has provided technical assistance to Nuclear Reactor Regulation (NRR) and Nuclear Material Safeguards and Safety (NMSS) in a number of programs connected with the licensing of commercial power reactors, nonpower reactors (NPRs), and fuel reprocessing and fabrication facilities. This assistance has included safety reviews, physical security

reviews, emergency planning studies, studies of some aspects of environmental problems, and the analyses of other special problems as required.

The basis for licensing US NPRs is the Atomic Energy Act of 1954 and the Energy Reorganization Act of 1974. These acts provide the U.S. Nuclear Regulatory Commission (NRC) with the authority to set the rules and requirements that an applicant must meet to be licensed. Specifically, when an NPR licensee applies for license renewal, he must modify his existing Safety Analysis Report (SAR) so that it addresses any changes that have been made to the facility that could affect public health and safety during the requested renewal period.

A complete review of the modified SAR is conducted by the NRC to ensure that the NPR licensee meets all of the applicable rules and regulations. For relicensing, the SAR must include information that thoroughly describes the facility, its operations, and all changes made during the previous license period. The SAR will contain the design basis and operating limits of reactor operation; a safety analysis of the structure, components, and systems showing that they will be able to perform their intended functions; updated information on meteorological, seismic, and other natural and man-caused phenomena; and analyses of design basis events (DBE) and their consequences.

At the present time, 26 NPRs have submitted applications for license renewal by the NRC. The NRC has requested that Los Alamos give technical assistance in performing these reviews.

B. Program Objective

The objective of this program is to assist in the review and evaluation of specified sections of the Safety Analysis Reports (SARs) for each of the 26 NPRs and provide Technical Evaluation Reports (TERs) covering these sections.

C. Review Criteria

Los Alamos will review and evaluate the SAR for each of the NPRs in accordance with the sections of the Standard Review Outline (SRO) identified at the end of this proposal.

D. Work Requirements

SCHEDULE

Perform the following subtasks for each task listed in the priority list following the SRO.

Projected Cumulative Task Time (weeks)

- | | |
|--|-----------|
| a. Review and evaluate the SAR in accordance with the SRO and draft questions for the licensee. | 3 |
| b. Conduct a site visit to become familiar with the facility and discuss any questions. | 4 |
| c. Formalize questions and submit them to NRC. | 6 |
| d. Review responses from the licensee and prepare the TER for input to the Safety Evaluation Report (SER). | 15 |
| e. Participate in public proceedings. | As needed |

We estimate that each case history will require approximately 15 weeks of elapsed time as shown above. The time will be extended indefinitely for a case with hearings. A test reactor case study would also require longer review time.

By cascading case studies to take advantage of mailing time and applicant response time (that is 4--5 week's lapse time during each case study for Los Alamos), we can complete five or six case studies annually. The proposed review schedule is shown on page 6. The disciplines and the estimated staff time that are required to review five or six case studies annually are shown in the following table.

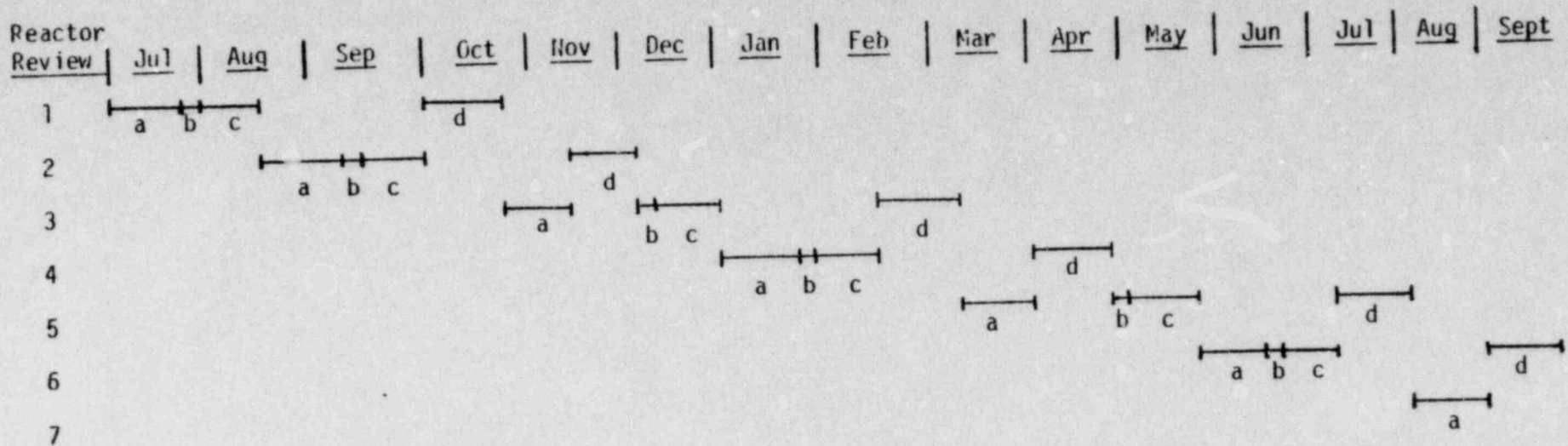
<u>Staff Required for NPR Cases</u>	<u>Staff Years for Five to Six Cases per Yr</u>
Structural	1/2 - 1
Radiation Protection Radiation Confinement Ventilation Systems	1 1/2 - 2
Accident Analysis	1/4 - 1 1/4
Instrumentation	1/4 - 3/4
Neutronics	1/4 - 3/4
Management	1/4

We anticipate that some plants will require less time than shown above, and some more complex facilities will require significantly more time. As the table indicates, approximately 5 staff-years are required for five to six cases per year or approximately 1 man-year per case. With the appropriate assistance of the NRC staff, this number could be raised to 7 to 10 cases per year. After 2 or 3 NPR reviews have been completed the proposed schedule will be modified, if necessary, to reflect the new required subtask times. This will be identified in the monthly business letter.

We do not anticipate that second-round questions will be required for these reviews, and therefore no time has been allowed for the preparation of second-round questions. If second-round questions are required, the average time allowed per case study will be altered to accommodate this additional effort.

A list of the case priorities is attached after the SRO section. The Director of the Division of Licensing (DL) retains the right to change the order of reviews as priorities change.

PROPOSED REVIEW SCHEDULE



NOTE: The continuation of the review schedule for FY 1983 will follow the same sequence shown above.

-
- a. Review and evaluate the SAR in accordance with the SRO and draft questions for the licensee.
 - b. Conduct site visit to become familiar with the facility and discuss questions.
 - c. Formalize questions and submit them to NRC.
 - d. Review responses from the licensee and prepare the TER for input to the SER.

All technical positions will be resolved in the question phases or reported as open items in the SER.

Reporting Requirements

1. Upon completion of each sub-task, Los Alamos will provide the cognizant NRR Branch Chief with draft and final questions and TERS as appropriate for each sub-task.
2. A letter report will be submitted by the 20th of each month to the Director of the Division of Licensing, with copies to the Cognizant Branch Chief; James R. Miller, DL; Robert L. Tedesco, DL; and B. L. Grenier, NRR. These reports will contain
 - o a list of any efforts completed during the period, milestones reached, or, if missed, an explanation,
 - o the amount of funds expended for manpower and computer services during the period covered and cumulative to date for each task;
 - o any problems or delays encountered or anticipated;
 - o a summary of the progress to date;
 - o plans for the next reporting period; and
 - o cost information for each reactor.

G. Meetings and Travel

We estimate that several team members will be required to make one trip to each reactor reviewed, and one or two persons will be required to make one trip to Bethesda, Maryland, for a review of the SER for each reactor.

H. NRC-Furnished Materials

The NRC will furnish the licensee's renewal application, including the SAR, for each facility, and background material such as hearing briefs with any associated questions and answers.

I. Disposal of Property

Upon completion of the project, all NRC-furnished materials can be requested by the NRC.

J. Conflict of Interest

There are no conflicts of interest associated with this program.

Standard Review Outline for
Sections of Safety Evaluation Report

1. INTRODUCTION

This section should present a brief evaluation of the principal aspects of the overall application including the type of license requested, a brief description of the proposed location of the facility, the type of reactor and its designer, the type of containment or reactor building and its designer, and the core power level.

1.1 General Facility Description

This section should include an evaluation of the principal characteristics of the site and a concise description of the facility.

2. SITE CHARACTERISTICS

This section of the SER should be an evaluation of the geological, seismological, hydrological, and meteorological characteristics of the site and its vicinity in conjunction with present and projected population distribution and land use as well as site activities and controls. The purpose is to show the adequacy of the site characteristics from a safety viewpoint.

3. REACTOR*

This section should provide an evaluation of the capability of the reactor to perform its safety functions throughout its design lifetime under all normal operational modes (including transient and steady-state conditions, as well as accident conditions). It should also include an evaluation of the analyses related to Design Basis Accidents.

*Los Alamos has a major responsibility for completing these sections; however they may participate in the final review of all sections.

4. FUNCTIONAL DESIGN OF REACTIVITY CONTROL SYSTEMS*

This section should provide an evaluation of the control rod drive system, which includes the essential ancillary equipment and hydraulic systems, to assure that it is designed and installed to provide the required functional performance and that it is properly isolated from other equipment. Additionally, it should provide an evaluation of the basis for assessing the combined functional performance of all the reactivity control systems to mitigate the consequences of anticipated transients and postulated accidents.

5. REACTOR COOLANT SYSTEM AND CONNECTED SYSTEMS*

This section of the SER should provide information about the reactor coolant system and the systems connected to it. Evaluations and the necessary supporting material should be presented to show that the reactor coolant system is adequate to accomplish its intended objective and to maintain its integrity under conditions imposed by all foreseeable reactor behavior under either normal or accident conditions.

6. ENGINEERED SAFETY FEATURES*

Engineered safety features may be provided to mitigate the consequences of postulated accidents in spite of the fact that these accidents are very unlikely. This section should be an evaluation of the adequacy of the engineered safety features provided in the facility.

7. INSTRUMENTATION AND CONTROLS*

The reactor instrumentation senses the various reactor parameters and transmits appropriate signals to the regulating systems during normal operation and to the reactor trip and engineered safety features during abnormal and accident conditions. The section should present an evaluation of those instruments and the associated equipment that constitute the reactor safety system (as defined in ANSI/ANS Std. 15.15-1978, "Criteria for the Reactor Safety Systems of Research Reactors").

*Los Alamos has a major responsibility for completing these sections; however they may participate in the final review of all sections.

7.1. Introduction*

A description and evaluation of instrumentation, control, and supporting systems that are safety related, including alarm, communication, and display instrumentation should be provided. A description of the design bases (including considerations of instrument errors), criteria, regulatory guides, standards, and other documents that will be implemented in the design of these systems should also be included.

7.2. Reactor Trip System*

This section should include an evaluation of the elements of the reactor trip system. It should include the design basis information required by Sec. 4 of ANSI/ANS Std. 15.15-1978 and an analysis demonstrating that the design criteria of Sec. 5 of ANSI/ANS Std. 15.15-1978 have been satisfied. The evaluation of the analysis should discuss the need for and method of changing to more restrictive trip setpoints during abnormal operating conditions.

7.3. Engineering Safety Feature Systems*

A description, design basis information, and an evaluation of the analysis showing that the design criteria are met (similar to those required in the previous section) should be provided for each engineered safety feature system.

7.4. Safety-Related Display Instrumentation*

This section should include an evaluation of the instrumentation systems (including control-rod position indicators) that provide information to enable the reactor operator to perform required safety functions.

8. AUXILIARY SYSTEMS*

This section should provide an evaluation of the auxiliary systems included in this facility. Those systems that are essential for the safe shutdown of the reactor or the protection of public health and safety should

*Los Alamos has a major responsibility for completing these sections; however they may participate in the final review of all sections.

be identified and, where applicable, an evaluation should be made of each system and the design bases for the system and for critical components. A safety evaluation demonstrating how the system satisfies the design bases, a description of the testing and inspection to be performed to verify system capability and reliability, and the required instrumentation and controls should be provided. There may be aspects of the auxiliary systems that have little or no relationship to protection of the public against exposure to radiation. In such cases, enough information should be provided to allow understanding of the auxiliary system design and function with emphasis on those aspects of design and operation that might affect the reactor and its safety features or contribute to the control of radioactivity.

For the fire protection system, the licensee should demonstrate that the requirements of ANSI/ANS Std. 15.17, "Fire Protection for Research Reactors," have been satisfied.

9. RADIOACTIVE WASTE MANAGEMENT*

This section should provide an evaluation of

1. the capabilities of the plant to control, collect, handle, process, store, and dispose of liquid, gaseous, and solid wastes that may contain radioactive materials; and
2. the proposed radioactive waste (radwaste) treatment systems that have the capability to meet the requirements of 10 CFR Parts 20 and 50 and the recommendations of appropriate regulatory guides concerning system design, control and monitoring of releases, and maintaining releases of radioactive materials at the "as low as is reasonably achievable" level.

*Los Alamos has a major responsibility for completing these sections; however they may participate in the final review of all sections.

10. RADIATION PROTECTION*

This section of the SER should be an evaluation of the methods for radiation protection and of estimated occupational radiation exposures to operating and construction personnel during normal operation and anticipated operational occurrences (including refueling; purging; fuel handling and storage; radioactive material handling, processing, use, storage, and disposal; maintenance; routine operational surveillance; inservice inspection; and calibration). It should also provide an evaluation of facility and equipment design, the planning and procedures programs, and the techniques and practices employed by the applicant in meeting the standards for protection against radiation of 10 CFR Part 20 and in ANSI/ANS Std. 15.11-1977, "Radiological Control for Research Reactors."

11. OPERATOR QUALIFICATION

This section of the SER should be an evaluation of the preparations and plans for operation of the facility. Its purpose is to provide assurance that the applicant will establish and maintain a staff of adequate size and technical competence and that the licensee's operating plans are adequate to protect public health and safety.

12. EMERGENCY PLANNING

This section of the SER should provide an evaluation of the applicant's plans for coping with emergencies pursuant to paragraphs (a) (10) and (b) (6) (v) of 550.34 of 10 CFR Part 50. The items to be discussed are set forth in Appendix E, "Emergency Plans for Production and Utilization Facilities," to 10 CFR Part 50. Additional guidance, including a discussion of emergency plan format and requirements, can be found in ANSI/ANS Std. 15.16-1978, "Emergency Planning for Research Reactors."

13. REVIEW AND AUDIT

The SER should provide an evaluation of the licensee's plans for conducting reviews and audits of operating activities that are important to

*Los Alamos has a major responsibility for completing these sections; however they may participate in the final review of all sections.

safety. Procedures for reviewing changes, tests, and experiments proposed in accordance with 50.59 of 10 CFR Part 50 should be covered, as well as procedures for after-the-fact review and evaluation of unplanned events. Provisions for performing independent reviews of operating activities should also be evaluated. The procedures and organization employed to audit operating activities, compliance with administrative controls, and the quality assurance program should be evaluated.

The guidance in ANSI/ANS Std. 15.18, "Administrative Controls for Research Reactors," should prove helpful in evaluating procedures.

14. REPORTS AND RECORDS

This section of the SER should provide an evaluation of the system for maintaining records of all facility activities and preparing, submitting, and filing reports in accordance with the guidance found in ANSI/ANS Std. 15.3, "Records and Reports for Research Reactors."

15. ACCIDENT ANALYSES*

This section should provide an evaluation of the accident analyses. The evaluation of the safety of a research reactor should include analyses of the response of the reactor to postulated disturbances in process variables and the postulated malfunctions, failures of equipment, or operator errors. Such safety analyses provide a significant contribution to the selection of limiting conditions for operation, limiting safety system settings, and design specifications for components and systems from the standpoint of public health and safety.

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LIST OF NONPOWER REACTOR REVIEWS IN ORDER OF PRIORITY*

- Task
1. UCLA (Confirm staff review)
 2. AFRRRI (Confirm staff review and finish)
 3. NBS (Entire review - including power increase)
 4. Texas A&M
 5. University of Virginia (Entire review)
 6. GETR
 7. GENTR
 8. Worcester Polytechnic (Entire review)
 9. University of Florida (Entire review)
 10. University of Maryland (Finish and confirm staff review)
 11. Washington State (Entire review)

ENTIRE REVIEW FOR ALL OF THE FOLLOWING:

12. Iowa State
13. VPI (including power increase)
14. Union Carbide
15. Cornell TRIGA
16. Cornell Critical Facility
17. B&W
18. University of Missouri (Rolla)
19. University of Texas
20. University of Illinois
21. Michigan State
22. Rensselaer
23. University of Kansas
24. University of Oklahoma
25. SUNY
26. Veterans Administration

*Priority as discussed in meeting with J. R. Miller on 5/15/81.