

U.S. Department of Energy
Washington, D. C.

ORDER

DOE 5480.6

9-23-86

SUBJECT: SAFETY OF DEPARTMENT OF ENERGY-OWNED NUCLEAR REACTORS

1. PURPOSE. To establish reactor safety program requirements to assure that:
 - a. The safety of each Department of Energy-owned (DOE-owned) reactor is properly analyzed, evaluated, documented, and approved by DOE; and
 - b. Reactors are sited, designed, constructed, modified, operated, maintained, and decommissioned in a manner that gives adequate protection for health and safety and will be in accordance with uniform standards, guides, and codes which are consistent with those applied to comparable licensed reactors.
2. CANCELLATION. DOE 5480.1A, ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION PROGRAM FOR DEPARTMENT OF ENERGY OPERATIONS, Chapter VI, "Safety of Department of Energy-Owned Reactors," of 8-13-81,
3. SCOPE. The provisions of this Order apply to all Departmental Elements and contractors performing work for the Department as provided by law and/or contract and as implemented by the appropriate contracting officer.
4. REFERENCES.
 - a. DOE 1324.2, RECORDS DISPOSITION, of 5-28-80, which contains procedures for the retention and disposition of records.
 - b. DOE 5000.3, UNUSUAL OCCURRENCE REPORTING SYSTEM, of 11-7-84, which establishes a system for reporting unusual occurrences having programmatic significance.
 - c. DOE 5480.1C, ENVIRONMENT, SAFETY, AND HEALTH PROGRAM FOR DEPARTMENT OF ENERGY OPERATIONS, of 9-23-86, which sets forth the responsibilities and requirements for an ES&H program.
 - d. DOE 5480.4, ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION STANDARDS, of 5-15-84, which specifies the application of mandatory ES&H standards to DOE operations.
 - e. DOE 5480.5, SAFETY OF NUCLEAR FACILITIES, of 9-23-86, which establishes DOE'S nonreactor nuclear facility Safety Program.

DISTRIBUTION
All Departmental Elements

INITIATED BY:
Assistant Secretary for
Environment, Safety, and Health

- r. NRC FORM 396 "CERTIFICATE OF MEDICAL EXAMINATION" for operators of commercial nuclear power plants.
- s. American Nuclear Society Standard, ANS 3.1, "Selection, Qualification, and Training of Personnel for Nuclear Power Plants" Draft of 10-80, which contains training requirements for commercial nuclear power plants. This document is available through the American Nuclear Society.
- t. American National Standards Institute standard, ANSI N546-1976, "Medical Certification and Monitoring of Personnel Requiring Operator Licenses for Nuclear Power Plants", which contains requirements for medical examinations. This document is available through the American Nuclear Society (see DOE 5480.4).

5. DEFINITIONS.

- a. Category A Reactor is a DOE designation based on power level (e.g., 20 MW steady state), potential fission product inventory, and experimental capability. Category A reactors are listed in Attachment 1, paragraph 3. All other DOE-owned reactors (excluding reactors assigned to the Deputy Assistant Secretary for Naval Reactors, NE-60) are designated Category B.
- b. Controls, when used with respect to nuclear reactors, means apparatus and mechanisms that, when manipulated, directly or indirectly affect the reactivity or power level of a reactor or status of an engineered safety feature.
- c. Health Examination is an examination performed by a licensed medical physician to determine the physical condition and general health for duty.
- d. Initial Startup includes those activities subsequent to preoperational testing, starting with the initial loading of fuel and involving all actions taken, including tests to assure a safe, orderly, incremental approach to predefine conditions of reactor operation.
- e. Inspection is a deliberate and systematic examination at the reactor including, but not limited to, physical inspection of reactor systems, operating and maintenance procedures, logs, records, and reactor operations.
- f. Modification is any change made to structures, systems, components, or procedures during any phase of the life of the reactor project.
- g. Operable is when the reactor is being operated or has the potential for being operated. A reactor that cannot be operated on a day-to-day basis because of refueling, extensive modifications, or technical problems is still considered to be operable.

- h. Operational Readiness Review is a structured method for determining that a project, process, or facility is ready to operate and occupy and includes, as a minimum, review of the readiness of the plant and hardware, personnel, and procedures. The review also includes a determination of compliance with ES&H Orders.
- i. Reactor Facility, unless it is modified by words such as containment, vessel, or core, means the entire reactor facility including the housing, equipment, and associated areas devoted to the operation and maintenance of one or more reactor cores. Any apparatus that is designed or used to sustain nuclear chain reactions in a controlled manner, including critical and pulsed assemblies and research, test, and power reactors, is defined as a reactor. All assemblies designed to perform subcritical experiments which could potentially reach criticality are also to be considered reactors. Critical assemblies are special nuclear devices designed and used to sustain nuclear reactions. Critical assemblies may be subject to frequent core and lattice configuration changes, and **may be** used frequently as mockups of reactor configurations. Therefore, requirements for modifications do not apply unless the overall assembly room is modified, a new assembly room is proposed, or a new configuration is not covered in previous safety evaluations (i.e., Safety Analysis Reports, Safety Analysis Report Addenda, or Technical Specifications).
- j. Reactor Operations are all those activities or functions involved in operating and using a reactor which, for purposes of this Order, begin with the initial loading of fuel in the reactor vessel and end with the removal of fuel to officially decommission or place the reactor in a standby status.
- k. Reactor Operator is an individual certified by contractor management to operate (manipulate the controls of) a DOE-owned reactor.
- l. Reactor **projects are those activities which** contribute to siting, designing, constructing, operating, or decommissioning a reactor, and those activities involving the operation or maintenance of operable and standby reactors, including shutdown reactors containing fuel.
- m. Reactor **supervisor is an individual** certified by contractor management to operate or to direct the operation of a DOE-owned Category B reactor.
- n. Risk is a quantitative or qualitative expression of possible loss which considers both the probability that a hazard will cause harm and the consequences of that event.
- o. Safety Analysis Report is a safety document providing a concise but complete description and safety evaluation of the site, the design, normal and emergency operation, potential accidents, and predicted

consequences of such accidents, and the means proposed to prevent such accidents or mitigate the consequences of such accidents. A Safety Analysis Report is designated as final when it is based on final design information. Otherwise, it is designated as preliminary

- p. Safety Document is a document prepared specifically to assure that the safety aspects of part or all of the activities conducted at a reactor are formally and thoroughly analyzed, evaluated, and recorded (e.g., Technical Specifications, Safety Analysis Reports and addenda, and documented reports of special safety reviews and studies).
- q. Safety Review is a deliberate and critical examination of the safety impact of a proposed activity or an ongoing activity during the siting, designing, constructing, operating, maintaining, modifying, or decommissioning of a reactor, which could affect health and safety. Documentation of the safety review serves to provide management with adequate identification of the safety issues and their possible implications, and also to allow others not directly involved in the program or review process to independently evaluate the completeness or adequacy of the review.
- r. Senior Reactor Operator is an individual certified by contractor management to operate or to direct the operation of a DOE-owned Category A reactor.
- s. Shutdown is that condition in which a reactor facility has ceased operation and DOE has declared officially that it does not intend to operate the reactor further.
- t. Standby is that condition in which a reactor facility is neither operable nor declared excess, and documentary authorization exists to maintain the reactor for possible future operation.
- u. Technical Safety Appraisal is a documented, multidiscipline appraisal of selected Department reactors and nuclear facilities conducted by a team selected by the Deputy Assistant Secretary for Safety, Health, and Quality Assurance (EH-30). They assure proper Department-wide application of particular safety elements of the ES&H program, nuclear industry lessons learned, and appropriate licensed facility requirements as described in DOE 5482.1B, paragraph 9b.
- v. Technical Specifications is a safety document approved by DOE which in a specified format defines the conditions, safety boundaries, and procedures under which activities are to be carried out at a reactor, See Code of Federal Regulations, Title 10. Part 50.36.
- w. Under Construction is when the authorization for construction has been issued and authorization for operation has not yet been issued,
- x. Unreviewed Safety Question. A proposed change, test, or experiment shall be deemed to involve an unreviewed safety question if:

- (1) The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety evaluated previously by safety analyses will be significantly increased; or
 - (2) A possibility for an accident or malfunction of a different type than any evaluated previously by safety analyses will be created which could result in significant safety consequences.
6. APPLICATION. This Order applies to DOE-owned reactors exempt from Nuclear Regulatory Commission (NRC) licensing; additional guidance applicable to DOE-owned licensed reactors will be provided as needed by future revision of the Order. The responsibilities, authorities, and requirements outlined in this Order are to be applied in addition to those provided in DOE 5480.1B and other Orders in the DOE 5480 series. This Order implements the Department's ES&H policy found in DOE 5480.16.
7. RESPONSIBILITIES AND AUTHORITIES.
 - a. Under Secretary(S-3) has overall responsibility and authority for DOE programs and may take necessary management actions to ensure safety, including directing the curtailment and suspension of operations, when in his or her opinion, such operation would result in an undue risk.
 - b. program Senior Officials (PSO), or their designees, perform the following functions for reactors under their program responsibility:
 - (1) Assume line management responsibility for reactor safety.
 - (2) Review of reactor activities in their programs and the field organizations to confirm that they are accomplished in consonance with the need for protecting the environment, safety, and health of DOE and DOE contractor employees, and the public.
 - (3) Approve the construction and initial operation of reactors and subsequent modifications involving an unreviewed safety question after:
 - (a) Confirming that an acceptable safety analysis and an independent review has been made and documented;
 - (b) Determining that the safety analysis and independent review indicate that an adequate degree of protection of the environment, health, and safety exists; and
 - (c) Obtaining the concurrence of the Assistant Secretary for Environment, Safety, and Health, EH-1. (See paragraph 7c(7), below.)
 - (4) Approve summary of training plans which define and describe the selective application of ANS 3.1 requirements to Category A reactors (see Attachment 1, paragraph 3), when confirmed that the

summary provides for the requirements necessary to achieve the goal of well trained personnel for the reactor(s) covered by the summary.

- (5) Transmit the results of the actions taken under subparagraphs 7b(2), (3), and (4), above, to the responsible field organizations with any necessary or appropriate instructions as to subsequent action to be taken, with a copy to EH-1.
- (6) Submit to higher management for action, any disagreement with recommendations made during safety reviews that cannot be resolved. A copy shall be provided to EH-1.
- (7) Provide assistance to field organizations in the performance of safety reviews, appraisals, and the preparation of safety analysis reports.
- (8) Recommend additions or revisions to reactor safety standards, guides, and codes to EH-1.
- (9) Confirm that field organizations comply with subparagraph 7e, below. In the execution of this responsibility, maximum use should be made of the appraisals and other reviews performed by EH, including assuring that recommendations made by EH are addressed in a responsive and timely manner.
- (10) Ensure the safe operation of reactors by:
 - (a) Directing the responsible field organization to require modification of equipment, procedures, or practices necessary for safe operations.
 - (b) Taking other actions to assure the implementation of this Order, including directing the field organization to curtail or suspend the operation of their reactors or related activities when necessary.
 - (c) Tasking other actions, as deemed necessary.
- (11) Provide EH-1 a copy of directions given under subparagraph 7b(10), above.
- (12) Include, in long range program objectives and plans, the requirements to assure safe reactor operation.
- (13) Require that program budgets provide adequate funds for environment, safety, and health requirements during all phases of reactor life.

- (14) Consider reactor safety factors in connection with review and approval of designs, program and project proposals, and other proposals requiring Headquarters action.
 - (15) Obtain special technical assistance as needed in the performance of assigned functions when the expertise is not available in the office in need of assistance.
 - (16) participate in selected field organization functional appraisals in accordance with DOE 5482.1B.
 - (17) Assume the responsibilities assigned to Heads of Field organizations, in paragraph 7e, below, for DOE program activities not assigned to a field organization.
 - (18) Actively monitor the decision making process of the field organizations in determining candidate modifications/operations which can involve an unreviewed safety question.
 - (19) Transmit to cognizant field organizations proposed additional safety requirements which are above those required by this Order. Upon consideration of field organization assessments of such requirements and EH-1 comments, provide final approval.
 - (20) Transmit to EH-1 appropriate reactor safety program and project direction documentation for concurrence (see paragraph 7c (5)).
- c. Assistant Secretary for Environment, Safety, and Health (EH-1) performs the following:
- (1) provides the Secretary (S-1) with an independent safety overview and assessment of the operation of DOE-owned reactors.
 - (2) Establishes priorities for conducting appraisals of reactor programs in conjunction with the Program Senior Officials and Heads of Field Organizations.
 - (3) Develops guidance and establishes requirements for nuclear reactor safety policy.
 - (4) Assures that reactor projects are consistent with DOE reactor safety policy.
 - (5) Reviews and concurs in nuclear reactor safety program and Project direction issued by the PSO to the field that affects more than one field organization.

- (6) Overviews and appraises reactor safety activities of the cognizant PSO and the field organization to assure that DOE reactor projects are accomplished in consonance with a need for protecting the safety and health of DOE and DOE contractor employees, and the public. Specific emphasis will be placed on training programs to assure that they include the requirements necessary to achieve the goal of well trained operators.
- (7) Reviews and concurs in the safety-related aspects of approvals granted under paragraph 7b(3), above.
- (8) Participates on selected field organization functional appraisals in accordance with DOE 5482.1B.
- (9) Conducts technical safety appraisals of DOE Category A reactors and selected Category B reactors. These appraisals will be coordinated with appropriate field organization and Headquarters program offices to minimize duplication of reviews. Appropriate field organization and Headquarters program offices will be requested to participate.
- (10) Develops training fundamentals covering fields such as nuclear theory, heat transfer, fluid flow, and thermodynamics for DOE application.
- (11) Issues and keeps current Attachment 1, which identifies the officials having program safety responsibility for each DOE-owned reactor.
- (12) Assures that responsible EH personnel are proficient in the operations personnel training area, including diverse expertise so that important areas related to nuclear safety are covered.
- (13) Collects new safety requirements applicable to licensed nuclear reactors and consults with the cognizant PSO to make a preliminary evaluation to determine their potential applicability to specific DOE-owned reactors, and:
 - (a) Evaluates field organization assessments and PSO disposition of newly proposed requirements and considers the requirements for inclusion in DOE Orders as appropriate.
 - (b) Maintains a summary of the consideration and disposition given by DOE to each of the newly proposed requirements for DOE-owned reactors.

NOTE : The above process for implementing newly proposed requirements into DOE ES&H Orders does not relieve the line program organization from its responsibility to assure that new requirements are considered and applied as necessary to their facilities.

- (14) Actively monitors the decisionmaking process of the field organizations in determining candidate modifications/operations which can involve an unreviewed safety question.

d. Deputy Assistant Secretary for Naval Reactors (NE-60).

- (1) With the assistance of the Managers of Pittsburgh and Schenectady Naval Reactors Offices, is responsible for assuring that adequate provision is made for the protection of health and safety in accordance with the provisions of this Order for reactors and facilities under his or her cognizance.
- (2) Is responsible for: (a) approving initial startup and modifications involving an unreviewed safety question for Naval Reactors prototype plants, support facilities, and critical facilities at supporting contractor laboratory facilities; (b) performing appraisals in accordance with DOE 5482.18 as deemed necessary at Naval Reactor prototype plants and supporting contractor laboratory critical facilities; (c) approving major environmental, safety, and health upgrades as considered necessary; and (d) selection, qualification, training, and certification of operating personnel for naval reactor prototype plants and critical facilities of supporting contractor laboratory facilities, and is exempted from notifying or obtaining concurrence of EH-1.
- (3) Is exempt from appraisals conducted by EH-1, and for reporting occurrences to EH-1.
- (4) Fulfills the responsibilities listed under paragraph 7e for Heads of Field Organizations.

e. Heads of Field Organizations shall, for reactors and operations under their jurisdiction:

- (1) Assume line management responsibility for the safety of assigned reactors.
- (2) Provide for an overview of reactor safety in their organization, independent of line management responsibility.
- (3) Require preparation and review of safety analyses and changes thereto consistent with this Order, DOE 5481.1B, and other Orders in the DOE 5480 series.
- (4) Require preparation of and approve, Technical Specifications and changes thereto for all assigned reactors.
- (5) Authorize construction and initial operation of a new reactor or modifications involving an unreviewed safety question after assuring that adequate consideration has been given to all

hazards and after obtaining cognizant Proapproval (with EH-1 concurrence). Prior to initial operation or after modifications involving an unreviewed safety question, an operational readiness review of the reactor shall be conducted and documented.

- (6) Specify in writing to the contractor those activities for which safety evaluations are to be submitted for DOE review and approval. Field organizations shall, as a minimum, review proposed modifications involving plant protection, reactivity control systems, and engineered safety features.
- (7) Authorize modifications to reactor operations including the addition of critical assemblies or critical assembly rooms to existing and approved critical facilities when these modifications could have an impact on reactor Safety, but do not involve unreviewed safety questions, after assuring that:
 - (a) The contractor has performed and documented a detailed evaluation of each proposed modification.
 - (b) The field organization safety reviews are appropriately performed and documented in the depth necessary to justify authorizing the modification.
 - (c) An adequate degree of protection of health and safety exists.
 - (d) Additional requirements of the Headquarters program organization having safety review responsibility have been met.
- (8) Review (either during inspections, appraisals, or through reviews of documents submitted by the contractor) changes made to reactor operations, including revision of procedures, experimental program changes, and physical modifications which could have safety implications, to assure that the contractor has made appropriate reviews and that the changes made do not violate Technical Specifications or involve an unreviewed safety question.
- (9) Take such actions as may be appropriate, including curtailment and suspension of operations, when, in their opinion, such operations may result in undue risk to health, safety, or the environment,
- (10) Monitor contractor activities, as appropriate, during siting, design, construction, operation, modification, and decommissioning phases by periodic inspections of, and visits to, individual reactor facilities.
- (11) Assure the establishment of an appraisal program in accordance with this Order, DOE 5482.1B, and other Orders in the DOE 5480 series, including periodic appraisal of the reactor operating

personnel training program. Appraisals of the overall operation of each reactor facility shall be conducted; however, individual reactor facility appraisal reports may be combined.

- (12) Assist in the review and development of ES&H codes, standards, and guides.
- (13) prepare a Summary of the training plan which defines and describes selective application of ANS 3.1 requirements to Category A reactors. Submit this summary through the cognizant Headquarters program organization to the PSO for approval. The summary shall include a description of the field organization review and approval process of contractor prepared training plans.
- (14) Assure that the staff includes an individual having broad knowledge in reactor design, construction, operations, and safety, including some experience in the area of reactor operations personnel training.
- (15) Keep appropriate Headquarters program organizations and EH-1 advised of reactor safety problems, deficiencies, and needs, and of actions taken under this Order.
- (16) Provide the PSO (with a copy to EH-1) appropriate safety documentation (e.g., safety analysis reports, technical Specifications) to permit those **organizations to meet** their responsibilities as outlined in this Order, in particular, paragraphs 7b(3) and 7c(7).
- (17) Perform additional duties including safety reviews, inspections, and appraisals as directed by the responsible Headquarters program organizations.
- (18) Review additional safety requirements and determine applicability to specific reactors and submit assessments of such proposed requirements to the cognizant PSO and EH-1.
- (19) Determine whether a proposed modification involves an unreviewed safety question and forward pertinent documentation to the cognizant PSO (with copy to EH-1) for review to support approval of the modification and subsequent operation. In those cases where there **may be some uncertainty as to** whether a modification involves an unreviewed safety question, actively involve the cognizant PSO and EH-1 in the determination.
- (20) Assure that DOE contractors to whom this Order is made applicable implement the requirements in paragraph 8, below, and provide advisory services to contractors and subcontractors on matters dealing with ES&H policies, standards, codes, guides, and procedures, including the requirements of this Order.

8. PROGRAM REQUIREMENTS.

- a. Siting. In the selection of the site for a new reactor and during modification of an operating reactor that may have a significant impact on property damage or dose commitment, the Code of Federal Regulations, Title 10, Part 100, and DOE 6430.16 shall be applied.
- b. General Design Criteria. The General Design Criteria specified in the Code of Federal Regulations, Title 10, Part 50, Appendix A, shall be applied to all DOE-owned reactors in the following cases:
 - (1) All new construction of reactor facilities.
 - (2) When DOE determines that safety can be significantly improved by implementing one or more of the criteria (for example, when modifications or repairs of those structures, systems, or components which involve an unreviewed safety question are undertaken).
- c. Safety Analysis Reports. The requirements of DOE 5481.13 shall be applied. In addition, new Safety analysis Reports shall follow the NRC's guidelines on standard format and content of safety analysis reports. While this guidance may focus on large complex reactor systems, the format and content is generally applicable to all reactors. The Requirements of this subparagraph and subparagraph 8b, above, do not apply to space based nuclear reactors which will use criteria consistent with space applications.
- d. Technical Specifications.
 - (1) Each DOE-owned reactor shall have a Technical Specification document meeting the Code of Federal Regulations, Title 10, Part 50.36. Technical Specifications for DOE-owned reactors shall be similar to those required for comparable facilities licensed by the NRC and yet provide the flexibility necessary for experimental activities. The Technical Specifications serve as an understanding between DOE and the operating contractor regarding limits and conditions under which the reactor will be operated and maintained. Documentation for Naval Reactor plants will be in accordance with Naval Reactor requirements.
 - (2) The Head of the Field Organization has the responsibility to transmit proposed and final Technical Specifications to the PSO and EH-1 and to approve Technical Specifications. The Head of the Field Organization shall require notification in a timely manner of any violation of the Technical Specifications,

e. Reactor Personnel Training and Qualification Program.

(1) Category A Reactors. The requirements for the qualification and training of personnel involved in the operation of DOE-owned Category A reactors are as follows (see Attachment 1, paragraph 3):

(a) General. American Nuclear Society (ANS) Standard 3.1, "Selection, Qualification and Training of Personnel for Nuclear Power Plants" (Draft), of 10-80, shall be the basis for qualification and training requirements for reactor personnel for Category A reactors. The requirements of ANS 3.1 are to be followed to the extent that they are appropriate for the facility or operation being considered. Paragraphs 8e(1)(a) through 8e(1)(d), contain interpretations of, or variations from, ANS 3.1 requirements.

1 Application. In view of the diversity of DOE Category A reactors and in order to facilitate the application of a power reactor standard to a DOE-owned reactor, requirements of ANS 3.1 shall be selectively applied as appropriate to each site or reactor. NRC Regulatory Guide 1.8 (Draft), of 9-80, shall also be considered, as appropriate, for DOE Category A reactors.

2 Training Plans. Training plans, which define and describe the selective application of ANS 3.1 requirements shall be prepared by the operating contractor of each Category A reactor. Suitable justification shall be included for provisions of ANS 3.1 which are not applied. These plans shall be submitted to the Head of the Field Organization for final approval.

3 Security Requirements. The requirements for security forces, including training, shall be in accordance with DOE requirements.

(b) Definitions (ANS 3.1, Section 2).

1 Nuclear Power Plant Experience. Experience acquired at Production, training, test, military, and research reactors may also qualify as equivalent experience on a one-for-one time basis.

2 Operator. An individual who has been certified by contractor management to operate or direct the operation of a DOE-owned reactor is considered comparable to a licensed operator for the purposes of this Order. Certification shall be valid for a 2 year period.

(c) Qualifications (ANS 3.1, Section 4).

- 1 General. ANS 3.1, section 4.1, includes provisions for substitution of experience for formal education on a case-by-case basis. Substitution of appropriate formal education for experience may also be considered. However, formal education shall not be allowed to substitute for more than 50 percent of the experience requirements.
- 2 Senior Reactor Operator. Senior reactor operators shall have 1 year of experience as a reactor operator at the plant for which the senior operator certification is required (ANS 3.1, Section 4.3.1.2).
- 3 Reactor Operators. The power plant experience required by ANS 3.1, section 4.5.1.2b, for the reactor operator position may be revised to 2 years.
- 4 Technicians. ANS 3.1, section 4.5.2, discusses training for technicians, and references sections 5.3.4 and 5.4 for necessary training. In amplification of these requirements-, the training program for radiation protection technicians shall include the training in sections 5.3.4 and 5.4 and training in:
 - a Principles of radiation protection
 - b Standards and regulatory requirements concerning radiation protection;
 - c The type and magnitude of potential radiological hazard for each plant system;
 - d Responsibilities and authorities for their position; and
 - e Tasks to be performed by the technician in normal, abnormal, and emergency situations.

Additionally, each radiation protection technician shall have demonstrated an understanding of the elements of the training program by satisfactory completion of both a written examination and a practical demonstration of the tasks referred to in subparagraph e, above.

- 5 Medical Certification. Medical certification requirements shall be in accordance with ANSI N546 1976, "Medical Certification and Monitoring of Personnel Requiring

Operator Licenses for Nuclear Power Plants," and NRC Regulatory Guide 1.134, Rev. 1, 3-79, "Medical Evaluation of Nuclear Power Plant Personnel Requiring operator Licenses." Form NRC 396, "Certificate of Medical Examination," or an alternative form may be used.

(d) Training (ANS 3.1, Section 5).

1 Position Task Analysis. A position task analysis shall ~~be~~ conducted by the operating contractor as necessary for operating personnel to define the tasks performed by the person in each position, and to identify the required training, in conjunction with education and experience, necessary to provide assurance that the tasks can be effectively performed. The position task analysis should include normal and emergency duties and place emphasis on the role played by each member of an operating organization in assuring safe plant operation. The position task analysis shall support the selection of requirements of ANS 3.1 and any supplemental requirements appropriate to the position.

2 Simulator Training. ANS 3.1, section 5, requires specific simulator training. However, adequate training maybe achieved by actual plant maneuvers, drills, partial plant simulators, or combinations of these. The use of a simulator for a DOE Category A reactor shall be based on an evaluation of the ability to adequately provide in-plant training covering all operator actions, where timely operator action must be taken to bring the reactor to a safe state or maintain the reactor in a safe state, and to provide adequate training in normal operations, anticipated transients, and accident conditions. In-plant training shall not lead to or have the potential for significant safety concerns.

3 Retraining and Reexamination Programs.

a Annual retraining and reexamination programs covering abnormal plant procedures and emergencies shall be required. Retraining and reexamination programs meeting all other requirements of ANS 3.1, section 5, shall be scheduled on a biennial basis. Examination content shall be varied from test to test.

b For tasks performed by shift operating personnel in response to off normal or accident situations, in-plant drills shall be conducted to enable personnel to maintain proficiency in those tasks.

c In addition to the training and retraining addressed in ANS 3.1, section 5, instruction shall be provided to operations personnel in the use of plant systems to control or mitigate accidents in which the core may be severely damaged. Such training shall include, as a minimum, classroom training, in-plant training, and simulator training (for those DOE reactors with simulators).

- 4 Control Manipulations. ANS 3.1, section 5.5.1.2.1, identifies specific control manipulations and plant evolutions applicable to power reactors. For each Category A reactor, specific control manipulation training requirements shall be developed by the operating contractor and approved by the cognizant DOE field organization.
- 5 Certification. The program leading to certification shall be documented and written procedures for certification by management of shift supervisors, senior reactor operators, and reactor operators shall be made either by senior line management or others designated by management. Neither an operator nor a supervisor may be certified by his or her immediate supervisor. Certification shall be made only after assuring that all the requirements of training and examinations (including written, operating, oral, and medical) have been satisfied, and management has assured that the individual is capable of performing Satisfactorily all functions of the assigned tasks. The qualification of all other personnel shall be appropriately documented (i.e., experience, education, medical condition, training, and testing, as pertinent to the specific job assignment).
- 6 On-the-Job Training. ANS 3.1, section 5.2.1.3.1, requires that candidates observe operating practices in the control room as part of the operator training program. In addition:
 - a Operators. Operator trainees should have received 3 months shift training, with no other concurrent duties, at the facility. During this training, under the observation and control of a certified operator, the trainee should have manipulated the facility controls and performed duties a person would perform as a certified operator.
 - b Senior Reactor Operators. Senior reactor operator trainees should have received 3 months of shift training, with no other concurrent duties, at the

facility. During this training, under the observation and control of a certified senior reactor operator, the trainee should have supervised the manipulation of the facility controls and performed duties a person would perform as a certified senior operator.

7 Record Requirements. Record retention requirements (ANS 3.1, Section 5.6) shall be in accordance with paragraph 8m.

(e) Implementation. Training plans for each Category A reactor shall be issued. All personnel filling the functional or equivalent positions contained in ANS 3.1 shall meet the training requirements of the applicable training plan. personnel not holding the position prior to the issuance of the plan shall meet the selection and training requirements of the training plan.

(2) Category B Reactors. This section contains the requirements for the qualification and training of personnel involved in the operation of DOE-owned Category B reactors (see Attachment 1, paragraph 3).

(a) Selection.

- 1 Candidates for reactor operator should possess that combination of education, experience, and training which provides the equivalent of at least a high school education. Candidates for reactor supervisor should possess that combination of education, experience, and training which provides the equivalent of at least a college education in engineering or science.
- 2 Coordinator management shall specify the demands on health, physical condition, coordination, and manual dexterity required to perform both routine and emergency functions. A health examination shall be given to establish the candidate's fitness to perform all proposed job tasks. -

(b) Training.

- 1 Reactor operator Training. The reactor operator's training shall be sufficiently comprehensive to cover areas which are fundamental to the candidate's job description.
 - a The program shall include on-the-job training for operators **and** supervisors to assure their familiarity with all required aspects of reactor operations,

including normal operations, anticipated transients, and accident conditions. Where construction precludes on-the-job training, practical experience at similar reactors, training on simulators, and other appropriate training are acceptable.

- b Training categories shall include nuclear theory, principles of reactor operation, features of facility design, design and operating characteristics and limitations, instruments and controls, safety and emergency systems, shielding, engineered safety features, standard and emergency operating procedures radiation monitoring systems and survey equipment, radiological safety principles, effects of experiments, and manipulation of reactivity controls. Training in heat transfer, fluid flow, and thermodynamics shall also be provided, as necessary, for the specific design of the reactor.

2 Reactor Supervisor Training. The supervisor training program shall include the categories and on-the-job training specified above for reactor operators, but with increased depth to reflect the added responsibilities of the supervisor. In addition, emphasis shall be placed on design and operating limitations, bases for technical specifications, radiation hazards, reactivity effects during experimental and maintenance activities, fuel handling, burnup and reactivity worth, alterations in core configuration, and administrative responsibilities associated with the facility and appropriate for his or her level of responsibility.

- (c) Examination. Written, operational, and oral examinations shall be prepared and administered by the contractor to satisfactorily demonstrate the required knowledge of reactor operators and supervisors. These examinations shall include questions on all categories listed above and the examination content shall be varied from test to test. DOE shall review the type, depth, and breadth of the examinations for initial certification. Administration of examinations of reactor operators and supervisors shall be by those personnel sufficiently knowledgeable to ascertain candidate deficiencies. The examination contents, administration, and evaluation shall be reviewed by personnel other than the candidate or his or her immediate supervisor.
- (d) Certification. The program leading to certification shall be documented, and written procedures for certification by management of qualified reactor operators and supervisors shall be made either by senior line management or others

designated by management. Neither a reactor operator nor a Supervisor may be certified by his or her immediate supervisor. Certification shall be made only after assuring that all the requirements of training and examinations (including written, operating, oral, and medical) have been satisfied, and management has assured that the reactor operator or supervisor is capable of performing satisfactorily all of the functions of the assigned tasks.

- (e) Retraining. A retraining program shall be established to provide training on changes to plant or procedures, areas in which the candidate shows deficiency, areas in which the candidate is not routinely exposed, and other areas necessary to keep operators and supervisors proficient. The retraining program shall include:

- 1 Periodic refresher training;
- 2 In depth retraining and reexamination at least annually in abnormal plant procedures and emergencies; and
- 3 Immediate retraining in identifiable weak areas (see subparagraph 8e(2)(f) 2c. below).

- (f) Reexamination.

- 1 The reexamination should emphasize those subjects which are necessary to determine weaknesses which could affect continued proficiency. The reexamination shall:
 - a Include the appropriate categories listed in paragraphs 8e(2)(b) 1 and 2. for operators and supervisors, respectively.
 - b Cover all areas in addition to subparagraph a. above, in which the candidates are expected to be proficient.
 - c Include written, oral, and operational testing.
- 2 The contractor has the following options:
 - a Giving one examination biennially which covers all categories.
 - b Giving examinations on selected categories throughout the 2 year period.
 - c In lieu of retraining prior to examination, give a comprehensive examination (written and oral) in each

category, and an operational examination to determine weak areas in which the operator or supervisor shall be retrained and retested.

A line manager or supervisor may administer the examination of the contractor does not have other qualified personnel from which to draw. However, if the employee who administers the examination is also to be certified or recertified, he or she shall not be examined by those persons whom he or she examines nor can he or she examine himself or herself.

- (9) Recertification. The candidate shall not be allowed to function as a certified operator or supervisor if he or she has not completed all of the requalification program within 2 years from the previous certification. If a certified operator fails a required portion of a recertification examination or shows serious deficiencies which indicate he or she may operate in an unsafe manner, then he or she is to be removed from activities requiring certification until retraining and reexamination are satisfactorily completed. In addition the recertification of previously certified operators and supervisors shall be based on:
- 1 Operating records and experiences during the past certification period.
 - 2 Successful completion of appropriate portions of the retraining and retesting program.
 - 3 A review made either by senior line management, by a committee, or by an individual designated by management. Reactor operators and supervisors may not be certified by their immediate supervisors.
 - 4 Whether an operator or supervisor has been away from reactor operations for a significant period, but less than 12 months, selected retraining including oral, written, and operative examinations shall be given as deemed necessary. However, if the absence is greater than 12 months, comprehensive written, oral, and operating examinations (as required of initial qualifying candidates) shall be given to determine weak areas. Retraining and retesting shall be required in areas of weakness.
 - 5 A health examination shall be administered biennially, or more frequently if circumstances warrant, to assure continued physical stamina, coordination, and manual dexterity, required to perform his or her assigned job tasks. Naval personnel at Naval Reactors prototypes

receive medical examinations as required by Department of Navy standards.

- (h) Documentation. The qualification of personnel shall be documented in a form amenable to audit. The documentation shall include:
 - 1 Education, experience, employment history, and health evaluation.
 - 2 Training programs completed.
 - 3 Records of initial and most recent written examinations consisting of the candidate's answers and examiner's evaluation.
 - 4 Records of initial and most recent oral and operational demonstration examinations, including:
 - a Either a listing of the basic questions asked and tasks performed, or a general summary of each area covered.
 - b An evaluation of the operator's or supervisor's response.
 - c A general summary of oral examination by the examiner including an evaluation of the knowledge, ability, and performance of the operator or supervisor.
 - 5 Records of initial certification and the most recent recertification, with dates and approval signatures.
- (i) Maintenance Personnel. The training requirements for maintenance personnel shall be determined by the class of maintenance which the personnel are to perform, the degree of supervision required, and the required knowledge of the reactor.
 - 1 All maintenance operations shall be performed by personnel who are trained in their respective discipline or under direct supervision of trained personnel.
 - 2 A written policy shall be established that describes functions, assignments, and responsibilities of the maintenance organization as it relates to reactor Safety.
 - 3 The successful completion of the training and qualification effort shall be documented.

- (3) Fuel Handling Operations. All fuel handling operations shall be performed by or under the direct supervision of an individual certified by management as qualified to perform the required functions. The requirements below are not necessary if fuel handling is performed by Individuals qualified for such under regular reactor operator and supervisor training programs.
 - (a) A specific qualification *program* shall be established for the fuel handling supervisor. Operators shall receive appropriate training for their assigned tasks.
 - (b) The initial qualification and recertification program for the supervisor shall consist of training, examination, certification, retraining, reexamination, and recertification. The training and testing may be limited to that needed for fuel handling safety, the impact of fuel handling on the safety of the reactor, and actions to be taken during abnormal and emergency conditions.
 - (c) Documentation requirements in subparagraph 8e(2)(h), above, shall be followed.
- f. Quality Assurance. DOE-owned reactors shall adhere *to the* quality assurance program in DOE 5700.6B.
- g. Contractor Independent Review and Appraisal System. Each contractor *to whom this Order is made* applicable shall establish and maintain an internal safety review system for all phases of reactor program life (e.g., design, construction, testing, and operation) which:
 - (1) Functions primarily in an advisory capacity to the line organization, reporting to a designated official at a level of management sufficiently high to take any necessary corrective action. (Safety is a line responsibility; neither review nor subsequent approval releases line management from its responsibility *for* the safety of people and equipment.)
 - (2) Is clearly defined and delineated in writing (e.g., purposes, objectives, functions, authority, responsibility, Composition, quorum, meeting frequency, and reporting requirements).
 - (3) Can be audited by contractor management and by DOE. The performance of the system shall be recorded in sufficient detail to permit contractor management and DOE to evaluate its effectiveness. *Actions* taken on any recommendations resulting from reviews, audits, inspections, appraisals, and surveillance shall be included in these records.
 - (4) Provides technical competence in the areas being *reviewed*. *Each* review, except that described in subparagraph 8g(9). below, shall

be carried out by persons whose technical disciplines cover the range of technical fields encountered in performing a safety review. Safety considerations are to be treated in the breadth and depth necessary to identify potential hazards and to evaluate the risks.

- (5) Provides for group discussions between reviewers on all but the more routine matters.
- (6) Provides an independent determination of whether a proposed activity involves an unreviewed safety question, violation of a Technical Specification, or any other matter for **which** approval is required.
- (7) Provides an appraisal of the overall operation of each facility at least annually. The majority of the individuals performing the appraisal shall be independent of the operation being appraised. It shall include, but not be limited to, applicable areas listed in subparagraph 8g(8), below.
- (8) Provides for objective and independent review of:
 - (a) Proposed modifications to plant and equipment having safety significance, and safety analysis thereof.
 - (b) Proposed experiments and irradiations having safety significance.
 - (c) Administrative, operating (normal and abnormal), maintenance, repair, testing, quality assurance, and emergency procedures and significant changes thereto.
 - (d) Organization and staffing.
 - (e) Safety evaluations and Technical Specifications, and changes
 - (f) Appropriate training programs, initial and subsequent qualification and certification requirements and procedures. Emphasis in the training program review shall include the involvement of all appropriate levels of management, including senior management, in assuring adequate coverage for: understanding of basic principles, mitigation of the severity of postulated reactor accidents, and understanding of plant specific limitations; and in reviewing general exam approach, management, and update techniques.
- (9) Occurrences, including violations of Technical Specifications.

- (h) The condition of the physical plant.
 - (i) The accuracy and completeness of recordkeeping and documentation.
- (9) Is reviewed by contractor management for adequacy of performance at least every 3 years.
- h. Fissile Material Storage and Handling Facilities and Operations Located Within a Reactor Facility. The requirements of DOE 5480.5 shall be applied as appropriate to fissile material storage handling facilities and operations within a reactor facility.
 - i. Standards. Reactor operations shall be conducted in accordance with established standards, where applicable. Where established standards are determined to be inadequate or not available, suitable operating standards shall be developed, using Contractor expertise as necessary, so that a defined and agreed upon basis for conducting and assessing operations is established and used. The Safety Analysis Report shall identify on a reactor specific basis the standards applied.
 - j. Standby and Decommissioning. Before placing a reactor in standby or decommissioning it (i.e., permanently shutting down the **reactor and** dismantling or entombing it), the activities shall be planned and documented with consideration given to final decommissioning. **The** Head of the Field Organization shall approve all standby and decommissioning plans before implementation. The facility shall be radiologically characterized and a safety assessment conducted regarding the existence of hazardous or radioactive material and nuclear fuel. Arrangements shall be made to assure adequate surveillance and maintenance of the facility during any indefinite standby period. Program responsibility for final decommissioning shall be determined and approved by the Program Senior Official.
 - k. Reporting and Analysis of Occurrences. Policies and procedures for reporting and analysis of occurrences shall be in accordance with DOE 5484.1 and DOE 5000.3.
 - l. Emergency Planning. Emergency planning shall be in accordance with DOE 5500.2, DOE 5500.3, and DOE 5500.4.
 - m. Recordkeeping. Records shall be maintained in accordance with the requirements of DOE 1324.2.
 - n. Tenant-Landlord safety Responsibilities. **When reactor** projects are located at sites which are under the direct control of a field *organi-* zation manager (landlord) other than the field organization manager having contractual responsibility *for* the reactor project (tenant), the tenant shall be assigned a parcel of land (the reactor test area) within which he or she will confine his or her activities. Specific

authorities, responsibilities, and limitations for the tenant and the landlord shall be described in a written agreement between the two field organization managers for each test area that is established. This agreement shall conform to the following general provisions:

- (1) The reactor test area shall be described in writing.
 - (2) The tenant shall assume responsibility for the health and safety of persons and property within the reactor test area and for keeping the landlord informed regarding the nature of activities undertaken and the condition of the reactors, including any reportable occurrences.
 - (3) The landlord shall have full responsibility for all safety matters except those within the confines of a reactor test area being operated by the tenant.
 - (4) The landlord shall have the right to take whatever action may be appropriate, including curtailment of operations within a reactor test area, when in his or her opinion such operation may jeopardize the health and safety of persons or property beyond the limits of the reactor test area.
 - (5) The landlord may accept responsibility for certain safety aspects within the tenants' reactor test area, particularly when those activities utilize landlord personnel or landlord contractor personnel and equipment.
9. ORGANIZATIONS HAVING RESPONSIBILITY FOR DEPARTMENT OF ENERGY-OWNED REACTORS. Assignments of **responsibility** for each DOE-owned reactor are listed in Attachment 1. To facilitate the updating of this information, the Headquarters organization which has the program responsibility for a reactor shall notify EH-1 when additions or changes are made in the responsibility for a reactor or its designation.

JOHN S. HERRINGTON
Secretary

ORGANIZATIONS RESPONSIBLE
FOR DEPARTMENT OF ENERGY OWNED REACTORS

The **table** provided on the following pages *lists all* DOE-owned reactors. The key to the abbreviations used in the tables and those reactors designated as Category A reactors is provided below.

1. FIELD ORGANIZATIONS AND OPERATING CONTRACTORS.

AL	- Albuquerque Operations Office
ANL	- Argonne National Laboratory
BNL	- Brookhaven National Laboratory
CH	- Chicago Operations Office
Du Pont	- E. I. Du Pont de Nemours and Company
EG&G	- EG&G Idaho, Inc.
GE	- General Electric Company
ID	- Idaho Operations Office
LANL	- University of California, Los Alamos National Laboratory
LLNL	- University of California, Lawrence Livermore National Laboratory
MMES	- Martin Marietta Energy Systems, Inc.
OR	- Oak Ridge Operations Office
PNL	- Pacific Northwest Laboratory (Battelle)
PRNC	- Puerto Rico Nuclear Center
RI	- Rockwell International
RL	- Richland operations Office
SAN	- San Francisco Operations Office
Sandia	- Sandia Laboratories
SR	- Savannah River Operations Office
UNC	- UNC Nuclear Industries, Inc.
WEST	- Westinghouse Electric Corporation
WHC	- Westinghouse Hanford Company

2. HEADQUARTERS ORGANIZATIONS.

DP-1	Defense Programs
ER-1	Office of Energy Research
NE-1	Nuclear Energy
NE-60	Naval Reactors

3. **DESIGNATED CATEGORY A REACTORS.** Operating DOE-owned reactors designated as Category A reactors are **as listed below. Designation as a Category A reactor is** generally based on power level (e.g., 20 MW steady State), **potential fission product inventory,** and experimental capability. All other DOE-owned reactors (not including Naval Reactors) are designated Category B.

ATR	- Advanced Test Reactor
c	- C Production Reactor
EBR-II	- Experimental Breeder Reactor II
FFTF	- Fast Flux Test Facility
HFBR	- High flux Beam Reactor
HFIR	- High Flux Isotope Reactor
K	- K Production Reactor
N	- N Production Reactor
ORR	- Oak Ridge Research Reactor
P	- P production Reactor
L	- L Production Reactor

REACTORS					
<u>N a m e s</u>	<u>Designation</u>	<u>Responsible Field Organization</u>	<u>Headquarters program Responsibility</u>	<u>Operating Contractor</u>	<u>Current Status</u>
Annular Core Research Reactor	ACRR	AL	DP-1	Sandia	Operable
Pajarito: Los Alamos Critical Assembly Facility	Big Ten	AL	DP-1	LANL	Operable
	Comet	AL	DP-1	LANL	Operable
	Flattop	AL	DP-1	LANL	Operable
	Godiva IV	AL	DP-1	LANL	Operable
	Honeycomb	AL	DP-1	LANL	Operable
	Mars	AL	DP-1	LANL	Operable
	Sheba	AL	DP-1	LANL	Operable
	Skua	AL	DP-1	LANL	Operable
	Venus	AL	DP-1	LANL	Operable
Omega West Reactor	OWR	AL	DP-1	LANL	Operable
Los Alamos Water Boiler	SUPO	AL	DP-I	LANL	Shutdown (No Fuel)

Name	Designation	REACTORS			
		Responsible Field Organization	Headquarters Program Responsibility	Operating Contractor	Current Status
Rocky Flats Nuclear Safety Facility (Critical Facility)	RFP-NSF: Horizontal Split Table	AL	DP-1	RI	Operable
	RFP-NSF: Vertical Split: Table	AL	DP- 1	RI	Operable
	RFP-NSF: Solution System	AL	DP-1	RI	Operable
	RFT-NSF: Tank Reservoir	AL	DP-1	RI	Operable
Sandia Pulsed Reactor II	SPR II	AL	DP-1	Sandia	Operable
Sandia Pulsed Reactor III	SPR III	AL	DP-1	Sandia	Operable
Argonne Fast Source Reactor	AFSR	CH	NE-1	ANL	Operable
Argonne Thermal Source Reactor	ATSR	CH	NE-1	ANL	Operable
Biological Research Reactor	JANUS	CH	ER-1	ANL	Operable
Chicago Pile No. 5	CP- 5	CH	ER-1	ANL	Shutdown

		REACTORS			
Name	<u>Designation</u>	<u>Responsible Field Organization</u>	<u>Headquarters Program Responsibility</u>	<u>Operating Contractor</u>	<u>Current Status</u>
Experimental Breeder Reactor II	EBR II	CH	NE-1	ANL	Operable
Transient Reactor Test	TREAT	CH	NE-1	ANL	Operable
Neutron Radiograph Facility	NRAD	CH	NE-1	ANL	Operable
Zero Power Reactor 6	ZPR-6	CH	NE-1	ANL	Shutdown
Zero Power Reactor 9	ZPR-9	CH	NE-1	ANL	Shutdown
Zero Power plutonium Reactor	ZPPR	CH	NE-1	ANL	Operable
Brookhaven Medical Research Reactor	BMRR	CH	ER-1	BNL	Operable
High Flux Beam Reactor	HFBR	CH	ER-1	BNL	Operable
Advanced Reactivity Measurement Facility (Critical Facility)	ARMF I	ID	NE-1	EG&G	Operable

REACTORS					
<u>Name</u>	<u>Designation</u>	<u>Responsible Field Organization</u>	<u>Headquarters Program Responsibility</u>	<u>Operating Contractor</u>	<u>Current Status</u>
Advanced Test Reactor	ATR	ID	NE-1	EG&G	Operable
Advanced Test Reactor Critical Facility	ATRC	ID	NE-1	EG&G	Operable
Coupled Fast Reactor Measurement Facility (Critical facility)	CFRMF	ID	NE-1	EG&G	Operable
Loss of Fluid Test	LOFT	ID	NE-1	EG&G	Shutdown
Power Burst facility	PBF	ID	NE-1	EG&G	Shutdown
Critical Facilities (1 cell)	KAPL FCPE	NE-60	NE-60	GE	Operable
Destroyer Reactor Prototype	DIG	NE - 60	NE-60	GE	Operable
Large Ship Reactor Prototype (2 reactors)	AIW	NE-60	NE-60	WEST	Operable

REACTORS					
Name	Designation	Responsible Field Organization	Headquarters Program Responsibility	Operating Contractor	Current Status
Modifications and Additions to Reactor Facilities	MARF	NE-60	NE-60	GE	Operable
Natural Circulation Test Plant	SSG	NE-60	NE-60	WEST	Operable
SIW Facility	SIW	NE-60	NE-60	WEST	Operable
Small Submarine Reactor Prototype	SIC	NE-60	NE-60	GE	Operable
Submarine Advanced Reactor Prototype	S3G	NE-60	NE-60	GE	Operable
Thermal Test Reactor No. 1	TTR-1	NE-60	NE-60	GE	Shutdown
Trident Reactor Prototype	S8G	NE-60	NE-60	GE	Operable
Bulk Shielding Reactor	BSR	OR	ER-1	MMES	Operable
High Flux Isotope Reactor	HFIR	OR	ER-1	MMES	Operable

REACTORS					
<u>Name</u>	<u>Designation</u>	<u>Responsible Field Organization</u>	<u>Headquarters Program Responsibility</u>	<u>Operating Contractor</u>	<u>Current Status</u>
Health Physics Research Reactor	HPRR	OR	En-I	MMES	operable
Oak Ridge Critical Experiments Facility	OR-CEF: Cell "W"	OR	ER-1	MMES	Operable
Oak Ridge Research Reactor	ORR	OR	ER-1	MMES	Operable
Pool Critical Assembly	PCA	OR	ER-1	MMES	Operable
Tower Shielding Reactor II	TSR-II	OR	NE-1	MMES	Operable
Puerto Rico Nuclear Center L-77	PRNC-L-77	OR	NE-1	PRNC	Shutdown
B Production Reactor	B	RL	OP-I	UNC	Shutdown
C Production Reactor	C	RL	DP-1	UNC	Shutdown
Fast Flux Test Facility	FFTF	RL	NE-1	WHC	Operable
Neutron Radiography Facility	NRF	RL	NE-1	WHC	Operable
K East Production Reactor	KE	RL	DP-1	UNC	In Standby

REACTORS					
Name	Designation	Responsible Field Organization	Headquarters Program Responsibility	Operating Contractor	Current Status
K Nest Production Reactor	KU	RL	DP-1	UNC	In Standby
N Production Reactor	N	RL	DP-1	UNC	Operable
Pacific Northwest Lab - Critical Mass Lab	PNL-CML: Split Table	RL	NE-1	PNL	Operable
	PNL-CML: Plutonium Solution system	RL	NE-1	PNL	operable
	PNL-CNLC: Fuel Element Array System	RL	NE-1	PNL	Operable
Pacific Northwest Lab Plutonium Recycle Critical Facility	PNL PRCF	RL	NE-1	PNL	Shutdown
Nuclear Effects Reactor	SUPER KUKLA	SAN	DP-1	LLNL	In Standby
C Production Reactor C		SR	DP-1	Dupont	Operable
K production Reactor K		SR	DP-1	Dupont	operable
L Production Reactor L		SR	DP-1	Dupont	Operable

REACTORS					
<u>Name</u>	<u>designation</u>	<u>Responsible Field Organization</u>	<u>Headquarters Program Responsibility</u>	<u>Operating Contractor</u>	<u>Current Status</u>
P Production Reactor	P	SR	DP-1	Du Pont	Operable
Process Development Pile	POP	SR	DP-1	Du Pont	In Standby
R Production Reactor	R	SR	DP- 1	Du Pont	In Standby
Lattice Test Reactor	LTR	SR	DP-1	Du Pont	In Standby
Subcritical Experiment	SE	SR	DP-1	Du Pont	In Standby
Standard Pile	SP	SR	DP- 1	Du Pont	In Standby