

AD 80-2
PDR

MEMORANDUM FOR: Michael Lesar, Acting Chief, Rules Review & Directives
Branch, Division of Freedom of Information and
Publications Services, Office of Administration

FROM: Sher Bahadur, Chief, Regulation Development
Branch, Division of Regulatory Applications, Office
of Nuclear Regulatory Research

SUBJECT: IMPLEMENTATION OF COMMISSION ACTION: AMENDMENTS TO
10 CFR PARTS 50 AND 52

APR 15 1993

By memorandum dated March 21, 1993, the Secretary of the Commission indicated that the Commission (with all Commissioners agreeing) has approved the final rule on "Training and Qualification of Nuclear Power Plant Personnel," set out in SECY-93-021.

Please implement the Commission's action by arranging for publication of the enclosed final rule in the Federal Register.

Enclosed is a marked-up copy of the Federal Register Notice showing Commission-requested changes for transmittal to the Office of the Secretary.

Also enclosed is a Congressional letter package for transmittal to OCA and two copies of the public announcement for transmittal to OPA.

In addition, enclosed are copies of the environmental assessment and finding of no significant impact and the draft regulatory analysis for transmittal to the PDR.

Sher Bahadur, Chief
Regulation Development Branch
Division of Regulatory Applications
Office of Nuclear Regulatory Research

Enclosures:

1. FR Notice and 2 Copies
2. Marked-up Copy of FR Notice
3. Congressional Letter Package
4. Environmental Assessment
5. Regulatory Analysis

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Enclosure 1
Federal Register Notice
and 2 Copies

[7590-01]

NUCLEAR REGULATORY COMMISSION

10 CFR Parts 50 and 52

RIN 3150 - AD80

Training and Qualification of Nuclear Power Plant Personnel

AGENCY: Nuclear Regulatory Commission.

ACTION: Final rule.

SUMMARY: The Nuclear Regulatory Commission (NRC) is amending its regulations to require each applicant for and each holder of a license to operate a nuclear power plant to establish, implement, and maintain a training program for nuclear power plant personnel based on a systems approach to training (SAT). The training program will provide qualified personnel to operate and maintain the nuclear power plant in a safe manner in all modes of operation. This action is being taken to meet the directives of Section 306 of the Nuclear Waste Policy Act of 1982.

EFFECTIVE DATE: [30 days following publication]

ADDRESSES: Copies of all referenced NRC documents are available for public inspection and copying for a fee at the NRC Public Document Room, 2120 L Street, NW. (Lower Level), Washington, DC 20555. Copies of NUREG documents may be purchased from the Superintendent of Documents,

U.S. Government Printing Office by calling (202) 275-2060, or by writing to the Superintendent of Documents, U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082. Copies are also available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

FOR FURTHER INFORMATION CONTACT: Dr. Rajender Auluck, P.E., Office of Nuclear Regulatory Research, telephone: (301) 492-3794 or Mary Ann Biamonte, Office of Nuclear Reactor Regulation, telephone: (301) 504-1073, U.S. Nuclear Regulatory Commission, Washington, DC 20555.

SUPPLEMENTARY INFORMATION:

Background

Nuclear Waste Policy Act of 1982.

In Section 306 of the Nuclear Waste Policy Act of 1982 (NWPA), Pub. L. 97-425, the NRC was "directed to promulgate regulations, or other appropriate Commission regulatory guidance for the training and qualifications of civilian nuclear power plant operators, supervisors, technicians and other operating personnel. Such regulations or guidance shall establish ... instructional requirements for civilian nuclear power plant licensee personnel training programs." In order to meet this directive, on March 20, 1985, the Commission published a Policy Statement on Training and Qualification of Nuclear Power Plant Personnel (50 FR 11147). The policy statement endorsed a

training accreditation program managed by the Institute of Nuclear Power Operations (INPO). It encompassed the elements of effective performance-based training and provided the basis to ensure that personnel have qualifications commensurate with the performance requirements of their jobs.

In addition to endorsing the INPO-managed training accreditation program, the 1985 Policy Statement also recognized the INPO-managed accreditation of utility training programs for the following categories of nuclear power plant personnel:

- (1) Non-licensed operator.
- (2) Control room operator.
- (3) Senior control room operator/shift supervisor.
- (4) Shift technical advisor.
- (5) Instrument and control technician.
- (6) Electrical maintenance personnel.
- (7) Mechanical maintenance personnel.
- (8) Radiological protection technician.
- (9) Chemistry technician.
- (10) On-site technical staff and managers.

While issuing the policy statement, the Commission decided to defer rulemaking in this area for a minimum of 2 years in order to allow the industry to continue its initiatives to upgrade training programs through the INPO-managed training accreditation program. Following issuance of the policy statement, the NRC evaluated the INPO-managed training accreditation program over a 2-year period and concluded that it was an effective program. On November 18, 1988 (53 FR 466073), the NRC published an amended policy statement in order to:

(1) Provide additional information regarding the NRC's experience with industry accreditation,

(2) Change the policy regarding enforcement to eliminate discretion in inspection and enforcement in the areas covered by the 1985 Policy Statement, and

(3) Reflect current Commission and industry guidance.

The NRC continues to perform inspections at different utilities to ensure that these training programs remain effective.

U.S. Court of Appeals Decision

On April 17, 1990, the U.S. Court of Appeals for the District of Columbia Circuit concluded that the Commission's Policy Statement did not meet the intent of the Congressional directive to create mandatory requirements for personnel training programs at civilian nuclear power plants. The Court remanded the issue back to the NRC for action consistent with the Court's findings. See, Public Citizen v. NRC, 901 F.2d 147 (D.C. Cir. 1990). The Commission requested a rehearing of the decision by the full court, which was denied on June 19, 1990. On November 26, 1990, the Supreme Court denied certiorari on petition by the Nuclear Utility Management and Resource Council. See, Nuclear Management and Resources Council, Inc. v. Public Citizen 111 S. Ct. 536 (1990).

Actions Taken in Response to the Court Decision

In response to the court decision, the NRC developed the proposed rule that would amend 10 CFR Parts 50 and 52, entitled "Training and Qualification of Nuclear Plant Personnel." The proposed rule was published in the Federal Register on January 7, 1992 (57 FR 537). The amendments would require that each applicant for and each holder of a license to operate a nuclear power plant establish, implement, and maintain a training program for nuclear power plant personnel that provides qualified personnel to operate and maintain the facility in a safe manner in all modes of operation. The proposed rule met the directives contained in Section 306 of the Nuclear Waste Policy Act of 1982 (NWPA), Pub. L. 97-425, as interpreted by the U.S. Court of Appeals for the District of Columbia Circuit, that mandatory requirements be established for the training and qualification of personnel at civilian nuclear power plants.

The proposed rule would require training programs that are derived from a systematic analysis of job performance requirements that can include both site-specific and industry-wide experiences. Current industry training programs have been developed consistent with this approach. Based on monitoring industry training programs since the 1985 Policy Statement went into effect, the NRC has concluded that these programs have been generally effective in ensuring that personnel have qualifications commensurate with the performance requirements of their jobs.

Summary and Analysis of Public Comments

The comment period for the proposed rule expired March 7, 1992. Public comment letters received on the proposed rule are available for public inspection and copying for a fee at the Commission's Public Document Room. Comments were received from 30 individuals and corporate entities, virtually all of whom are directly involved in the nuclear power industry. Many of the letters contained similar comments and have been grouped together and addressed as a single issue. All comments have been grouped into eight broad issues. For each broad issue, the NRC has included a summary of the comments received and an analysis and response to those comments.

1. Responsibility for Training and Acceptability of Third-Party Training-Accreditation Programs.

Comment. Several commenters indicated that the NRC should clarify who under the proposed requirements will have responsibility for training contractor personnel. Given the proposed rule's requirement that training programs be based on a systems approach to training, they indicated that the NRC should clarify its intention regarding the acceptability of licensees relying on third-party training programs other than INPO-managed training accreditation-certification programs in evaluating the training needs and qualifications of personnel. The Radiation Protection Association's program of registration-certification of Health Physics Technicians was cited as an example of an other than INPO-managed training accreditation-certification program that the Commission should explicitly endorse. Commenters also

indicated that the NRC should clarify that if the evaluation of personnel does not indicate that additional training is needed (i.e., they are already qualified), then additional training is not required. Finally, commenters questioned whether the NRC has developed acceptance criteria for licensees to use in determining the acceptability of vendor-developed and other third-party training programs, and if the NRC anticipated deriving such criteria from NUREG-1220.

Response. The intent of the rule is to ensure that nuclear power plant personnel have the necessary knowledge, skills, and abilities to perform their assigned jobs competently; i.e., they are qualified to independently perform specific activities. Therefore, it is the responsibility of each licensee and applicant to ensure that personnel specified by the rule, regardless of whether they are employees or contractors, are qualified.

The requirement that each licensee or applicant develop, implement, and maintain a SAT-based training program is applicable only to licensee personnel, not contractors, and establishes a process that provides a high-degree of assurance that personnel will be qualified to perform their assigned duties. This assurance arises from the five major elements of the SAT process: 1) analysis of job performance requirements and training needs; 2) derivation of learning objectives; 3) design and implementation of the training programs; 4) trainee evaluation; and 5) program evaluation and revision. Training is only required when a comparison of job performance requirements for tasks being assigned and the skills and knowledge of a specific person indicate a training need. Third-party (including vendor-developed) training programs, although not specifically endorsed by the NRC,

are acceptable provided that the licensee has evaluated the programs to ensure that they will result in proper qualification. Because the acceptability of vendor-developed programs will vary based on individual facility needs, the NRC is not providing specific acceptance criteria. Licensees should evaluate vendor-developed training programs against the facility's job and task analysis results to ensure that the vendor programs will meet the licensee's specific qualification requirements.

2. Appropriateness of SAT-based Training.

Comment. Numerous commenters questioned the appropriateness of requiring SAT-based training. At the most basic level was a concern that the NRC has not placed sufficient emphasis on the fact that the required SAT-based training is not intended to be a simple "cookbook" approach and that personnel should be encouraged to acquire additional knowledge, training, and academic instruction to give them a deeper understanding of the technical principles underlying their training. A more widely held concern was that the proposed rule could be construed as requiring additional rigorous job and task analysis, particularly since NRC Inspection Procedure 41500 is more restrictive in this area than the current requirements for INPO-managed training accreditation. These commenters noted that the job and task analysis is not necessarily appropriate or sufficient for all of the types of personnel covered by the rule. They requested that the NRC explicitly acknowledge that varying degrees of rigor in the performance of job and task analysis are appropriate for differing types of positions, as are analyses completed through cooperative generic industry efforts. Specifically, it was

recommended that training programs affecting the Shift Supervisor, Shift Technical Advisor, and Technical Staff and Managers be allowed and encouraged to rely on additional bases for determining training needs and that Inspection Procedure 41500 and NUREG-1220, "Training Review Criteria and Procedures," be revised to make them fully consistent with current INPO guidance. Finally, one commenter noted that SAT-based training is inconsistent with the requirements in 10 CFR Part 55 for licensed operators and requested that the NRC explain why it has determined that only SAT-based training is acceptable.

Response. The Commission shares the concern that SAT-based training not be treated in a "cookbook" manner. It is not the intent of the NRC that the industry simply approach the SAT-based program in a "cookbook" manner, since the NRC does not intend to discourage licensees from imposing additional requirements above those developed from the SAT-based training program. The decision to require SAT-based training programs reflects both the industry's success with this approach and the fact that the process has the advantage of incorporating ongoing review and revision of the program to reflect changing needs.

Additional rigorous job and task analysis will not be required for any of the positions listed in this rule. The NRC has monitored and evaluated the development and implementation of the current industry programs. The NRC believes that the job, task, and needs analyses underlying the currently accredited programs are adequate, as are the criteria that are used in determining the acceptability of programs for future accreditation. In order to clarify its position that additional job and task analyses are not being

required, the NRC has revised Inspection Procedure 41500 and NUREG-1220 to make them consistent with this regulation.

The NRC recognizes that 10 CFR Part 55, which only applies to licensed operators, allows non-SAT based approaches to training. This provision was necessary to accommodate existing industry programs for training licensed operators at the time Part 55 was promulgated, because industry-wide implementation of SAT-based training was not complete. At this time, SAT-based training has been broadly implemented by the industry for both licensed operators and other plant personnel. Virtually all of the initial and requalification programs for licensed operators are SAT-based. The NRC believes that, based on SAT's success and its wide use by industry, that it is appropriate to incorporate SAT-based training as a requirement in this rule.

3. Definition of Personnel to be Trained.

Comment. A number of both general and specific comments were received that addressed the issue of the definition of the personnel that would be covered by the proposed rule. Some held the view that the specification of the personnel covered by the proposed rule was too narrow while others believed it was too broad. Some commenters recommended that the proposed rule cover all personnel who perform or oversee design, operation, or maintenance activities regardless of whether they are physically located on-site or off-site. At the same time, the commenters indicated that the proposed rule should explicitly exclude all personnel who, regardless of location, only perform support services. In addition, the commenters indicated that personnel working under direct supervision, such as short-term contractor

personnel, should be excluded from these training requirements. More concretely, numerous commenters requested that the proposed rule, be clarified in terms of personnel to be trained. For example:

Is a "Radwaste Operator" to be considered a "Non-Licensed Operator"? Does "Shift Supervisors" include "Assistant Shift Supervisors"? While the job title "I&C Technicians" is precise, "electrical personnel" and "mechanical personnel" appear to be broader than "electricians" and "mechanics." Which functions or personnel are included in on-site technical staff?

Finally, a number of commenters noted that to be consistent with INPO's current accreditation program, managers should not be included in the rule. This could be accomplished by amending § 50.120(b) so that the personnel designated as (9) "Technical Staff and Managers" be designated "Engineering Support Personnel." Almost all the commenters seeking clarification of the personnel to be trained recommended that the regulation explicitly state that it applies only to the training programs currently included in the INPO accreditation program.

Response. The scope of the list of personnel is consistent with and incorporates those positions that are currently covered by accreditation and existing industry practice. The NRC believes that the existing training programs for the personnel listed are satisfactory. For these reasons, the NRC does not believe it is appropriate to revise the scope of the regulation. The shift supervisor position is the only supervisory function included within the scope of the rule and does not include the assistant shift supervisor. However, the regulation has been revised to reflect a change from the title of the "on-site technical staff and managers" category to "engineering support

personnel," which is now consistent with the name for the corresponding INPO accredited training program. The scope of the personnel covered by that program to be trained in accordance with this regulation, however, is unchanged.

The NRC does not believe that a change to the rule is needed in order to clarify the applicability of this rule to short-term contractor personnel. Contractor personnel are not covered by this rule unless they occupy regular positions working independently within the licensee's organization. However, if short-term contractor personnel are assigned to work independently, they must be qualified to perform the assigned tasks. Finally, the issue of including off-site personnel in the final rule has been considered. The NRC has concluded that the requirements apply to job functions in the identified categories of personnel relating to on-site activities regardless of the location of the personnel.

4. Relationship Between Training and Qualification.

Comment. One commenter expressed concern that the relationship between training and qualification has been blurred. The commenter indicated that while the proposed rule is entitled "Training and Qualification of Nuclear Power Plant Personnel," the requirements appear to relate to training only. It was recommended that the term qualification be eliminated, or, alternatively, that necessary qualifications be explicitly listed. The commenter also indicated that the NRC should clarify that successful completion of a training program is not in and of itself sufficient, in lieu

of any specific qualifications imposed by other regulations, for a particular position.

Response. The NRC disagrees that the distinction between training and qualification has been blurred by the rule. As stated in the preamble for the proposed rule, qualification in the context of this rule means job task qualification. The proposed rule contained the requirement that licensees and applicants develop, implement, and maintain a SAT-based training program to ensure that nuclear power personnel are qualified to perform the tasks of their jobs. Because licensees and applicants must comply with all applicable regulations, there should be no ambiguity concerning the fact that successful completion of a training program does not obviate the need to comply with any other training or qualification requirements imposed by other regulations or license conditions. This means that nuclear power plant personnel must also meet the licensees' initial job qualification requirements imposed as part of initial employment. Therefore, no changes were made to the rule in response to this comment.

5. Applicability of the Rule.

Comment. Several commenters expressed the opinion that the applicability of the rule was too broad with respect to licensees who are undergoing decommissioning or are Part 52 applicants. Specifically, they recommended that the rule apply only to applicants for or licensees with an operating license. The commenters suggested that facilities engaged in decommissioning where all fuel has been permanently removed from the reactor

vessel or those with a possession only license (POL) should not be subject to this rule. Additionally, they questioned why Part 52 needed to be amended to include the requirements of § 50.120(b), since the provisions of Part 52 already automatically incorporate all of the standards in Part 50 that are technically relevant.

Response. The NRC believes that making the provisions of the rule applicable to all Part 50 licensees and applicants is appropriate. The SAT-process ensures that as plant conditions change, training programs will be revised to reflect these changes. These revisions could include the development of new programs or the elimination of obsolete programs. However, the process also ensures that the modification of the program to reflect the changed environment is performed in an orderly fashion. If permanent changes in the condition of the plant (i.e., decommissioning or POL) make some or all existing training programs unnecessary, the licensee would obtain relief from these requirements by applying for an exemption eliminating or modifying the affected programs. Also, the reason that 10 CFR Part 52 needs to be amended is to ensure that Part 52 applicants have considered the requirements of 10 CFR 50.120(b) in their applications.

6. Implementation of the Rule.

Both general and specific concerns were raised regarding implementation of the rule, the time periods allowed for implementation, and the means to be used by licensees to demonstrate compliance of a training program that is not accredited by the INPO-managed training accreditation program.

(a) General Concerns.

Comment. Numerous commenters expressed concerns regarding the manner in which the NRC will monitor implementation of the rule to ensure that it is consistent with the Commission's intentions and that the guidance provided by the NRC and INPO is consistent. Specifically, it was recommended that the Commission carefully monitor the implementation of the final rule to ensure a consistent understanding of the regulatory goals as was identified in SECY-91-172, "Regulatory Impact Survey - Final." In addition it was suggested that the principles in the Staff Requirements Memorandum dated December 20, 1991, regarding the Systematic Assessment of Licensee Performance (SALP) program should be applied to this training rule. Commission monitoring of the training rule would ensure that there is intra- and inter-regional consistency in the requirements, evaluation criteria, and results, and would preclude the imposition of additional requirements based on rising expectations. Commenters indicated that the NRC should clarify the process that INPO and the NRC will use to avoid giving licensees conflicting guidance. Commenters indicated that the NRC should explicitly state that maintenance of an accredited training program will be construed as complete compliance with these training requirements. Other commenters indicated that NRC should consider delaying the effective date of the rule until it has completely reviewed implementing guidance (e.g., Reg. Guide 1.8, Rev. 2) and made it consistent with the final rule.

Response. The NRC believes that the requirements and implementation of this rule will be consistent with the accredited programs already developed

and implemented by the industry. Therefore, the policy the Commission expects to follow in implementing the rule is that continued accreditation along with effective implementation of the accredited program is considered to be an acceptable means of demonstrating compliance. This conclusion is based on staff inspections which have found the accredited programs to be generally acceptable, and the NRC review of documents that provide the industry program objectives and criteria. An applicant or licensee could also comply with the requirements of this rule without being accredited. Inspection Procedure 41500 and NUREG-1220 have been revised to make them consistent with this regulation. This guidance will be used by the NRC staff when monitoring implementation of this rule or inspecting training programs and is intended to ensure consistent interpretation of training criteria by all NRC regions. The NRC, therefore, does not intend to revise Reg. Guide 1.8.

(b) Implementation Period.

Comment. With regard to the specific time frames allowed for implementation, several commenters expressed the opinion that if the rule is truly consistent with established programs, that an implementation period of 180 days was reasonable. However, other commenters stated that additional time should be granted to accommodate the industry's implementation date of December 31, 1993, for the new "Engineering Support Personnel" accredited program and for the review and documentation activities that are believed by the commenters to be necessary to demonstrate compliance with the rule. Similarly, many believed that the requirement in § 50.120(b) that applicants must have established and implemented the required training program 18 months

prior to fuel load is not reasonable, given that the accreditation process for training programs provides for verification and revision of training programs based on experience gained from operations. It was recommended by several commenters that applicants simply be required to have training programs established and ready for accreditation prior to initial fuel load. Finally, several commenters noted that linking the required program review and revision cycle to the industry's current 4-year schedule is unnecessarily prescriptive.

Response. The NRC has considered the issues raised by the commenters regarding the appropriate implementation time periods for both licensees and applicants. For licensees, the Commission believes that the 180-day implementation period is sufficient, because all licensees have developed, implemented, and are maintaining accredited programs. Implementation of the new "Engineering Support Personnel" program, which replaces the current "Technical Staff and Managers" program or other future accredited program changes, does not negate the fact that SAT-based training is continuing for the personnel covered by the rule, therefore, compliance with the regulation would be maintained.

The requirement that applicants establish and implement the training program 18 months prior to fuel load is also considered appropriate. The NRC realizes that an applicant would not have a training program accredited 18 months prior to fuel load, and this rule does not require accreditation. The rule only requires that a training program be established for those portions of the plant programs necessary to support ongoing activities covered under the rule. In addition, the NRC believes that having the SAT-based training program in place prior to fuel load allows significant benefits in

terms of program review and revisions based upon experience gained prior to fuel loading.

The NRC concurs that linking the program review-revision cycle to existing practice (i.e., a 4-year accreditation-renewal cycle) is unnecessarily prescriptive, therefore reference to specific 4-year review cycle has been deleted from the supplementary information section of the final rulemaking notice.

(c) Review and Recordkeeping Requirements.

Comment. Several commenters requested that the NRC clarify the requirements for recordkeeping and for program reviews and revisions. Specifically, the NRC was requested to clarify (1) what records need to be maintained in order to meet the requirements of § 50.120, (2) whether any special retention periods apply to these records, and (3) what "associated programs" must be readily auditable, or that this language be dropped from the discussion. They also requested that NRC clarify the rule so that it is clear that the periodic reviews of training programs are to be conducted by appropriate functional managers, not just training managers.

Response. The records the licensees will need to maintain to meet the requirements of § 50.120 are the same records currently being maintained by licensees for their existing training programs. The proposed rule does not impose any special retention periods for these records. The words "associated programs" will be deleted from the discussion related to being readily auditable. The final rule does not require clarification since the proposed

rule notes "licensee management," which NRC takes to include functional line managers.

(d) Demonstration of Compliance.

Comment. The NRC should clarify how compliance with the rule is to be demonstrated by facilities without an accredited program.

Response. An accredited program is considered to be an acceptable means of demonstrating compliance with the rule. Facilities that do not have an accredited program would demonstrate compliance with the final rule through the development of training programs using the systems approach to training as defined in 10 CFR 55.4. The NRC will conduct inspections of non-accredited facility programs to ensure that the requirements of the final rule are met.

7. Recommend that the Commission Try One More Time to Reverse the Court Decision.

Comment. Most commenters expressed their strong opinion that the rule is unnecessary given the industry's initiatives in developing and implementing effective training programs, but accept the rule as necessary given the Court's decisions. However, one commenter requested that, given the President's January 28, 1992, directive that agencies are to "identify and accelerate action on initiatives which will eliminate any unnecessary regulatory burden," the Commission seek, through the Executive Branch, if necessary, a judicial review of the Court's ruling.

Response. The Commission believes that the President's directive does not supersede the Court's ruling and the NRC has exhausted all reasonable avenues of judicial review.

8. Reconsideration of Other Training Requirements in Light of This Rule.

Comment. One commenter requested that the NRC review Part 55 in its entirety to ensure that it is consistent with this rule, stating that it is possible that many of the prescriptive requirements in existing Part 55 could be eliminated if it were amended to reflect existing industry practice for identifying the need for and developing training programs.

Response. Part 55 currently states that a SAT-based training program and a certified simulator is an acceptable alternative to the prescriptive requirements of Part 55 and would meet the existing requirements for licensed operator training. In fact, most of the initial and requalification programs for licensed operators are based on SAT. Thus, Part 55 is consistent with this rule. Furthermore, some programs retain elements of the prescriptive portion of 10 CFR Part 55 and to eliminate these elements would create an unnecessary perturbation to these programs.

Discussion

The safety of nuclear power plant operations and the assurance of general public health and safety depend on personnel performing at adequate

performance levels. The systematic determination of qualifications and the provision of effective initial training and periodic retraining will enhance confidence that workers can perform at adequate performance levels. Qualification in the context of this rule means that nuclear power plant personnel have completed the training program, or parts thereof, as evidenced by meeting the job performance requirements, and are permitted to independently perform specific activities. The Commission has taken an approach in this rule that would specify the process to be implemented by applicants and licensees through which job performance criteria and associated personnel training would be derived. This approach provides for flexibility and site-specific adaptations in the training programs. No additional cost is anticipated with this approach for licensees with accredited programs because the rule is believed to be consistent with existing industry practice for personnel training.

Summary of Final Rule

Each applicant for and each holder of an operating license for a nuclear power plant shall:

- (1) Establish a training program for certain nuclear power plant personnel who perform operating, maintenance, and technical support activities;
- (2) Use a systems approach to training;
- (3) Incorporate instructional requirements to provide trained and qualified personnel who can safely operate the facility in all modes of operation;
- (4) Periodically review, evaluate, and revise the training program; and

(5) Maintain sufficient records, available for NRC inspection, to verify the adequacy of the training program.

Although no written response is required, licensees are expected to review their license conditions and other commitments for consistency with this rule.

The Commission has also developed conforming amendments to 10 CFR Parts 50 and 52 to accompany this rule. Part of these amendments to Parts 50 and 52 are considered minor. The other change to Part 52 is more substantive and has been developed to ensure that applicants for a combined license (construction and operation) will establish, implement, and maintain a training program in accordance with the requirements in 10 CFR 50.120. This rule is not intended to preclude vendor training programs developed in conjunction with standardization of design.

Discussion of Final Rule

A new § 50.120, has been added to 10 CFR Part 50, entitled "Training and qualification of nuclear power plant personnel."

This Section establishes the requirements for and the essential elements of the process to be used by applicants and licensees to:

(1) Determine training and qualification requirements for all appropriate personnel;

(2) Develop training programs to ensure that each licensee has trained and qualified personnel to operate and maintain the facility in a safe manner; and

(3) Implement and maintain these programs effectively on a continuing basis.

Paragraph (a), "Applicability," indicates that the rule applies to each applicant for and each holder of an operating license for a nuclear power plant.

Paragraph (b), "Requirements," requires that each applicant or licensee establish, implement, and maintain a program for training nuclear power plant personnel which addresses all modes of operation and is derived from a systems approach to training (SAT). The SAT process was selected because it has the following characteristics:

- (1) Training design and content are derived from job performance requirements;
- (2) Training is evaluated and revised in terms of job performance requirements and observed results on the job;
- (3) Success in training can predict satisfactory on-the-job performance; and
- (4) A training program can be audited because it involves clearly delineated process steps and documentation.

The SAT process contains five major elements and is intended to require a training system that will ensure successful performance on the job by trained individuals. The elements are:

- (1) Analysis of job performance requirements and training needs;
- (2) Derivation of learning objectives;
- (3) Design and implementation of the training programs;
- (4) Trainee evaluation;
- (5) Program evaluation and revision.

The SAT process also provides a sequential method of generating the type of documentation needed for training review. Use of SAT will obviate the need for additional documentation for NRC review.

The SAT process is a generic process, and its application is not limited to a certain subject matter or to specific licensee personnel. Training programs based on job performance requirements have been successfully used by the military for over 20 years and by the nuclear industry for much of the past decade. Furthermore, the Commission has recognized the appropriateness of using this approach to training in its requirements for operator licensing prescribed in § 55.31(a)(4), and for operator requalification prescribed in § 55.59(c).

This rule would provide for the training and qualification of the following nuclear power plant personnel:

- (1) Non-licensed operator.
- (2) Shift supervisor.
- (3) Shift technical advisor.
- (4) Instrument and control technician.
- (5) Electrical maintenance personnel.
- (6) Mechanical maintenance personnel.
- (7) Radiological protection technician.
- (8) Chemistry technician.
- (9) Engineering support personnel.

Licensed operators, such as control room operators and senior control room operators, are not covered by this rule. They will continue to be covered by 10 CFR Part 55 for both initial and requalification training. Because some senior control room operators may also be shift supervisors, only

those aspects of training related to their shift supervisor function would be covered by this rule.

This rule would require that training programs be periodically evaluated and revised as appropriate, and also be periodically reviewed by management for effectiveness. Current industry objectives in this regard involve the evaluation by management of individual training programs on a continuing or periodic basis to identify program strengths, weaknesses, and effectiveness. These evaluations are normally completed within a 3- to 6-month period following completion of training within the programs. The sum of these evaluations results in a comprehensive review. Periodic evaluations of the overall training programs are being performed by the industry as part of accreditation renewal. The Commission expects this practice to continue.

Determination of job performance requirements and training needs is part of the analysis in the SAT process and is reflected in qualification requirements. The facility applicant or licensee will be responsible for ensuring that all personnel within the scope of this rule have the training and resulting qualifications commensurate with job performance requirements for their assigned tasks. Initial and continuing training, as appropriate, is expected to be provided to job incumbents in positions covered by this rule.

Each applicant and licensee is required to maintain and keep available for NRC inspection the materials used to establish and implement required training programs for the affected personnel. Current industry practice in this regard involves retention of those records necessary to support management information needs and to provide required historical data. In general, these include records of program development, evaluation, and revision related to the existing training program. The NRC has found through

inspections of training programs that sufficient records are being retained for periods that are adequate for regulatory purposes. The Commission believes that no additional guidance for recordkeeping is necessary.

No written response is required by this rule. However, applicants and licensees would be expected to compare their current training commitments and licensing bases with the requirements of this rule. Licensees should use the results of this comparison to evaluate and revise, as appropriate, existing technical specifications or previous commitments. This approach will ensure a common understanding between applicants, licensees, and the NRC staff of training commitments when future inspections are conducted.

Impact of this Rule on Existing Industry Training Programs

This rule would supersede the Policy Statement on Training and Qualification of Nuclear Power Plant Personnel. The Commission believes that this rule would not result in any change to accredited training programs. The NRC has found through inspections that the programs are generally acceptable. The Commission expects that training programs accredited and implemented consistent with the industry program objectives would be in compliance with the requirements of this regulation.

An existing Memorandum of Agreement between INPO and the Commission assures that the NRC will be made aware of any modifications or updates to the industry's program objectives and criteria. Having seen such modifications, the NRC will review to determine if they warrant any modification in the Commission's position expressed above. The NRC will continue to monitor the industry accreditation process by:

(a) Nominating individuals who are not on the NRC staff to serve as members of the National Nuclear Accrediting Board with full voting privileges;

(b) Having an NRC staff member attend and observe selected National Nuclear Accrediting Board meetings with the INPO staff or the utility representatives;

(c) Having NRC staff observe selected INPO accreditation team site visits;

(d) Reviewing any subsequent revisions to the program objectives and criteria as currently described in the National Academy for Nuclear Training document "The Objectives and Criteria for Accreditation of Training in the Nuclear Power Industry" (ACAD 91-015)¹; and

(e) Verifying licensee programs through the NRC inspection process.

As noted above, the NRC has the ability to verify compliance with this regulation through the inspection program and will do so as appropriate. In its inspections, the NRC staff will use Inspection Procedure 41500, "Training and Qualification Effectiveness," which references the guidance in NUREG-1220, Revision 1,² "Training Review Criteria and Procedures." Based on NRC inspections conducted to date, the Commission believes that the objectives developed by the industry provides sufficiently clear guidance to allow applicants and licensees to implement effective training programs in

¹ A copy of ACAD 91-015 is available for public inspection or copying at the NRC Public Document Room, 2120 L Street, NW. (Lower Level), Washington, DC.

² Copies of NUREG-1220, Rev. 1 may be purchased from the Superintendent of Documents, U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082. Copies are also available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. A copy is also available for public inspection or copying at the NRC Public Document Room, 2120 L Street, NW. (Lower Level), Washington, DC.

compliance with this rule. Therefore, the Commission does not believe it is necessary to issue a regulatory guide to provide additional guidance for complying with this rule.

Vendor-Developed Programs for Standardized Plants

In 10 CFR Part 52, the Commission articulated the goal of safety through standardization of design. The Commission believes that the benefits of standardization could involve the standardization of some types of training associated with the 10 CFR Part 52 design certification. Therefore, nothing in this rule is intended to preclude standard training programs being developed or implemented by a vendor. For example, the initial training for instrument and control technicians related to a particular standard design may be conducted by a vendor. As a result, there could be a pool of technicians trained by the vendor on the certified design available for hire at a nuclear power plant site. These personnel, however, would need to complete site-specific training related to the administrative and operating philosophy of the site as well as any other specific requirements of the licensee.

Thus, the requirements for personnel training programs prescribed by § 50.120 do not prevent a vendor from training personnel or from developing a training process. However, it is important to note that vendor training programs are not governed by this rule and that the licensee is ultimately responsible for ensuring that personnel are qualified.

Applicants for a Combined License

Part 52 is being amended to require that applicants for combined licenses establish, implement, and maintain training programs in accordance with the requirements in 10 CFR 50.120.

Criminal Penalties

As a result of the addition of Section 52.78 by this rulemaking, the criminal penalty provision, Section 52.113, is being modified to add Section 52.78 to the list of sections in subsection (b), since the new section is not identified as substantive, as that criterion is expressed in the Federal Register Notice: Clarification of Statutory Authority for Purposes of Criminal Enforcement, 57 Fed. Reg. 55062 (November 24, 1992). In addition, Section 52.101 is deleted and Section 52.103 is added to the list, to reflect changes made to Part 52 in a previous rulemaking, 57 Fed. Reg. 60978 (December 23, 1992).

Finding of No Significant Environmental Impact: Availability

The Commission has determined under the National Environmental Policy Act of 1969, as amended, and the Commission's regulations in Subpart A of 10 CFR Part 51, that this rule is not a major Federal action significantly affecting the quality of the human environment and, therefore, an environmental impact statement is not required. Numerous studies have shown that in complex man-machine systems, human error has often been the overriding

contributor to actual or potential system failures that may be precursors to accidents. With this rulemaking, the NRC is emphasizing the need to ensure that industry personnel training programs are based upon job performance requirements. Personnel who are subjected to training based on job performance requirements should be able to perform their jobs more effectively, and with fewer errors. Therefore, the environmental effect of implementing this rule would, if anything, be positive because of the reduction in human error. The environmental assessment and finding of no significant impact on which this determination is based are available for inspection at the NRC Public Document Room, 2120 L Street, NW. (Lower Level), Washington, DC 20555. Single copies of the environmental assessment and finding of no significant impact are available from Rajender Auluck, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, DC 20555, telephone: (301) 492-3794.

Paperwork Reduction Act Statement

This final rule amends information collection requirements that are subject to the Paperwork Reduction Act of 1980 (44 U.S.C. 3501 et seq.). These requirements were approved by the Office of Management and Budget approval numbers 3150-0011 and 3150-0151.

Public burden for update and maintenance of information is estimated to average 780 hours per utility per year, including the time for reviewing the present program, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this

collection of information, including suggestions for reducing this burden, to the Information and Records Management Branch (MNBB-7714), U.S. Nuclear Regulatory Commission, Washington, DC 20555; and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-3019, (3150-0011), Office of Management and Budget, Washington, DC 20503.

Regulatory Analysis

A regulatory analysis has been prepared for this final regulation. The analysis examines the values (benefits) and impacts (costs) of implementing the regulation for personnel training and qualification. This analysis is available for inspection in the NRC Public Document Room, 2120 L Street, NW. (Lower Level), Washington, DC 20555. Single copies of the analysis may be obtained from Rajender Auluck (see ADDRESSES heading).

Regulatory Flexibility Certification

As required by the Regulatory Flexibility Act of 1989, 5 U.S.C. 605(b), the Commission certifies that this rule will not have a significant economic impact on a substantial number of small entities. This final rule primarily affects the companies that own and operate light-water nuclear power reactors and the vendors of those reactors. The companies that own and operate these reactors do not fall within the scope of the definition of "small entity" set forth in the Regulatory Flexibility Act or the Small Business Size Standards set out in regulations issued by the Small Business Administration in 13 CFR Part 121.

Backfit Analysis

The Commission has determined that the backfit rule, 10 CFR 50.109, does not apply to this final rule because these amendments are mandated by Section 306 of the Nuclear Waste Policy Act of 1982, 42 U.S.C. Section 10226. Therefore, a backfit analysis is not required for this rule.

List of Subjects

10 CFR Part 50- Antitrust, Classified information, Criminal penalty, Fire protection, Incorporation by reference, Intergovernmental relations, Nuclear power plants and reactors, Radiation protection, Reactor siting criteria, Reporting and recordkeeping requirements.

10 CFR Part 52- Administrative practice and procedure, Antitrust, Backfitting, Combined license, Early site permit, Emergency planning, Fees, Inspection, Limited work authorization, Nuclear power plants and reactors, Probabilistic risk assessment, Prototype, Reactor siting criteria, Redress of site, Reporting and recordkeeping requirements, Standard design, Standard design certification.

For the reasons set out in the preamble and under the authority of the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, the Nuclear Waste Policy Act of 1982, and 5 U.S.C. 552 and 553, the NRC is adopting the following amendments to 10 CFR Parts 50 and 52 as follows:

PART 50 - DOMESTIC LICENSING OF
PRODUCTION AND UTILIZATION FACILITIES

1. The authority citation for 10 CFR Part 50 is revised to read as follows:

AUTHORITY: Secs. 102, 103, 104, 105, 161, 182, 183, 186, 189, 68 Stat. 936, 937, 938, 948, 953, 954, 955, 956, as amended, sec. 234, 83 Stat. 1244, as amended (42 U.S.C. 2132, 2133, 2134, 2135, 2201, 2232, 2233, 2236, 2239, 2282); secs. 201, as amended, 202, 206, 88 Stat. 1242, as amended, 1244, 1246 (42 U.S.C. 5841, 5842, 5846).

Section 50.7 also issued under Pub. L. 95-601, sec. 10, 92 Stat. 2951 (42 U.S.C. 5851). Section 50.10 also issued under secs. 101, 185, 68 Stat. 936, 955, as amended (42 U.S.C. 2131, 2235); sec. 102, Pub. L. 91-190, 83 Stat. 853 (42 U.S.C. 4332). Sections 50.13, 50.54(dd), and 50.103 also issued under sec. 108, 68 Stat. 939, as amended (42 U.S.C. 2138). Sections 50.23, 50.35, 50.55, and 50.56 also issued under sec. 185, 68 Stat. 955 (42 U.S.C. 2235). Sections 50.33a, 50.55a, and Appendix Q also issued under sec. 102, Pub. L. 91-190, 83 Stat. 853 (42 U.S.C. 4332). Sections 50.34 and 50.54 also issued under sec. 204, 88 Stat. 1245 (42 U.S.C. 5844). Sections 50.58, 50.91, and 50.92 also issued under Pub. L. 97-415, 96 Stat. 2073 (42 U.S.C. 2239). Section 50.78 also issued under sec. 122, 68 Stat. 939 (42 U.S.C. 2152). Sections 50.80 - 50.81 also issued under sec. 184, 68 Stat. 954, as amended (42 U.S.C. 2234). Section 50.120 is also issued under Section 306 of the NHPA of 1982, 42 U.S.C. 10226. Appendix F also issued under sec. 187, 68 Stat. 955 (42 U.S.C. 2237).

2. In § 50.8, paragraph (b) is revised to read as follows:

2. In § 50.8, paragraph (b) is revised to read as follows:

§ 50.8 Information collection requirements: OMB approval.

* * * * *

(b) The approved information collection requirements contained in this part appear in §§ 50.30, 50.33, 50.33a, 50.34, 50.34a, 50.35, 50.36, 50.36a, 50.48, 50.49, 50.51, 50.55, 50.55a, 50.59, 50.60, 50.61, 50.63, 50.64, 50.71, 50.72, 50.80, 50.82, 50.90, 50.91, 50.120, and Appendixes A, B, E, G, H, I, J, K, M, N, O, Q, and R.

* * * * *

3. Section 50.120 is added to read as follows:

§ 50.120 Training and qualification of nuclear power plant personnel.

(a) Applicability. The requirements of this section apply to each applicant for (applicant) and each holder of an operating license (licensee) for a nuclear power plant of the type specified in § 50.21(b) or § 50.22.

(b) Requirements. Each nuclear power plant applicant, by (180 days after the effective date of the rule) or 18 months prior to fuel load, whichever is later, and each nuclear power plant licensee, by (180 days after the effective date of the rule), shall establish, implement, and maintain a training program derived from a systems approach to training as defined in 10 CFR 55.4. The training program must provide for the training and qualification of the following categories of nuclear power plant personnel:

- (1) Non-licensed operator.
- (2) Shift supervisor.
- (3) Shift technical advisor.

- (4) Instrument and control technician.
- (5) Electrical maintenance personnel.
- (6) Mechanical maintenance personnel.
- (7) Radiological protection technician.
- (8) Chemistry technician.
- (9) Engineering support personnel.

The training program must incorporate the instructional requirements necessary to provide qualified personnel to operate and maintain the facility in a safe manner in all modes of operation. The training program must be developed so as to be in compliance with the facility license, including all technical specifications and applicable regulations. The training program must be periodically evaluated and revised as appropriate to reflect industry experience as well as changes to the facility, procedures, regulations, and quality assurance requirements. The training program must be periodically reviewed by licensee management for effectiveness. Sufficient records must be maintained by the licensee to maintain program integrity and kept available for NRC inspection to verify the adequacy of the program.

PART 52 - EARLY SITE PERMITS; STANDARD DESIGN CERTIFICATIONS; AND
COMBINED LICENSES FOR NUCLEAR POWER PLANTS

4. The authority citation for 10 CFR Part 52 continues to read as follows:

AUTHORITY: Secs. 103, 104, 161, 182, 183, 186, 189, 68 Stat, 936, 948, 953, 954, 955, 956, as amended, sec. 234, 83 Stat. 1244, as amended (42 U.S.C.

2133, 2201, 2232, 2233, 2236, 2239, 2282); secs. 201, 202, 206, 88 Stat. 1242, 1244, 1246, as amended (42 U.S.C. 5841, 5842, 5846).

5. In § 52.8, paragraph (b) is revised to read as follows:

§ 52.8 Information collection requirements: OMB approval.

* * * * *

(b) The approved information collection requirements contained in this part appear in §§ 52.15, 52.17, 52.29, 52.45, 52.47, 52.57, 52.75, 52.77, 52.78, and 52.79.

6. Section 52.78 is added to read as follows:

§ 52.78 Contents of applications; training and qualification of nuclear power plant personnel.

(a) Applicability. The requirements of this section apply only to the personnel associated with the operating phase of the combined licenses.

(b) The application must demonstrate compliance with the requirements for training programs established in § 50.120 of this chapter.

7. In § 52.113, paragraph (b) is revised to read as follows:

§ 52.113 Criminal penalties.

* * * * *

(b) The regulations in Part 52 that are not issued under Sections 161b, 161i, or 161o for the for the purposes of Section 223 are as follows:

§ § 52.1, 52.3, 52.5, 52.8, 52.11, 52.13, 52.15, 52.17, 52.18, 52.19, 52.21, 52.23, 52.24, 52.27, 52.29, 52.31, 52.33, 52.37, 52.39, 52.41, 52.43, 52.45, 52.47, 52.48, 52.49, 52.51, 52.53, 52.54, 52.55, 52.57, 52.59, 52.61, 52.71.

52.73, 52.75, 52.77, 52.78, 52.79, 52.81, 52.83, 52.85, 52.87, 52.89, 52.93,
52.97, 52.103, 52.111, and 52.113.

Dated at Rockville, MD, this _____ day of _____ 1992.

For the Nuclear Regulatory Commission.

Samuel J. Chilk,
Secretary of the Commission.

NUCLEAR REGULATORY COMMISSION

10 CFR Parts 50 and 52

RIN 3150 - AD80

Training and Qualification of Nuclear Power Plant Personnel

AGENCY: Nuclear Regulatory Commission.

ACTION: Final rule.

SUMMARY: The Nuclear Regulatory Commission (NRC) is amending its regulations to require each applicant for and each holder of a license to operate a nuclear power plant to establish, implement, and maintain a training program for nuclear power plant personnel based on a systems approach to training (SAT). The training program will provide qualified personnel to operate and maintain ^{the} nuclear power plants in a safe manner in all modes of operation. This action is being taken to meet the directives of Section 306 of the Nuclear Waste Policy Act of 1982.

[30 days following publication]

EFFECTIVE DATE: For each nuclear power plant applicant, by [180 days after the effective date of the rule] or 18 months prior to fuel load, whichever is later, and for each nuclear power plant licensee, by [180 days after the effective date of the rule].

ADDRESSES: Copies of all referenced NRC documents are available for public inspection and copying for a fee at the NRC Public Document Room,

2120 L Street, NW. (Lower Level), Washington, DC 20555. Copies of NUREG documents may be purchased from the Superintendent of Documents, U.S. Government Printing Office by calling (202) 275-2060, or by writing to the Superintendent of Documents, U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082. Copies are also available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

FOR FURTHER INFORMATION CONTACT: Dr. Rajender Auluck, P.E., Office of Nuclear Regulatory Research, telephone: (301) 492-3794 or Mary Ann Biamonte, Office of Nuclear Reactor Regulation, telephone: (301) 504-1073, U.S. Nuclear Regulatory Commission, Washington, DC 20555.

SUPPLEMENTARY INFORMATION:

Background

Nuclear Waste Policy Act of 1982.

✓ In Section 306 of the Nuclear Waste Policy Act of 1982 (NWPA), Pub. L. 97-425, the NRC was "directed to promulgate regulations, or other appropriate Commission regulatory guidance for the training and qualifications of civilian nuclear power plant operators, supervisors, technicians and other operating personnel. ^{Such} The regulations or guidance shall establish ... instructional requirements for civilian nuclear power plant licensee personnel training programs." In order to meet this directive, on March 20, 1985, the Commission published a Policy Statement on Training and Qualification of

used by licensees to demonstrate compliance of a training program that is not accredited by the INPO-managed training accreditation program.

(a) General Concerns.

*more comments
clearly. What SRM?
What survey?*

Comment. Numerous commenters expressed concerns regarding the manner in which the NRC will monitor implementation of the rule to ensure that it is consistent with the Commission's intentions and that the guidance provided by the NRC and INPO is consistent. Specifically, it was recommended that the Commission carefully monitor the implementation of the final rule to ensure consistency with the principles established by the Commission in response to the Regulatory Impact Survey. Applying the principles in the Staff Requirements Memorandum for the Systematic Assessment of Licensee Performance (SALP) program would ensure that there is intra- and inter-regional consistency in the requirements, evaluation criteria, and results, and would preclude the imposition of additional requirements based on rising expectations. Commenters indicated that the NRC should clarify the process that INPO and the NRC will use to avoid giving licensees conflicting guidance. Commenters indicated that the NRC should explicitly state that maintenance of an accredited training program will be construed as complete compliance with these training requirements. Other commenters indicated that NRC should consider delaying the effective date of the rule until it has completely reviewed implementing guidance (e.g., Reg. Guide 1.8, Rev. 2) and made it consistent with the final rule.

Similarly, many believed that the requirement in § 50.120(b) that applicants must have established and implemented the required training program 18 months prior to fuel load is not reasonable, given that the accreditation process for training programs provides for verification and revision of training programs based on experience gained from operations. It was recommended by several commenters that applicants simply be required to have training programs established and ready for accreditation prior to initial fuel load. Finally, several commenters noted that linking the required program review and revision cycle to the industry's current 4-year schedule is unnecessarily prescriptive.

Response. The NRC has considered the issues raised by the commenters regarding the appropriate implementation time periods for both licensees and applicants. For licensees, the Commission believes that the 180-day implementation period is sufficient, because all licensees have developed, implemented, and are maintaining accredited programs. Implementation of the new "Engineering Support Personnel" program, which replaces the current "Technical Staff and Managers" program or other future accredited program changes, does not negate the fact that SAT-based training is continuing for the personnel covered by the rule, therefore, compliance with the regulation would be maintained.

The requirement that applicants establish and implement the training program 18 months prior to fuel load is also considered appropriate. The NRC realizes that an applicant would not have ^a training program accredited 18 months prior to fuel load, and this rule does not require accreditation. The rule only requires that a training program be established for those portions of the plant programs necessary to support ongoing activities covered

(2) Develop training programs to ensure that each licensee has trained and qualified personnel to operate and maintain the facility in a safe manner; and

(3) Implement and maintain these programs effectively on a continuing basis.

Paragraph (a), "Applicability," indicates that the rule applies to each applicant for and each holder of an operating license for a nuclear power plant.

Paragraph (b), "Requirements," requires that each applicant or licensee establish, implement, and maintain a program for training nuclear power plant personnel which addresses all modes of operation and is derived from a systems approach to training (SAT). The SAT process was selected because it has the following characteristics:

- (1) Training design and content are derived from job performance requirements;
- (2) Training is evaluated and revised in terms of job performance requirements and observed results on the job;
- (3) Success in training can predict satisfactory on-the-job performance; and
- (4) A ~~T~~ Training program can be audited because it involves clearly delineated process steps and documentation.

The SAT process contains five major elements and is intended to require a training system that will ensure successful performance on the job by trained individuals. The elements are:

- (1) Analysis of job performance requirements and training needs;
- (2) Derivation of learning objectives;

Licensed operators, such as control room operators and senior control room operators, are not covered by this rule. They will continue to be covered by 10 CFR Part 55 for both initial and requalification training. Because some senior control room operators may also be shift supervisors, only those aspects of training related to their shift supervisor function would be covered by this rule.

This rule would require that training programs be periodically evaluated and revised as appropriate, and also be periodically reviewed by management for effectiveness. Current industry objectives in this regard involve the evaluation by management of individual training programs on a continuing or periodic basis to identify program strengths, weaknesses, and effectiveness. These evaluations are normally completed within a 3- to 6-month period following completion of training within the programs. The sum of these evaluations results in a comprehensive review. Periodic evaluations of the overall training programs are being performed by the industry as part of accreditation renewal. The Commission expects this practice to continue.

Determination of job performance requirements and training needs is part of the analysis in the SAT process and is reflected in qualification requirements. The facility applicant or licensee will be responsible for ensuring that all personnel within the scope of this rule have the training and resulting qualifications commensurate with job performance requirements for their assigned tasks. Initial and continuing training, as appropriate, is expected to be provided to job incumbents in positions covered by this rule.

Each applicant and licensee is required to maintain and keep available for NRC inspection the materials used to establish and implement required training programs for the affected personnel. Current industry practice in

industry's program objectives and criteria. Having seen such modifications, the NRC will review to determine if they warrant any modification in the Commission's position expressed above. The NRC will continue to monitor the industry accreditation process by:

(a) Nominating individuals who are not on the NRC staff to serve as members of the National Nuclear Accrediting Board with full voting privileges;

(b) Having an NRC staff member attend and observe selected National Nuclear Accrediting Board meetings with the INPO staff or the utility representatives;

(c) Having NRC staff observe selected INPO accreditation team site visits;

(d) Reviewing any subsequent revisions to the program objectives and criteria as currently described in the National Academy for Nuclear Training document "The Objectives and Criteria for Accreditation of Training in the Nuclear Power Industry" (ACAD 91-015),^{*} and

(e) Verifying licensee programs through the NRC inspection process.

✓ As noted above, the NRC has the ability to verify compliance with this regulation through the inspection program and will do so as appropriate. In ^{its} ~~their~~ inspections, the NRC staff will use Inspection Procedure 41500, "Training and Qualification Effectiveness," which references the guidance in NUREG-1220, Revision 1,¹ "Training Review Criteria and Procedures." Based on NRC inspections conducted to date, the Commission believes that the objectives

¹Copies of NUREG-1220, Rev. 1 may be purchased from the Superintendent of Documents, U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082. Copies are also available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. A copy is also available for public inspection or copying at the NRC Public Document Room, 2120 L Street, NW., (Lower Level), Washington, DC.

*

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Add a footnote
noting availability of ACAD 91-015 in PDR
for ~~an~~ inspection.

periodically evaluated and revised as appropriate to reflect industry experience as well as changes to the facility, procedures, regulations, and quality assurance requirements. The training program must be periodically reviewed by licensee management for effectiveness. Sufficient records must be maintained and kept available for the licensee to maintain program integrity.

for NRC inspection to verify the adequacy of the program.

PART 52 - EARLY SITE PERMITS; STANDARD DESIGN CERTIFICATIONS; AND
COMBINED LICENSES FOR NUCLEAR POWER PLANTS

4. The authority citation for 10 CFR Part 52 continues to read as follows:

AUTHORITY: Secs. 103, 104, 161, 182, 183, 186, 189, 68 Stat. 936, 948, 953, 954, 955, 956, as amended, sec. 234, 83 Stat. 1244, as amended (42 U.S.C. 2133, 2201, 2232, 2233, 2236, 2239, 2282); secs. 201, 202, 206, 88 Stat. 1242, 1244, 1246, as amended (42 U.S.C. 5841, 5842, 5846).

5. In § 52.8, paragraph (b) is revised to read as follows:

§ 52.8 Information collection requirements: OMB approval.

* * * * *

(b) The approved information collection requirements contained in this part appear in §§ 52.15, 52.17, 52.29, 52.45, 52.47, 52.57, 52.75, 52.77, 52.78, and 52.79.

6. Section 52.78 is added to read as follows:

§ 52.78 Contents of applications: training and qualification of nuclear power plant personnel.

Enclosure 3

Congressional Letters



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

The Honorable Joseph Lieberman, Chairman
Subcommittee on Clean Air and Nuclear Regulation
Committee on Environment and Public Works
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

Enclosed for the information of the subcommittee is a copy of a final rule to be published in the Federal Register that contains amendments to 10 CFR Parts 50 and 52. This rulemaking meets the directives contained in Section 306 of the Nuclear Waste Policy Act of 1982 which required NRC to promulgate regulations or other appropriate regulatory guidance establishing instructional requirements for civilian nuclear power plant personnel. This rule replaces the March 20, 1985, NRC Policy Statement on Training and Qualification of Nuclear Power Plant Personnel, and its subsequent 1988 amendment, which were intended to meet the Congressional mandate. The NRC undertook this rulemaking in order to comply with a decision made in April 1990 by the U.S. Court of Appeals for the District of Columbia Circuit which concluded that the NRC did not meet the intent of Section 306 when the Agency published a nonbinding policy statement rather than regulations. The NRC believes that the additions to 10 CFR Parts 50 and 52 are fully responsive to the spirit and intent of Section 306 and offer an integrated approach to the concerns highlighted by Congress.

This rule would require that each applicant for and holder of an operating license for a nuclear power plant establish, implement, and maintain, a training program for nuclear power plant personnel. It would also require that the training program provide qualified personnel to operate and maintain the facility in a safe manner in all modes of operation. Licensees would be required to have the training programs in place no later than 180 days after the effective date of this rule. Applicants for an operating license would be required to have the training programs in place no later than 18 months prior to fuel load, or 180 days after the effective date of the rule, whichever comes later.

Sincerely,

Dennis K. Rathbun, Director
Office of Congressional Affairs

Enclosure:
Notice of Final Rulemaking

cc: Senator Alan K. Simpson



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

The Honorable Philip R. Sharp, Chairman
Subcommittee on Energy and Power
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

Enclosed for the information of the subcommittee is a copy of a final rule to be published in the Federal Register that contains amendments to 10 CFR Parts 50 and 52. This rulemaking meets the directives contained in Section 306 of the Nuclear Waste Policy Act of 1982 which required NRC to promulgate regulations or other appropriate regulatory guidance establishing instructional requirements for civilian nuclear power plant personnel. This rule replaces the March 20, 1985, NRC Policy Statement on Training and Qualification of Nuclear Power Plant Personnel, and its subsequent 1988 amendment, which were intended to meet the Congressional mandate. The NRC undertook this rulemaking in order to comply with a decision made in April 1990 by the U.S. Court of Appeals for the District of Columbia Circuit which concluded that the NRC did not meet the intent of Section 306 when the Agency published a nonbinding policy statement rather than regulations. The NRC believes that the additions to 10 CFR Parts 50 and 52 are fully responsive to the spirit and intent of Section 306 and offer an integrated approach to the concerns highlighted by Congress.

This rule would require that each applicant for and holder of an operating license for a nuclear power plant establish, implement, and maintain, a training program for nuclear power plant personnel. It would also require that the training program provide qualified personnel to operate and maintain the facility in a safe manner in all modes of operation. Licensees would be required to have the training programs in place no later than 180 days after the effective date of this rule. Applicants for an operating license would be required to have the training programs in place no later than 18 months prior to fuel load, or 180 days after the effective date of the rule, whichever comes later.

Sincerely,

Dennis K. Rathbun, Director
Office of Congressional Affairs

Enclosure:
Notice of Final Rulemaking

cc: Representative Michael Bilirakis

Enclosure 4

Environmental Assessment

ENVIRONMENTAL ASSESSMENT AND FINDING OF
NO SIGNIFICANT IMPACT
ON
FINAL AMENDMENT TO 10 CFR PART 50
"TRAINING AND QUALIFICATION OF NUCLEAR POWER PLANT PERSONNEL"

Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
August 1992

I. THE ACTION

This action is to amend 10 CFR Part 50 to require each applicant for and each holder of a license to operate a nuclear power plant to establish, implement, and maintain programs for the training of nuclear power plant personnel that consider all modes of operation. This rule meets the directives of Section 306 of the Nuclear Waste Policy Act of 1982. Specifically, each applicant, by (180 days after the effective date of the rule), or 18 months prior to fuel load, whichever is later, and each licensee, by (180 days after the effective date of the rule), shall establish, implement, and maintain personnel training programs to meet the requirements of the rule. This rule generally reflects current industry practice.

II. THE NEED FOR THE RULEMAKING ACTION

In Section 306 of the Nuclear Waste Policy Act of 1982 (NWPA), Pub. L. 97-425, the NRC was "directed to promulgate regulations, or other appropriate Commission regulatory guidance for the training and qualification of civilian nuclear power plant operators, supervisors, technicians and other operating personnel." In order to meet this directive, on March 20, 1985, the Commission published a Policy Statement which endorsed a training accreditation program managed by the Institute of Nuclear Power Operations (INPO) in that it encompassed the essential elements of "effective performance-based training."

Following issuance of the policy statement, the NRC evaluated the effectiveness of the INPO-managed training accreditation program over a 2-year period and concluded that it was an effective program for ensuring that nuclear power plant personnel have qualifications commensurate with the performance requirements of their jobs. On November 18, 1988, the NRC published an amended policy statement in order to (1) provide additional information regarding the NRC's experience with industry accreditation, (2) change the policy regarding enforcement to eliminate discretion in inspection and enforcement in the areas covered by the 1985 Policy Statement, and (3) reflect current Commission and industry guidance.

On April 17, 1990, the U.S. Court of Appeals for the District of Columbia Circuit concluded that the Commission's Policy Statement did not meet the intent of the Congressional directive to create mandatory requirements for the training of personnel at civilian nuclear power plants. The Court remanded the issue back to the NRC for action consistent with the Court's

findings. Public Citizen v. NRC, 901 F.2d 147 (D.C. Cir.). The Commission requested a rehearing by the full court of the decision. The request was denied on June 19, 1990. On November 26, 1990, the Supreme Court denied a petition for certiorari by the Nuclear Utility Management and Resource Council, 59 U.S.L.W. 3392 (November 26, 1990). This rulemaking meets the directives of Section 306 of the Nuclear Waste Policy Act of 1982 as interpreted by the Court.

III. ALTERNATIVES TO THE RULEMAKING ACTION

The alternatives to this rulemaking action are to: take no action; reaffirm the existing Policy Statement; or issue regulatory guidance. As noted previously, this rulemaking is being conducted pursuant to the Court's order that the NRC establish training requirements by rulemaking as called for by Section 306 of the Nuclear Waste Policy Act of 1982 (Pub. L. 97-425). Therefore, the alternatives of taking no action, reaffirming the existing Policy Statement, and/or issuing regulatory guidance are not viable.

IV. ENVIRONMENTAL IMPACT OF THE ACTION (RULEMAKING)

The safety of nuclear power plant operations and the assurance of general public health and safety depend on personnel performing at adequate performance levels. The provision for a systematic determination of initial training and periodic retraining will enhance confidence that workers can perform at adequate performance levels. Numerous studies have shown that in complex man-machine systems, human error has often been the overriding

contributor to actual or potential system failures that may be precursors to accidents. With this rulemaking, the NRC is emphasizing the need to ensure that industry personnel training programs are based upon job performance requirements, and incorporate the instructional requirements necessary to provide qualified nuclear power plant personnel to operate and maintain the facility in a safe manner in all modes of operation. Personnel who are subjected to training programs based on job performance requirements should be able to perform their jobs more effectively, and with fewer errors. Therefore, the environmental effect of implementing this rule would, if anything, be positive because of the reduction in human error.

V. FINDING OF NO SIGNIFICANT IMPACT

The Commission has determined under the National Environmental Policy Act of 1969, as amended, and the Commission's regulations in 10 CFR Part 51, that this amendment to 10 CFR Part 50 specifying training requirements for nuclear power plant personnel, if adopted, would not have a significant effect on the quality of the human environment and that an environmental impact statement is not required. This determination is based on the foregoing environmental assessment performed in accordance with the procedures and criteria in part 51, "Environmental Protection Regulations for Domestic Licensing and related Regulatory Functions."

VI. MAJOR REFERENCE DOCUMENTS

Regulatory Analysis: Amendment to 10 CFR Part 50 to Require Training and Qualification Programs for Nuclear Power Plant Personnel, prepared for the U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research by SC&A, Inc., McLean, VA, September 1992.

VII. PERSONS CONTACTED

Not applicable. No other agencies or persons were contacted to determine any potential environmental impact as a result of this proposed rule.

Enclosure 5

Regulatory Analysis

REGULATORY ANALYSIS

Regulations to Require
Training Programs for
Nuclear Power Plant Personnel

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EXECUTIVE SUMMARY

Consistent with the Court's decision in *Public Citizen v. NRC*, the NRC is proceeding with a rulemaking to establish training and qualification requirements for personnel at civilian nuclear power plants. The rule requires that each applicant and licensee establish, implement, and maintain a training program that incorporates the necessary instructional requirements to provide qualified personnel to operate and maintain the facility in a safe manner in all modes of operation. The training program must be in compliance with the facility license, including all technical specifications and applicable regulations. The rule also requires that the training program be derived from a systems approach to training, as defined in 10 CFR 55.4. The rule is compatible with the industry's existing training programs, which have proven generally effective in ensuring that nuclear power plant personnel have qualifications commensurate with the performance requirements of their jobs.

The alternatives evaluated in this regulatory analysis are limited by the Court's decision in *Public Citizen v. NRC*. The alternatives of taking no action, continuing to rely on the existing Policy Statement, or only issuing regulatory guidance are rejected without analysis as they would not meet the dictate of the Court. The NRC staff has determined that training programs developed using a systems approach provide high assurance that personnel will have the qualifications needed to perform their duties. In addition, since the training programs implemented by the industry during the 1980s have proven effective, alternative regulatory approaches, although identified, are not evaluated in detail.

The value impact analysis of the rule indicates that it will provide additional protection of the public health and safety. The benefit derives from the estimated reductions in human errors which, in turn, reduces the probability of large accidents. Training is also estimated to significantly reduce occupational exposures for routine operations.

The evaluation of impacts (costs) indicates that the rule is cost effective for both the industry and the NRC. Costs to the industry are minimized by the fact that training programs that are consistent with the requirements of the final rule have already been developed and implemented. Similarly, the NRC has already largely developed the regulatory guidance and inspection and enforcement procedures necessary to assure the full implementation and effectiveness of such programs.

1. STATEMENT OF THE PROBLEM

The major incidents at Brown's Ferry and Three Mile Island made it clear that training of personnel at civilian nuclear power plants was not receiving the same scrutiny and careful decisionmaking that the NRC and the industry were devoting to structures, systems, and components important to safety. A study performed after the accident at Three Mile Island found that during the period of 1969-1979, 38 percent of precursors to potentially severe core damage accidents involved human error (NRC82). Moreover, the human errors were not confined to licensed operators; they were made by licensed and non-licensed operators, instrument technicians, mechanical and electrical maintenance personnel, and engineering and plant testing personnel.

In the aftermath of the accidents at Brown's Ferry and Three Mile Island, both the NRC and the industry focused increased attention to the factors that contribute to human errors. Significant among the factors identified was the failure to ensure that personnel assigned to tasks that affect the safe operation of the plant were qualified to perform their duties. The training programs in place at that time were poorly designed, insufficient in their scope, and incompletely implemented.

In light of these findings, the NRC has emphasized the need to upgrade training programs. In the *NRC Action Plan Developed as a Result of the TMI-2 Accident* (NRC80), the NRC cited its ongoing study of accreditation of training programs as a possible means of upgrading the qualifications of the industry's personnel. Such an accreditation program was envisioned to assure that the industry's programs were addressing job requirements important to safety, that the training provided to personnel performing such jobs was appropriate to their responsibilities, and that the training was effective.

Subsequently, the Institute of Nuclear Power Operations (INPO) and the Nuclear Management and Resources Council (NUMARC) initiated efforts to improve training at nuclear power plants and began to develop an accreditation plan for training programs. The industry indicated strong voluntary support for the INPO training initiative.

The Congress also expressed its concern over the role of human error in the safety of plant operations. Section 306 of the Nuclear Waste Policy Act of 1982 (Public Law 97-425) directed the Nuclear Regulatory Commission (NRC) to promulgate regulations or other regulatory guidance establishing instructional requirements for civilian nuclear power plant operators, supervisors, technicians, and other appropriate operating personnel. In 1985, the Commission determined that a Policy Statement would provide licensees with the appropriate regulatory guidance (50 FR 11147). The decision to rely on guidance rather than regulations was made after a careful review of the INPO-managed program and in recognition of the progress that the industry was making in improving the training and qualifications of personnel. The Policy Statement provided for the NRC to closely monitor, over a two-year period, the industry's progress in implementing effective, accredited training programs.

In 1988, the NRC found that the INPO-managed training accreditation program was generally effective in ensuring that personnel have qualifications commensurate with the requirements of their jobs, and that the industry was making satisfactory progress in achieving accreditation for their training programs.

Based on these findings, the Commission concluded that its Policy Statement provided sufficient guidance to the industry. The Commission also concluded that the industry had amassed sufficient familiarity with the process to warrant changes in the enforcement policy normalizing the NRC's inspection and enforcement in areas covered by the Policy Statement. Accordingly, amendments to the Policy Statement were published in the *Federal Register* on November 18, 1988 (53 FR 46603).

The legality of the NRC's decision to rely on guidance in lieu of promulgating regulations was challenged by Public Citizen. On April 17, 1990, the U.S. Court of Appeals for the District of Columbia Circuit concluded that the Congress intended that the NRC promulgate regulations and that the NRC's reliance on its Policy Statement did not satisfy the statutory requirement. Therefore, the Court found for the plaintiff and remanded the issue to the NRC for further action consistent with the Court's decision. In response, the NRC proceeded with rulemaking.

The NRC is promulgating a regulation that incorporates the principals and procedures underlying the systems approach to training originally incorporated in the Policy Statement. The inclusion of a systems approach to training (SAT) in the Policy Statement is based on the success of such programs in other environments (e.g., military weapons systems and space programs) involving highly complex man-machine interfaces. The regulation specifies the process by which applicants and licensees are to derive and implement training programs to assure that personnel are qualified to operate and maintain the plant in a safe manner.

The primary advantages of this approach include:

- o high assurance that personnel performing functions important to safety have the skills, knowledge, and abilities required to perform their duties;
- o flexibility for licensees to determine plant-specific training requirements based on the needs of their personnel and plant configuration; and
- o prompt remediation of deficiencies through the provision of mechanisms to identify and incorporate plant-specific operating experience into the programs.

Since the rule is based on current industry practice and is compatible with the industry's existing programs, it will also:

- o minimize the NRC resources committed to the rulemaking; and
- o eliminate the need for the industry to expend additional resources for program development and implementation.

2. OBJECTIVES

The objectives of the rulemaking are to comply with the order of the Court and to assure that the industry's training programs continue to enhance plant safety through the improved performance of operating personnel.

3. ALTERNATIVES

As noted in Section 1, the rulemaking is being conducted pursuant to the Court's order that the NRC establish training and qualification requirements by rulemaking as called for by Section 306 of the Nuclear Waste Policy Act (Public Law 97-425). Therefore, the alternatives of taking no action, reaffirming the existing policy statement, and/or issuing regulatory guidance are not viable and are not considered further in this regulatory analysis.

Approaches to the rulemaking other than establishing requirements consistent with the programs already developed and implemented by the industry, were not evaluated in detail. There is no evidence that any other approach would provide greater protection of the public's health and safety than the site-specific training programs called for in this rule. At the same time, other approaches would involve greater costs to the industry and the NRC.

3.1 The Final Action: Issue Regulations that Establish Requirements for Training and Qualification Programs for Nuclear Power Plant Personnel

In its earlier considerations of the need to promulgate regulations specifying training requirements, the NRC found that programs based on a systems approach to training (SAT) offer high assurance that the personnel performing tasks important to safety would possess and maintain the aptitudes and skills needed to perform their jobs.

The rule requires each nuclear power plant applicant and licensee to establish, implement and maintain a personnel training program for certain operating personnel. The training programs are required to consider all modes of plant operation. The following list illustrates the types of personnel to be trained:

- a. non-licensed operators;
- b. shift supervisor;
- c. shift technical advisor;
- d. instrument and control technician;
- e. electrical maintenance personnel;
- f. mechanical maintenance personnel;
- g. radiological protection technicians;
- h. chemistry technicians; and
- i. engineering support personnel.

The systems approach to training specified in the rule requires (at a minimum) the following process for developing, implementing, and maintaining the personnel training program:

1. systematic analysis of the jobs to be performed;
2. learning objectives derived from the analysis which describe desired performance after training;
3. training design and implementation based on the learning objectives;
4. evaluation of trainee mastery of the objectives during training; and
5. evaluation and revision of the training based on the performance of trained personnel in the job setting.

Implementation of the systems approach to training described above assures that the affected personnel will have and maintain the skills, knowledge, and abilities necessary to perform their duties. Furthermore, since the analysis of job requirements and training needs is performed on a site-specific basis, the cost-effectiveness of the programs is optimized.

This approach, which is fully compatible with the industry's existing programs, eliminates the need for a transitional implementation period and minimizes the costs to both the NRC and the industry.

4. CONSEQUENCES

The benefits and costs associated with the imposition of SAT-based training requirements on the industry were developed in 1983 to support the Commission in its determination of the most cost-effective manner of attaining a high level of personnel competency (NRC83a). The basic data developed in NRC83a have been reviewed, updated as appropriate, and used to determine the benefits and costs of the action.

4.1 Benefits and Costs

The benefits that are anticipated to accrue due to the imposition of the rule are reductions in radiation exposure to both occupational workers and the public. The magnitude of these potential benefits are estimated based on the expected reduction in human errors attributable to training. The costs for the rule are the operating costs for inspections and program maintenance and revision that will be incurred by the NRC and the industry. Note, the industry's costs are subject to a cost off-set due to averted onsite costs.

It should be noted that since the accident at Three-Mile Island Unit 2 (TMI-2), the industry has developed, implemented, updated, and won accreditation for training programs that embrace the fundamental elements of the systems approach to training and are fully compatible with the rule. Thus, the benefits, in terms of averted dose, discussed in the following subsections are essentially already being accrued due to the industry's initiatives. However, it is the staff's position that these benefits are the result of voluntary programs and without the rule the industry could disband its training initiative and the benefits would dissipate. It is in this context that sizable benefits are attributed to this rulemaking. The imposition of the rule will assure that the industry continues to maintain and update its personnel training programs and that it uses these programs as an integral part of its evaluation of the appropriateness of the qualifications of the personnel whose performances affect the safe operation of the plant.

With regard to the impacts, the costs of development and implementation of training programs based on the systems approach have already been expended by the industry. These costs were estimated in NRC83a to total \$63.3 million (1983 dollars) for program development and implementation, are sunk costs and are not included as incremental costs of the rulemaking. However, the future costs of maintaining and operating these training programs over the remaining lifetimes of the plants is included in this analysis.

4.1.1 Benefits

The reduction in risk that is potentially achievable by the training requirements is directly related to the reduction in human errors that is achieved. All probabilistic risk assessments indicate that human error is a major contributor to the potential risks from nuclear power plants. This fact is supported by the industry's performance prior to the voluntary improvement of training programs. Analysis of operating experience from that era indicates that human error was involved in 38 percent of the events that were precursors of severe core damage accidents (NRC82).

Rigorous studies quantifying the reduction in human error rates that the current voluntary programs have achieved are not available. However, the efficacy of such programs is suggested by the continual decline in the number of scrams experienced at operating reactors and in the improvements that have been achieved in unit capacity factors.

In the 1983 evaluation of training programs, expected error rate reductions were estimated based on performance ratings of individual plants. A composite estimate, combining the ratings made by an expert panel established by Pacific Northwest Laboratory (PNL), the opinions of NRC regional inspectors, and the results of SALP (Systematic Assessment of Licensee Performance) inspections, rated the performance of 19 percent of operating plants above average, 48 percent as average, and 33 percent below average. Error rate reductions were then estimated for each class of plants as follows:

<u>Rating Classification</u>	<u>Range of Expected Reduction</u>	<u>Point Estimate</u>
Above Average	0 - 10 percent	5 percent
Average	10 - 30 percent	15 percent
Below Average	20 - 50 percent	30 percent

Based on the percentage of plants ranked in each classification, a weighted average error reduction of 18 percent was calculated. Based on considerations of nonquantifiable factors, the 1983 analysis used 20 percent as the point estimate of human error reduction with lower and upper bounds of 10 and 50 percent, respectively. These estimates were based on training programs developed and implemented using a systems approach to training. As the rule is consistent with the training programs already developed and implemented by the industry, 20 percent is retained in this analysis as the point estimate of the reduction in human error rates, within a range of 10 - 50 percent.

4.1.1.1 Reduction in Public Health Risk

The expected reduction in public health risk is estimated using a methodology similar to that used in the 1983 analysis. The methodology and analysis are as follows:

1. Determine the person-rem exposure resulting from a severe core melt accident at a typical pressurized-water reactor (PWR) and boiling-water reactor (BWR). Based on the probabilistic risk assessments for Oconee and Calvert Cliffs, the exposure resulting from a severe core melt accident at a typical PWR is estimated to be 3.2×10^6 person-rem. Based on the probabilistic risk assessment for Grand Gulf, the exposure resulting from a severe core melt accident at a typical BWR is estimated to be 6.8×10^6 person-rem.

2. Determine the average probability of a severe core melt accident per reactor year of operation for a typical PWR and BWR prior to the establishment of training programs. Based on the same three plants, these probabilities are 1.8×10^{-4} per reactor year for PWRs and 3.7×10^{-5} per reactor year for BWRs.

3. Determine the baseline risk (person-rem/reactor year) for a typical PWR and BWR prior to the establishment of training programs. For PWRs this is:

$$3.2 \times 10^6 \frac{\text{person-rem}}{\text{severe core melt}} \times 1.8 \times 10^{-4} \frac{\text{severe core melt}}{\text{reactor year}} = 576 \frac{\text{person-rem}}{\text{reactor year}}$$

For BWRs this is:

$$6.8 \times 10^6 \frac{\text{person-rem}}{\text{severe core melt}} \times 3.7 \times 10^{-5} \frac{\text{severe core melt}}{\text{reactor year}} = 250 \frac{\text{person-rem}}{\text{reactor year}}$$

4. Determine the change in severe core melt probabilities per reactor year based on reductions in human errors of 10, 20, and 50 percent. Based on relationships developed by PNL (NRC83b, PNL83), these changes are given as:

Type of Plant	Decrease in Error Rate (percent)	Decrease in Core Melt Probability (percent)	Revised Core Melt Probability (events/ry)
PWR	10	5.7	1.7×10^{-4}
PWR	20	14.8	1.5×10^{-4}
PWR	50	34.5	1.2×10^{-4}
BWR	10	27.1	2.7×10^{-5}
BWR	20	45.8	2.0×10^{-5}
BWR	50	87.8	4.5×10^{-6}

5. Determine the range of potential risk reduction (person-rem/reactor year) for a typical PWR and BWR. This is simply the percent reduction in core melt probability from Step 4 times the person-rem/reactor year calculated for PWRs and BWRs in Step 3. For PWRs, the reduction in risk ranges from 33 to 199 person-rem/reactor year, with a point estimate (20 percent human error reduction) of 85 person-rem/reactor year. For BWRs, the point estimate of the reduction in risk is 115 person-rem/reactor year, within a range of 68 to 220 person-rem/reactor year.

6. Based on the number of reactors of each type, and the average reactor lifetime remaining after implementation of the rule, calculate the potential benefit (person-rem avoided) over the entire post-implementation period. As of September 30, 1990, the number of PWRs operating or under construction was 82 and the number of BWRs was 40 (NRC90). Based on the calculations in NRC83b, in 1990, the average PWR has 22.5 years of service remaining, while the average BWR has 21 years. These life expectancies ignore the possibility of license renewal. If such renewals occur, the benefits would be greater than estimated.

Since the industry has already implemented training programs based on the principals of the systems approach called for by this action, there is no need to calculate the period of time needed for implementation. Therefore, the potential person-rem avoided (point estimate) is:

$$85 \frac{\text{person-rem}}{\text{reactor year}} \times 22.5 \text{ reactor years} \times 82 \text{ PWRs} = 157,000 \text{ person-rem at PWRs}$$

plus

$$115 \frac{\text{person-rem}}{\text{reactor year}} \times 21 \text{ reactor years} \times 40 \text{ BWRs} = 97,000 \text{ person-rem at BWRs}$$

$$= 254,000 \text{ person-rem TOTAL}$$

The lower-bound estimate is 118,000 person-rem and the upper-bound estimate is 552,000 person-rem.

As noted above, these calculations assume that if the rule were not implemented, the industry would abandon its voluntary training programs. They further assume that the reductions in human errors achieved by these programs over the past 7 years are immediately lost. While the first assumption is tenable (i.e., absent a rule the industry could opt to abandon its training initiative), the second is not. The trained work force's error rate would not immediately revert to pre-training levels. However, without refresher courses and given turnover and attrition in the work force, the error rate would be expected to increase to pre-training levels over time. Assuming that the increase in error rate occurs at a rate of 10 percent per year until pre-training error rates are reached, the benefits attributable to the action would be approximately 25 percent smaller than indicated by the above calculations.

Table 4.1 summarizes the adjusted (-25%) estimates of the public health risk averted by the imposition of the training requirements.

Table 4.1: Estimated Public Risk Reduction

Total Risk Reduction (person-rem)		
Lower Bound	Point Estimate	Upper Bound
89,000	191,000	414,000

4.1.1.2 Reduction in Occupational Risk - Accidents

A methodology for calculating avoided occupational exposure from accidents was developed by PNL for the NRC (NRC83c). This methodology estimates the avoided occupational exposure from accidents as the product of the change in core melt probability and the occupational exposure likely to occur in the event of a major accident. From the data presented in Subsection 4.1.1.1, the changes in core melt frequencies at PWRs and BWRs are calculated as:

PWRs			BWRs		
Lower Bound	Point Estimate	Upper Bound	Lower Bound	Point Estimate	Upper Bound
1.0×10^{-5}	2.7×10^{-5}	6.2×10^{-5}	1.0×10^{-5}	1.7×10^{-5}	3.2×10^{-5}

In the event of an accident, increases in occupational exposure may be expected to be incurred both at the time of the accident and at the time that the facility is ultimately decommissioned. Based on the accident at TMI-2, as discussed in NRC83c, a collective occupational dose of 1,000 person-rem could be attributed to the emergency management of the incident. The value of 1,000

person-rem is used here as the point estimate of the immediate occupational dose. The upper bound is estimated by assuming that the average worker receives a dose equal to that of the maximum individual dose of 4.2 rem received by a worker at TMI-2. Assuming 1,000 workers, this yields an estimate of 4,200 person-rem. A lower bound of zero is used to indicate that there could be instances where no increase over normal occupational dose results from the accident.

The estimate of long-term occupational dose is also taken from NRC83c. For a reference light-water reactor that experiences a major loss-of-coolant accident (LOCA) with delayed startup of the emergency-core-cooling system (ECCS), PNL estimates the occupational radiation exposure from cleanup and recovery to be 20,000 person-rem. The lower- and upper-bound estimates are 10,000 and 30,000 person-rem, respectively.

The expected reduction in occupational risk from accidents is calculated as:

$$D_{TOA} = N_{PWR} T_{PWR} \Delta F_{PWR} (D_{IO} + D_{LTO}) + N_{BWR} T_{BWR} \Delta F_{BWR} (D_{IO} + D_{LTO})$$

where:

- D_{TOA} = Total occupational dose averted (person-rem);
- N_{PWR} = Number of PWRs;
- T_{PWR} = Average PWR lifetime after implementation;
- ΔF_{PWR} = Change in core melt frequency at PWRs;
- D_{IO} = Immediate occupational dose (person-rem);
- D_{LTO} = Long-term occupational dose (person-rem);
- N_{BWR} = Number of BWRs;
- T_{BWR} = Average BWR lifetime after implementation; and
- ΔF_{BWR} = Change in core melt frequency at BWRs.

The number of PWRs and BWRs is given as 82 and 40, and T is 22.5 years for PWRs and 21 years for BWRs. Table 4.2 presents the estimates of the occupational health risk from accidents averted by the imposition of the training requirements. As above, an adjustment factor of -25 percent is applied to these estimates to reflect the gradual loss of skill in the already trained work force.

Table 4.2: Estimated Occupational Risk Reduction - Accidents

Total Risk Reduction (person-rem)		
Lower Bound	Point Estimate	Upper Bound
200	1,000	3,600

4.1.1.3 Reduction in Occupational Risk - Normal Operations

Since the action involves improved training programs, no increase in occupational exposure will result from implementation. However, the potential exists to reduce occupational exposure during annual operation and maintenance

as a result of the improved performance of personnel. PNL estimated the potential reduction in occupational exposure during normal operations to be 60 person-rem per reactor year (NRC83b). The lower and upper bounds are given as 0 and 90 person-rem per reactor year, respectively. For this action, given that the weighted average lifetime remaining for PWRs and BWRs is 22 years, the point estimate of normal occupational exposure averted is 161,000 person-rem. The lower limit is 0 person-rem, and the upper limit is 242,000 person-rem. Table 4.3 presents the estimates of routine occupational exposure averted during normal operations by the imposition of the rule. These estimates are also adjusted downward by 25 percent to reflect the fact that the current work force has received training over the past 7 years.

Table 4.3: Estimated Occupational Risk Reduction - Normal Operations

Total Risk Reduction (person rem)			
	Lower Bound	Point Estimate	Upper Bound
	0	120,800	181,500

4.1.1.4 Summary of Health Risk Averted

The risks averted by the imposition of training programs on the industry have been estimated for the public and occupational workers. Table 4.4 summarizes the estimated risk reductions achieved by the action.

Table 4.4: Summary of Estimated Risk Reductions

Total Risk Reduction (person-rem)			
	Lower Bound	Point Estimate	Upper Bound
Public Exposure - Accidents	89,000	191,000	414,000
Occupational Exposure - Accidents	200	1,000	3,600
Occupational Exposure - Normal Operations	0	120,800	181,500
TOTAL REDUCTION	89,200	312,800	599,100

4.1.1.5 Summary of Benefits

The benefits that are attributable to the imposition of requirements for training are due to the safer operations achieved by reductions in human errors. For regulatory analysis purposes, the estimates of person-rem averted may be converted to monetary terms by assuming \$1,000 per person-rem. The staff views \$1,000 per person-rem as sufficiently large to encompass an allow-

ance for health, life-shortening, and all offsite property losses associated with the radiological releases that would cause doses of the magnitudes estimated. The point estimate (20 percent human error reduction) indicates that about \$313 million of benefits accrue to the action, with a lower bound of \$89 million and an upper bound of \$599 million.

4.1.2 Costs

The costs of the rule are addressed in terms of the costs to the industry and the costs to the NRC. The costs to the industry are the annual costs of training program maintenance and revision. The costs of program development and implementation are not included as these costs have already been incurred by the industry over the past 7 years; i.e., they represent sunk costs. The industry's costs of program maintenance and revision are offset by the averted onsite property losses. The costs to the NRC include the costs of developing the regulation and the annual costs of program evaluation.

4.1.2.1 Industry Costs

4.1.2.1.1 Program Development and Implementation

As noted above, the industry has already developed and implemented the SAT-based training programs required by the action. In 1983, the costs to the industry for developing and implementing training programs based on the systems approach to training was estimated to be about \$63 million (NRC83a). Using a price deflator of 1.31 (NRC89), the estimated cost of developing and implementing SAT-based training programs would be approximately \$83 million in 1990 dollars. These sunk costs, which are not accounted as costs of the rule, are presented to provide the basis for the annual costs of program maintenance and revision.

4.1.2.1.2 Program Maintenance and Revision

The annual costs of maintaining and revising training programs ranges from 10 to 20 percent of the programs' development and implementation cost (NRC83a). Given the relatively stable configuration of nuclear power plants, the lower end of the range, i.e., 10 percent, is used to estimate the costs associated with program maintenance and revision. The total program development and implementation costs for the action are estimated to be \$83 million in 1990 dollars. Thus, annual program maintenance and revision costs are about \$8.3 million per year. Since these annual costs will be incurred over the remaining lifetimes of the reactors, they need be expressed in terms of their present worth. The weighted average lifetime remaining at the 82 PWRs and 40 BWRs is 22 years. At a 10 percent discount rate, the uniform series present worth factor is 8.77, which yields a present worth value of \$73 million. At 5 percent, the present worth would be \$109 million. The uncertainty in these estimates is assumed to be ± 50 percent. Thus, at a 10 percent discount rate the point estimate is \$73 million within the range of \$37 million to \$110 million. For a 5 percent discount rate, the point estimate is \$109 million within the range of \$55 million to \$164 million.

4.1.2.1.3 Property Losses Averted

The reduction in the probability of a severe core melt through improvement in worker job performance also results in reduced risk of monetary and property losses associated with an accident. Simply stated, reducing the risk of

severe accidents reduces the risk of damaging both offsite and onsite property. As discussed in Subsection 4.1.1.5, the value of the offsite property losses averted is encompassed in the value of \$1,000 per person-rem used to assign a monetary value to the averted doses. The value of the onsite property losses averted can be calculated as:

$$V_{FP} = N_{PWR} \Delta F_{PWR} D_{PWR} + N_{BWR} \Delta F_{BWR} D_{BWR}$$

where:

- V_{FP} = Present value of avoided property damage
- N_{PWR} = Number of PWRs (82)
- ΔF_{PWR} = Estimated change in core melt frequency at PWRs
- D_{PWR} = Present value of estimated property loss per accident at PWRs
- N_{BWR} = Number of BWRs (40)
- ΔF_{BWR} = Estimated change in core melt frequency at BWRs
- D_{BWR} = Present value of estimated property loss per accident at BWRs

In NRC83a, a point estimate of onsite property losses, based on the experience at TMI-2, is given as \$1.2 billion per accident. Using a price deflator of 1.31, this is equivalent to \$1.6 billion in 1990 dollars.

The present value of these onsite property losses is calculated using the average lifetime remaining for PWRs and BWRs, which is 22.5 and 21 years, respectively. Assuming a 10 percent discount rate, the present value factor is 8.83 for PWRs and 8.65 for BWRs. At a 5 percent discount rate the present value factor is 13.33 for PWRs and 12.82 for BWRs.

Table 4.5 presents the point estimate and the lower and upper bounds of the onsite property losses averted by the rule. The point estimate is calculated using the point estimates of the changes in core melt frequencies presented in Subsection 4.1.1.2. The lower bound uses the lower-bound estimate, and the upper bound uses the upper-bound estimate. The 25 percent adjustment factor, to account for the fact that the current work force has received training over the past 7 years, was then applied to each estimate.

Table 4.5: Estimated Onsite Property Losses Averted

	(\$ million)	
	10% Discount	5% Discount
Point Estimate	31	48
Lower Bound	13	19
Upper Bound	67	101

4.1.2.1.4 Summary of Industry Costs

The present worth value of the estimated costs to the industry for the action are summarized in Table 4.6. Since the costs of onsite property damage are averted costs (i.e., cost savings) to the industry, they are shown as negative costs in the table.

Table 4.6: Summary of Industry Costs

(\$ million, 10 percent discount rate)

	Lower Bound	Point Estimate	Upper Bound
Program Maintenance & Revision	37	73	110
Onsite Property Loss Averted	(13)	(31)	(67)
TOTALS - 10%	24	42	43

(\$ million, 5 percent discount rate)

	Lower Bound	Point Estimate	Upper Bound
Program Maintenance & Revision	55	109	164
Onsite Property Loss Averted	(19)	(48)	(101)
TOTALS - 5%	36	61	63

4.1.2.2 NRC Costs

The action involves the promulgation of a rule that specifies the process to be used to determine the training requirements for the personnel specified in the rule. The development costs to the NRC include the costs of developing the rule and the associated regulatory guidance, and the inspection modules necessary to assess applicant's and licensee's compliance with the requirements.

Since the action is compatible with the existing programs voluntarily established by the industry, the costs to the NRC of developing and implementing the rule have already been largely expended, i.e., they are also sunk costs. Based on estimates obtained from cognizant NRC personnel, the preparation of the rule and the revision of the associated inspection modules is estimated to require less than \$0.5 million.

The annual inspection and auditing costs to the NRC for the action would be essentially the same as for the industry's current voluntary programs. Based on discussions with cognizant NRC personnel, the annual costs to the NRC are approximately \$0.15 million. As these inspection costs will be recurrent costs over the remaining lifetimes of the reactors, the present value is \$1.3 million at a 10 percent discount rate or \$2 million at a 5 percent discount rate.

4.1.2.3 Summary of Costs

Table 4.7 summarizes the present value of the costs estimated for the industry and the NRC for the action. The point estimate (10 percent discount rate) indicates a total cost of \$44 million.

Table 4.7: Summary of Costs

(\$ million, 10 percent discount rate)

	Lower Bound	Point Estimate	Upper Bound
Program Development & Implementation - NRC	<0.5	<0.5	<0.5
Program Maintenance & Revision - Industry	37	73	110
Program Maintenance & Revision - NRC	1.3	1.3	1.3
Onsite Property Losses Averted - Industry	(13)	(31)	(67)
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TOTALS - 10%	26	44	45

(\$ million, 5 percent discount rate)

	Lower Bound	Point Estimate	Upper Bound
Program Development & Implementation - NRC	<0.5	<0.5	<0.5
Program Maintenance & Revision - Industry	55	109	164
Program Maintenance & Revision - NRC	2	2	2
Onsite Property Losses Averted - Industry	(19)	(48)	(101)
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TOTALS - 5%	39	64	66

4.2 Impact on Other Requirements

The action will have only minor impacts on other requirements. 10 CFR Part 52, section 52.78 will be amended to require applicants for combined licenses to develop training programs in accordance with section 50.120 of 10 CFR Part 50.

4.3 Constraints

There are no known constraints on the industry or the NRC for the action.

5. DECISION RATIONALE

Given the Court's decision and the NRC's previous oversight of the development and implementation of the industry's existing programs, the decision to promulgate regulations consistent with the existing programs is obvious. Furthermore, all of the quantitative decision factors determined in this analysis support such a decision. The positive decision factors include:

1. the averted public and occupational doses are large (312,800 person-rem), when valued at \$1,000 per person-rem, the benefits are in excess of \$300 million;
2. the costs to the industry and the NRC are small (\$44 million) relative to the projected benefit;
3. the systems approach to training offers high assurance that workers will have the skills needed to perform their safety-related jobs; and
4. although the consequences of other rulemaking approaches have not been quantified, it is the staff's view that none would be as cost-effective as the site-specific programs and all would take longer to implement.

Nonquantified factors also support the action. The most important of these factors is the improved efficiency that is expected by having the responsibility for program development and maintenance reside with the individual sites. This approach will make it easier to tailor the training to the specific needs of the plant and its existing work force. It will also expedite identification and remediation of training program deficiencies.

6. IMPLEMENTATION

In this regulatory analysis, it is assumed that all licensees will be able to implement the required training programs within 180 days after the effective date of the rule; and all applicants will be able to implement training programs within either 180 days or 18 months prior to fuel load, whichever is later. These assumptions are based on the fact that the industry's existing programs are compatible with the requirements of the rule.

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