RES Files
Subject File No. R-2513

Task No.
Research Request No.
FIN No.
NUREG No.
Docket No.
Rulemaking No.
Other
Return NRC-318 to RES, Yes ✓ No

OCT 9 1981

MEMORANDUM FOR: R. B. Minogue, Director, RES
H. R. Denton, Director, NRR
V. Stello, Director, IE

FROM: Satish K. Aggarwal
Electrical Engineering Branch
Division of Engineering Technology
Office of Nuclear Regulatory Research

SUBJECT: PROPOSED RULE, "ENVIRONMENTAL AND SEISMIC QUALIFICATION OF ELECTRIC EQUIPMENT FOR NUCLEAR POWER PLANTS" - DRAFT DATED OCTOBER 8, 1981

Enclosed for your information is a copy of the subject proposed rule. The following changes have been made in this revised version:

(1) In response to Chairman Palladino's Memorandum dated September 30, 1981, I propose to implement SECY-81-486 by incorporating into the proposed rule the extension dates recommended by the Commission. I believe this is the most efficient course of action since the subject rule covers the same electric equipment as the Commission's Memorandum and Order CLI-80-21, and is being developed on an expeditious basis. If, after receipt of public comments, any significant delay is perceived in the development of the subject rule, the provisions extending the deadline will be issued by a separate, final rulemaking action.

(2) The Regulatory Flexibility Statement has been modified, as proposed by Mr. J. Felton.

(3) Several paragraphs describing the evolution of seismic qualification have been included in the Commission Paper and also in the Statement of Consideration in the subject rule.

(4) Enclosure E has been added to the subject rule to describe three backfitting alternatives, their advantages and disadvantages, pertaining to seismic and dynamic qualification for operating power plants.

(5) The subject proposed rule applies only to future nuclear power plants in the area of seismic and dynamic qualification, since this position (Alternative 1 - Enclosure E) has been concurred in by Directors of NRR, IE and RES.

(6) One member of the NRR staff has expressed his dissent with regard to the position stated in paragraph 5 (above). He contends that the requirements of seismic and dynamic qualification should also apply to all operating nuclear power plants (Alternative 3 - Enclosure E). This will be a subject of a meeting with Mr. Dircks in the near future.

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NRC FORM 318 (10-80) NRCM 0240

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(7) Based on recent reevaluations and discussions, the staff (with the concurrence of RES and IE Office Directors) will recommend to Mr. Dircks that the proposed rule be modified in accordance with Alternative 2 (Enclosure E), ie., the seismic and dynamic qualification provisions be extended to the nuclear power plants currently in the "pipeline" for operating licenses.

Original Signed By:

Satish K. Aggarwal
Electrical Engineering Branch
Division of Engineering Technology
Office of Nuclear Regulatory Research

cc: W. Dircks
T. Rehm
F. Remick
L. Bickwit
H. Shapar
J. Felton
C. Michelson
D. Ross
E. Case
G. Arlotto
L. Shao
R. Vollmer
Z. Rosztoczy

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SAggarwal
DSullivan

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SURNAME	SAggarwal	DSullivan	LShao	GArlotto	DRoss
DATE	10/9/81	10/9/81	10/9/81	10/ /81	10/ /81

NRC FORM 318 (10-80) NRCM 0240

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OCT 8 1981

For: The Commissioners

From: William J. Dircks
Executive Director for Operations

Subject: PROPOSED RULEMAKING, "ENVIRONMENTAL AND SEISMIC QUALIFICATION OF ELECTRIC EQUIPMENT FOR NUCLEAR POWER PLANTS"

Purpose: To obtain Commission approval for publication of the notice of a proposed rulemaking, "Environmental and Seismic Qualification of Electric Equipment for Nuclear Power Plants," in the Federal Register.

Discussion: The proposed rulemaking is being undertaken in response to the Commission's Memorandum and Order CLI-80-21 dated May 23, 1980, relating to the environmental qualification of electric equipment.

The current requirements for qualification of structures, systems, and components important to safety are contained in General Design Criteria 1, 2, 4, and 23 of Appendix A to Part 50; Criteria III and XI of Appendix B to Part 50; and paragraph 50.55a(h) of 10 CFR Part 50. These are general requirements stating the principle that structures, systems, and components important to safety in a nuclear power plant shall be designed to accommodate the effects of environmental conditions (i.e., remain functional under postulated accident conditions) and that design control measures such as testing shall be used to check the adequacy of design.

Specific qualification methods have evolved over the past several years to ensure that these general requirements are met for electric equipment. Although most of these methods have been documented in various national standards, regulatory guides, and NRC publications, none has been codified as requirements in NRC's regulations.

Contact:
Satish K. Aggarwal, RES
44-35946

In brief, the evolution of environmental qualification has been as follows: Prior to 1971, qualification was based on the fact that the electric components were of high industrial quality. For nuclear plants licensed to operate after 1971, qualification was judged on the basis of IEEE 323-1971. In November 1974, the NRC staff issued Regulatory Guide 1.89, "Qualification of Class IE Equipment for Nuclear Power Plants," which endorsed IEEE 323-1974, "IEEE Standard for Qualifying Class IE Equipment for Nuclear Power Generating Stations," subject to supplementary provisions. Subsequently, more definitive criteria for environmental qualification of electric equipment were developed by the staff. DOR issued its "Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors" in November 1979. In addition, NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment," was issued in December 1979. NUREG-0588 includes two sets of qualification requirements: the first for plants originally reviewed in accordance with IEEE 323-1971 and the second for plants reviewed in accordance with IEEE 323-1974.

As an interim step, in its Memorandum and Order CLI-80-21, the Commission ordered that the DOR Guidelines and NUREG-0588 (December 1979 "for comment" issue) form the basis for the requirements that licensees and applicants must meet. The Commission also noted that the guidelines and NUREG-0588 apply progressively less strict standards to the older plants and instructed the staff to justify its position if a single uniform standard is not applied to all nuclear plants in the proposed rule.

General Design Criterion 4 states, in part, "Structures, systems, and components important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents." The scope of the proposed rule, however, does not include all its electric equipment important to safety in its various gradations of importance. The proposed rule includes that portion of equipment important to safety commonly referred to in IEEE national standards as "class 1E" equipment and some additional non-class 1E equipment and systems. This additional equipment should also be qualified for the accident and seismic conditions if its malfunction or failure due to accident or seismic conditions will negate the safety function of essential systems and equipment.

The proposed rule is generally based on the DOR Guidelines and NUREG-0588. However, the scope has been expanded to include seismic and dynamic qualification. In the area of dynamic qualification, the NRC staff is concerned about hydrodynamic

loads due to accident conditions (for example, hydrodynamic loads resulting from pressure suppression pool operation in BWR plants).

The evolution of seismic qualification was as follows: prior to 1971, no specific requirements existed. Industry practice was such that the effects of seismic accelerations were determined by physical tests, mathematical analysis, or engineering judgment. In 1971, IEEE 344-1971, "IEEE Guide for Seismic Qualification of Class I Electric Equipment for Nuclear Power Generating Stations" was published. In 1972, the NRC staff informally issued a branch technical position that supplemented IEEE 344-1971 by requiring justification for single-axis and single-frequency testing in lieu of multi-axis and multi-frequency testing. In 1975, IEEE 344-1975 adopted this position. Section 3.10, "Seismic Qualification of Category I Instrumentation and Electrical Equipment of the Standard Review Plan (SRP)," issued November 24, 1975, provided the following criteria for seismic and dynamic qualification for nuclear power plants for which an operating license had not been issued: electric equipment for plants having construction permit docket dates prior to October 27, 1972 should meet the requirements of IEEE 344-1971, and electric equipment for plants having construction permit docket dates after October 27, 1972 should meet the requirements of IEEE 344-1975, with certain exceptions. Regulatory Guide 1.100 issued in August 1977 endorsed, with certain exceptions, IEEE 344-1975. NUREG-0588, the DOR Guidelines and the Commission Memorandum and Order do not address the question of seismic and dynamic qualification.

For purposes of this rulemaking, the staff has evaluated the following three alternatives with respect to backfitting seismic and dynamic qualification:

1. No backfitting

2. Partial backfitting to include those plants for which a construction permit was docketed after October 27, 1972.

3. Complete backfitting to include all operating nuclear power plants.

The advantages and disadvantages of these alternatives are discussed in Enclosure E.

Based on this discussion, the staff recommends Alternative 1, namely, the seismic and dynamic qualification requirements of the rule be applied only to nuclear power plants for which the construction permit application is docketed after the effective date of the rule.

The staff further recommends that, for all other plants, the question of seismic and dynamic qualification of electric equipment be addressed by a separate advance notice of rulemaking. The staff will seek information on the cost of backfitting and related safety benefits. The staff will also perform research and appropriate risk analysis to justify backfitting, if needed, in the area of seismic qualification based on decrease in risk.

The proposed rule will codify explicitly the current NRC practice with respect to qualification of electric equipment and will apply the same uniform performance criteria with respect to environmental qualification to all operating nuclear power plants and plants for which application has been made for a construction permit or an operating license. Included are specific technical requirements pertaining to (a) qualification parameters, (b) qualification methods, and (c) documentation. The environmental qualification methods are progressively less strict for older plants.

Based on Commission Memorandum and Order CLI-80-21, the licensees and the NRC staff are in the process of identifying the systems and equipment that must be qualified. The proposed rule (Enclosure A) will apply to those systems and equipment identified during the ongoing review.

Currently, Regulatory Guide 1.89 is being revised and will contain methods acceptable to the NRC staff for meeting the Commission's requirements for the environmental qualification of electric equipment. Attached for your information as Enclosure F is a draft of Proposed Revision 1 to Regulatory Guide 1.89, "Environmental Qualification of Electric Equipment for Nuclear Power Plants." The implementation section provides guidance for meeting the qualification requirements of the proposed rule at older plants that takes into consideration the prior qualification history of these plants.

The proposed rule and the proposed Revision 1 to Regulatory Guide 1.89 were reviewed by the ACRS Electrical Systems Subcommittee on July 22, 1981. On August 7, 1981, the Advisory Committee on Reactor Safeguards reviewed the proposed rule and regulatory guide, which had been revised in response to the Subcommittee's comments. ACRS concurrence to issue the rule and guide for public comment was received on August 7, 1981.

The staff plans to issue Proposed Revision 1 to Regulatory Guide 1.89 and the proposed rule concurrently and invite public comments on both.

Upon publication of the final rule, the DOR Guidelines and NUREG-0588 will be withdrawn.

The Commission's Memorandum and Order CLI-80-21 directed that the environmental qualification of electric equipment in operating nuclear power plants be completed by June 30, 1982. However, based on the Commission's meeting on September 23, 1981 (SECY-81-846), the Commission agreed to extend this deadline and directed the staff to issue a rule for public comments on the extension of the deadline. Since this proposed rule is being developed on an expeditous basis and covers the same electric equipment as CLI-80-21, the staff has elected to implement SECY-81-486 by incorporating in the proposed rule the extension dates recommended by the Chairman in his memorandum dated September 30, 1981. If, after receipt of public comments, any significant delay is perceived in the development of the final rule, the provisions extending the deadline will be issued in a separate final rulemaking.

On a long-term basis, the staff is considering expanding the scope of the proposed rule to include additional electric equipment important to safety as deemed necessary to provide adequate assurance of public safety. The staff is also proposing to develop criteria for determining equipment important to safety and the relative importance of such equipment. An attempt will be made to prepare a list based on the criteria to include all equipment important to safety--electrical and mechanical. Accordingly, the staff is preparing an advance notice of rulemaking on qualification of electrical and mechanical equipment important to safety. This advance notice of rulemaking will also include consideration of backfitting the requirement of seismic and dynamic qualification of electric equipment to the operating nuclear power plants. Public comments will be invited to assess the capabilities of testing laboratories and the cost, as well as the benefit, of testing of all equipment important to safety. Subsequent to receipt of public comment, the staff will prepare a risk analysis to justify qualification based on decrease in risk.

Recommendation: That the Commission:

1. Approve

   a. Publication of the proposed rule, "Environmental and Seismic Qualification of Electric Equipment for Nuclear Power Plants," for public comment.

   b. The staff's conclusions set forth in Enclosure D, which provide the analysis called for by the Periodic and Systematic Review of the Regulations. The criteria used were derived from Executive Order 12044, which was rescinded on February 17, 1981, by Executive Order 12291 (see memorandum dated February 27, 1981, from L. Bickwit, General Counsel to the Commission). This approach is proposed as an interim procedure until the

staff can make recommendations and the Commission decides what to do in response to Executive Order 12291.

2. In order to satisfy the requirement of the Regulatory Flexibility Act, 5 U.S.C. 605(b), certify that this rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. The proposed rule affects only the licensing and operation of nuclear power plants.

3. NOTE

   a. That the notice of proposed rulemaking in Enclosure A will be published in the Federal Register allowing 60 days for public comment.

   b. That if, after expiration of the comment period, no significant adverse comments or significant questions have been received and no substantial changes in the text of the rule are indicated, the Executive Director for Operations will arrange for publication of the amendment in final form.

   c. That the information collection requirements in this proposed rule will be submitted to the Office of Management and Budget as a part of the general clearance for 10 CFR Part 50.

   d. That, pursuant to § 51.5(d) of Part 51 of the Commission's regulations, neither an environmental impact statement nor a negative declaration need be prepared in connection with the amendment since the amendment is nonsubstantive and insignificant from the standpoint of environmental impact.

   e. That the Subcommittee on Energy and the Environment of the House Committee on Interior and Insular Affairs, the Subcommittee on Energy Conservation and Power of the House Committee on Energy and Commerce, the Subcommittee on Environment, Energy and Natural Resources of the House Committee on Government Operations, and the Subcommittee on Nuclear Regulation of the Senate Committee on Environment and Public Works will be informed.

   f. That the Federal Register Notice of proposed rulemaking will be distributed directly to power reactor licensees/permit holders, applicants for a construction permit for a power reactor, public interest groups, and nuclear steam system suppliers.

g. That a public announcement (Enclosure C) prepared by the Office of Public Affairs will be issued when the Federal Register Notice is filed with the Office of the Federal Register.

Scheduling: Recommend affirmation at an open meeting.

William J. Dircks
Executive Director for Operations

Enclosures:
A - Notice of Proposed Rulemaking
B - Value/Impact Statement
C - Draft Public Announcement
D - Analysis with Respect to Review of Regulations
E - Seismic and Dynamic Qualification of Electric Equipment
F - Draft Regulatory Guide 1.89 (Revised)

DSI:AEB	RES:FBB	NRR	DSI:D	NRR	Coordinated with
RWHouston	MSilberberg	WButler	RJMattson	FRosa	OPE
9/16/81	8/13/81	8/18/81	8/21/81	8/20/81	FRemick
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IE	D:NRR	ELD	ELD	IE	IE
RCDeYoung	HRDenton	HShapar	GHCunningham	VStello	JHSniezek
9/16/81	9/16/81	8/20/81	8/20/81	9/16/81	8/31/81

DRR	RES:DFO	RES:DFO	RES:EEB	RES:DET	RES:DET	NRR
JMFelton	EWenzinger	AHintze	DFSullivan	LCShao	GAArlotto	TEMurley
8/12/81	8/21/81	8/11/81	8/11/81	8/13/81	8/17/81	8/25/81

RES:	NRR	NRR:EQB	NRR	NRR	NRR
DFRoss	GWKnighton	ZRRosztoczy	W[illegible]on	RHVollmer	EGCase
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[7590-01]
10/8/81

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

Environmental and Seismic Qualification of Electric Equipment for Nuclear Power Plants

AGENCY: Nuclear Regulatory Commission.

ACTION: Proposed Rule.

SUMMARY: The Nuclear Regulatory Commission is proposing to amend its regulations applicable to nuclear power plants to clarify and strengthen the criteria for environmental and seismic qualification of electric equipment. Specific qualification methods currently contained in national standards, regulatory guides, and certain NRC publications for equipment qualification have been given different interpretations and have not had the legal force of an agency regulation. The proposed rule would codify these qualification methods and clarify the Commission's requirements in this area.

DATES: Comment period expires (60 days after publication in the Federal Register). Comments received _____ will be considered if it is practical to do so, but assurance of consideration cannot be given except as to comments received on or before this date.

ADDRESSES: Written comments and suggestions may be mailed to the Secretary of the Commission, Attention: Docketing and Service Branch, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, or hand-delivered to the Commission's Public Document Room at 1717 H Street NW.,

Washington, D.C., between the hours of 8:30 a.m. and 4:45 p.m. on normal work days.

FOR FURTHER INFORMATION CONTACT: Satish K. Aggarwal, Office of Nuclear Regulatory Research, Electrical Engineering Branch, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Telephone (301)443-5946.

SUPPLEMENTARY INFORMATION: Nuclear power plant equipment important to safety must be able to perform the safety functions throughout its installed life. This requirement is embodied in General Design Criteria 1, 2, 4, and 23 of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities"; in Criterion III, "Design Control," and Criterion XI, "Test Control," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50; and in 10 CFR 50.55a(h), which incorporates by reference IEEE 279-1971,* "Criteria for Protection Systems for Nuclear Power Generating Stations." This requirement is applicable to equipment located inside as well as outside the containment.

The NRC has used a variety of methods to ensure that these general requirements are met for electric equipment important to safety. Prior to 1971, qualification was based on the fact that the electric components were of high industrial quality. For nuclear plants licensed to operate after 1971, qualification was judged on the basis of IEEE 323-1971. For plants whose Safety Evaluation Reports were issued since July 1, 1974, the Commission has used Regulatory Guide 1.89, "Qualification of Class IE

*Incorporation by reference approved by the Director of the Office of Federal Register on January 1, 1981. Copies may be obtained from the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, N.Y. 10017.

Equipment for Light-Water-Cooled Nuclear Power Plants," which endorses IEEE 323-1974,* "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations," subject to supplementary provisions.

Currently, the Commission has underway a program to reevaluate the qualification of electric equipment important to safety in all operating nuclear power plants. As a part of this program, more definitive criteria for environmental qualification of electric equipment have been developed by the NRC. A document entitled "Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors" (DOR Guidelines) was issued in November 1979. In addition, the NRC has issued NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment," which contains two sets of criteria: the first for plants originally reviewed in accordance with IEEE 323-1971 and the second for plants reviewed in accordance with IEEE 323-1974.

By its Memorandum and Order CLI-80-21 dated May 23, 1980, the Commission directed the staff to proceed with a rulemaking on environmental qualification of safety-grade equipment and to address the question of backfit. The Commission also directed that the DOR Guidelines and NUREG-0588 form the basis for requirements licensees and applicants must meet until the rulemaking has been completed.

This proposed rule is generally based on the requirements of the Division of Operating Reactors (DOR) Guidelines and NUREG-0588. However, the scope has been expanded to include requirements pertaining to seismic and dynamic qualification. In the area of dynamic qualification, the NRC staff is concerned about hydrodynamic loads due to accident conditions

(for example, hydrodynamic loads resulting from pressure suppression pool operation in BWR plants).

Prior to 1971, no specific requirements for seismic qualification existed. Industry practice was such that the effects of seismic accelerations were determined by physical tests, mathematical analysis, or engineering judgement. In 1971, IEEE 344-1971, "IEEE Guide for Seismic Qualification of Class I Electric Equipment for Nuclear Power Generating Stations" was published. In 1972 the NRC staff informally issued a branch technical position that supplemented IEEE 344-1971 by requiring justification for single-axis and single-frequency testing in lieu of multi-axis and multi-frequency testing. In 1975, IEEE 344-1975 adopted this position. Section 3.10, "Seismic Qualification of Category I Instrumentation and Electrical Equipment," of the Standard Review Plan (SRP), issued November 24, 1975, provided the following criteria for seismic and dynamic qualification for nuclear power plants for which an operating license had not been issued: electric equipment for plants having construction permit docket dates prior to October 27, 1972 should meet the requirements of IEEE 344-1971, and electric equipment for plants having construction permit docket dates after October 27, 1972 should meet the requirements of IEEE 344-1975, with certain exceptions. Regulatory Guide 1.100 issued in August 1977 endorsed, with certain exceptions, IEEE 344-1975.

In the proposed rule, the requirements of seismic and dynamic qualification will apply to nuclear power plants whose applications for construction permit is made after the proposed rule becomes effective. However, the requirements for environmental qualification will apply to operating nuclear power plants and all future nuclear power plants.

The Commission's Memorandum and Order CLI-80-21 directed that the environmental qualification of electric equipment in operating nuclear power plants be completed by June 30, 1982. However, based on the Commission's meeting on September 23, 1981 (SECY-81-486), the Commission agreed to extend this deadline and directed the staff to issue a rule for public comments on the extension of the deadline. Since this proposed rule is being developed on an expeditious basis and covers the same electric equipment as CLI-80-21, the staff has elected to implement SECY-81-486 by incorporating in the proposed rule the extension dates recommended by the Chairman in his memorandum dated September 30, 1981. If, after receipt of public comments, any significant delay is perceived in the development of the final rule, the provisions extending the deadline will be issued in a separate final rulemaking.

The scope of the proposed rule does not include all electric equipment important to safety in its various gradations of importance. It includes that portion of equipment important to safety commonly referred to "Class 1E" equipment in IEEE national standards and some additional non-class 1E equipment and systems whose failure under extreme seismic or environmental conditions could prevent the satisfactory accomplishment of safety functions by accident-mitigating equipment.

Included in the proposed rule are specific technical requirements pertaining to (a) qualification parameters, (b) qualification methods, and (c) documentation. Qualification parameters include temperature, pressure, humidity, radiation, chemicals, submergence, vibration and seismic forces. Qualification methods include (a) testing as the principal means of qualification and (b) analysis and operating experience in lieu of testing. The proposed rule would require that the qualification

program include synergistic effects, aging, margins, radiation, and environmental conditions. Also, a record of qualification must be maintained. Regulatory Guide 1.89 is being revised to describe methods acceptable to the NRC for meeting the provisions of this proposed rule and to include a list of typical equipment covered by this proposed rule; a draft of the proposed revision is being published for public comment concurrently with the proposed rule.

The proposed rule will codify the Commission's current requirements for the environmental and seismic qualification of electric equipment. Upon publication of a final rule, the DOR guidelines and NUREG-0588 will be withdrawn.

To provide adequate assurance of public safety, NRC is considering expansion of the scope of this proposed rule to include additional electric equipment important to safety. This will also include consideration of backfitting the requirement of seismic and dynamic qualification to operating nuclear power plants. These matters will be the subject of a future rulemaking.

Paperwork Reduction Act

The proposed rule contains recordkeeping requirements that are subject to review by the Office of Management and Budget (OMB). As required by P.L. 96-511, this proposed rule will be submitted to OMB for clearance of the recordkeeping requirements.

Regulatory Flexibility Statement

In accordance with the Regulatory Flexibility Act of 1980, 5 U.S.C. 605(b), the Commission hereby certifies that this rule, if promulgated,

will not have a significant economic impact on a substantial number of small entities. This proposed rule affects the method of qualification of electric equipment by utilities. Utilities do not fall within the definition of a small business found in Section 3 of the Small Business Act, 15 U.S.C. 632. In addition, utilities are required by Commission's Memorandum and Order CLI-80-21, dated May 23, 1980, to meet the requirements contained in the DOR "Guidelines for Evaluating Environmental Qualification of Class 1E Electric Equipment in Operating Reactors," (November 1979) and NUREG-0588, "Intering Staff Position on Environmental Qualification of Safety-Related Electrical Equipment," which form the basis of this proposed rule. Consequently, this rule codifies existing requirements and imposes no new costs or obligations on utilities.

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, and section 553 of title 5 of the United States Code, notice is hereby given that adoption of the following amendment to 10 CFR Part 50 is contemplated.

10 CFR Part 50

1. The authority citation for 10 CFR Part 50 reads as follows: AUTHORITY: Secs. 103, 104, 161b and i, 182, 183, 189, 68 Stat. 936, 937, 948, 953, 954, 955, 956, as amended (42 U.S.C. 2133, 2134, 2201(b) and (i), 2232, 2233, 2239); secs. 201, 202, 206, 88 Stat. 1243, 1244, 1246 (42 U.S.C., 5841, 5842, 5846), unless otherwise noted. Section 50.78 also issued under Sec. 122, 68 Stat. 933 (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). Sections 50.100-50.102 issued under Sec. 186, 68 Stat. 955; (42 U.S.C. 2236). For Purposes of Sec. 223, 68 Stat. 958, as amended; (42 U.S.C. 2273),

§ 50.54 (i) issued under Sec. 161i, 68 Stat. 949; (42 U.S.C. 2201(i)), §§ 50.70, 50.71 and 50.78 issued under Sec. 161o, 68 Stat. 950, as amended; (42 U.S.C. 2201(o)) and the Laws referred to in Appendices.

2. A new § 50.49 is added to read as follows:

§ 50.49 Environmental and seismic qualification of electric equipment for nuclear power plants.

(a) Except as noted in paragraph (g) of this section, each holder of or each applicant for a license to operate a nuclear power plant shall establish a program for qualifying the electric equipment as defined in paragraph (b) of this section.

(b) Electric equipment and systems covered by this section include electric equipment and systems that are essential to emergency reactor shutdown, containment isolation, reactor core cooling, and containment and reactor heat removal or that are otherwise essential in preventing significant release of radioactive material to the environment. Included is equipment (1) that performs the above functions automatically, (2) that is used by the operator to perform these functions manually, and (3) whose failure can prevent the satisfactory accomplishment of one or more of the above safety functions.

(c) The applicant or licensee shall prepare a list of all electric equipment covered by this section and maintain it in a central file. This list of equipment must, as a minimum, include:

(1) The performance characteristics and integrity requirements under conditions existing during normal and abnormal operation and during design basis events and afterwards, and the lengths of the periods during which the integrity must be maintained.

(2) The range of voltage, frequency, load, and other electrical characteristics for which the performance specified in accordance with paragraph (c)(1) of this section can be ensured.

(3) The environmental conditions, including temperature, pressure, humidity, radiation, chemicals, submergence, vibration, and seismic forces and the predicted variations of these environmental conditions with time, at the location where the equipment must perform as specified in accordance with paragraphs (c)(1) and (2) of this section.

(d) The electrical equipment qualification program must include the following:

(1) Temperature and Pressure. The time-dependent temperature and pressure at the location of the equipment must be established for the most limiting of the applicable postulated accidents and must be used as the basis for the environmental qualification of electric equipment.

(2) Humidity. Time-dependent variations of relative humidity during normal operation and design basis events must be considered.

(3) Chemical Effects. The composition of chemicals used must be at least as severe as that resulting from the most limiting mode of plant operation (e.g., containment spray, emergency core cooling, or recirculation from containment sump). If the composition of the chemical spray can be affected by equipment malfunctions, the most severe chemical spray environment that results from a single failure in the spray system must be assumed.

(4) Radiation. The radiation environment must be based on the type of radiation and the dose and dose rate of the radiation environment expected during normal operation over the installed life of the equipment plus the radiation environment associated with the most severe

design basis event during or following which the equipment is required to remain functional, including the radiation resulting from recirculating fluids for equipment located near the recirculating lines.

(5) Aging. Equipment qualified by test must, where practicable, be preconditioned by natural or artificial (accelerated) aging to its installed end-of-life condition. Aging considerations based on seismic and dynamic loads must include a justifiable number of operating basis earthquakes and other dynamic (cyclic) loading effects. Electromechanical equipment must be operated to simulate the mechanical wear and electrical degradation expected during its installed life. Where preconditioning to a qualified life equal to the installed life is not possible, the equipment may be preconditioned to a shorter qualified life. The equipment must be replaced at the end of its qualified life unless ongoing qualification of prototype equipment naturally aged in plant service shows, by artificial aging and type testing, that the item has additional qualified life.

(6) Submergence (if subject to being submerged).

(7) Seismic and Vibratory Loads.

(i) Equipment must be subjected to the forces resulting from one operating basis earthquake and one safe shutdown earthquake. Other vibratory loads occurring during both normal operation and accidents must be included. Loads resulting from anticipated operational occurrences or accidents must be combined appropriately with the seismic loads.

(ii) The characteristics of the applicable input motion must be specified by response spectra, time history, or other means, if appropriate.

(8) Synergistic Effects. The preconditioning and testing of equipment must consider known synergistic effects, when these effects are known to have a significant effect on equipment performance.

(9) Margins. Margins must be applied to account for production variations and inaccuracies in test instruments. These margins are in addition to margins applied during the derivation of the environmental conditions.

(e) Each item of electric equipment must be qualified by one of the following methods:

(1) Testing an identical item of equipment.

(2) Testing a similar item of equipment with a supporting analysis to show that the equipment to be qualified is acceptable.

(3) Experience with identical or similar equipment under similar conditions with a supporting analysis to show that the equipment to be qualified is acceptable.

(4) Analysis in lieu of testing in the following cases, subject to the approval of the NRC--

(i) Type testing is precluded by the physical size of the equipment or by the state of the art; or

(ii) The equipment was installed prior to May 23, 1980.

(f) If an item of electric equipment is to be qualified by test -

(1) The acceptance criteria must be established prior to testing.

(2) The tests must be designed and conducted to demonstrate that the equipment can perform its required function as specified in accordance with paragraph (c)(1) of this section for all conditions as specified in accordance with paragraphs (c)(2) and (3) of this section. The

test profile (e.g., pressure, temperature, radiation vs. time) must include margins as set forth in paragraph (d)(9) of this section.

(3) The test profile must be either (i) a single profile that envelops the environmental conditions resulting from any design basis event during any mode of plant operation (e.g., a profile that envelops the conditions produced by the postulated spectrum of main steamline break (MSLB) and loss-of-coolant accidents (LOCA)) or (ii) separate profiles for each type of event (e.g., separate profiles for the MSLB accidents and for LOCAs).

(4) The same piece of equipment must be used throughout the complete test sequence under any given profile.

(5) Seismic and vibratory load testing must use:

(i) Multifrequency and multiaxial input motions unless adequate justification for using a single-frequency input motion or a single-axis input motion is provided.

(ii) A test mounting that simulates the actual service mounting and does not cause any significant extraneous dynamic coupling to the equipment being tested.

(iii) An actual input motion that can be demonstrated to equal or exceed the anticipated input motion. The duration of each test must equal or exceed the strong motion portion of the design earthquake and other dynamic loads due to accident conditions.

(g) All operating nuclear power plants must, by June 30, 1982, submit a schedule for the environmental qualification of electric equipment. This schedule must provide for the completion of all environmental qualification within 90 days following the two refueling outages after March 31, 1982. The Director of Nuclear Reactor Regulation may, upon sufficient

justification, extend the completion date for environmental qualification to a date no later than November 30, 1985.

(h) Each licensee shall, upon discovery of a significant equipment qualification defect, notify the Commission within 30 days of such discovery and provide the information pertaining to its impact on the qualification program and justify the continued operation of the plant.

(i) The aging considerations based on seismic and dynamic loads of paragraph (d)(5) of this section and testing requirements for seismic and vibrating loads of paragraph (d)(7) of this section apply only to nuclear power plants whose applications for a construction permit is made after (effective date of the rule).

(j) A record of the qualification must be maintained in a central file to permit verification that each item of electric equipment covered by this section (1) is qualified for its application and (2) meets its specified performance requirements when it is subjected to the conditions predicated to be present when it must perform its safety function up to the end of its qualified life.

Dated at _____ this _____ day of _____, 1981.

For the Nuclear Regulatory Commission.

_____
Samuel J. Chilk
Secretary of the Commission

VALUE/IMPACT STATEMENT

1. PROPOSED ACTION

1.1 Description

The applicant (licensee) of a nuclear power plant is required by the Commission's regulations to verify that structures, systems and components important to safety will perform their intended functions in spite of the environments that may result from the anticipated operational occurrences or postulated accidents. This verification includes environmental and seismic qualification by test, operating experience, and analysis, or a combination of these. The proposed rule sets forth the Commission's requirements for the qualification of electric equipment by test and analysis.

1.2 Need for Proposed Action

The current general requirements for qualification of electric equipment important to safety are found in General Design Criteria 1, 2, 4, and 23 of Appendix A to Part 50; Section III and XI of Appendix B to Part 50; and 10 CFR 50.55a(h), which incorporates by reference IEEE 279-1971,* "Criteria for Protection System for Nuclear Power Generating Stations." The NRC has used several methods to ensure that these general requirements are met for electric equipment. Prior to 1971, qualification was based on the fact that the electric components were of high industrial quality. For nuclear plants licensed to operate after 1971, qualification was judged on the basis of IEEE 323-1971. However, no regulatory guide was ever issued endorsing IEEE 323-1971, although some of the plants referenced the standard in their licensing submissions to the Commission. For the plants whose safety evaluation reports were issued after July 1, 1974, the Commission has issued Regulatory Guide 1.89, which endorses IEEE 323-1974* subject to supplementary provisions.

*Copies can be obtained from the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, N.Y. 10017.

Currently, the Commission has underway a program to reevaluate the qualification of electric equipment in all operating reactors. As part of this program, the staff has developed more definitive criteria for the environmental qualification. The Division of Operating Reactors (DOR) issued "Guidelines for Evaluating Environmental Qualification of Class IE Electrical Equipment in Operating Reactors" in November 1979. In addition, for reactors under licensing review, the staff has issued NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment."

In its Memorandum and Order CLI-80-21 issued on May 23, 1980, the Commission endorsed the staff's actions to use the DOR Guidelines to review operating plants and NUREG-0588 to review plants under licensing review. Further, the Commission ordered that these two documents form the basis for requirements that licensees and applicants must meet in order to satisfy those aspects of Appendix A to 10 CFR Part 50 that relate to the environmental qualification of electric equipment. The Commission also ordered that licensees of operating reactors must comply with these requirements so that the applicable equipment in all operating plants will meet the DOR Guidelines or NUREG-0588.

The Commission also noted that the guidelines and NUREG-0588 apply progressively less strict standards to older plants and that this problem is best resolved by a rulemaking. The purpose of the proposed rule is to codify the current NRC practice with respect to qualification of electric equipment. The proposed rule will apply the same uniform performance criteria for environmental qualification to all operating nuclear power plants and plants for which application has been made for a construction permit or an operating license.

1.3 Value/Impact of Proposed Action

1.3.1 NRC Operations

Since regulations specifically setting forth requirements for the qualification of electric equipment in new and operating plants have never been issued, the proposed action should result in more effective effort by the staff in reviewing applications for construction permits and operating licenses and in the backfitting of the these requirements to operating plants. The proposed action will codify an NRC position by taking advantage of previous staff effort (1) in completion of a generic activity (A-24), "Qualification of Class 1E Safety-Related Equipment," (2) in the preparation of the DOR Guidelines and

NUREG-0588, (3) in IEEE standards committee work, and (4) in the development, funding, and monitoring of related research programs.

There should be little impact on the staff at the time the rule is approved. Approximately two man-years of effort is anticipated in preparation of the rule.

1.3.2 Other Government Agencies

Not applicable, unless the government agency is an applicant.

1.3.3 Industry

The licensees and applicants currently must meet the requirements for qualification of electric equipment in accordance with the Commission's Memorandum and Order CLI-80-21. The requirements pertaining to seismic and dynamic qualification will not apply to operating nuclear power plants. If the final rule is published as now proposed, the rule will not have significant impact on industry because of backfit.

The value of this rule is that the industry will have clearly specified requirements to follow with respect to the qualification of electric equipment for new and existing plants. This, in turn, should ease the licensing process for industry by eliminating delays resulting from misinterpretation of NRC's requirements.

1.3.4 Public

The proposed action will improve public safety by further ensuring that electric equipment will perform its safety functions in spite of environments that may result from design basis events. These is no perceived impact on the public

1.4 Decision on Proposed Action

The proposed action has been mandated by the Commission in its Memorandum and Order CLI-80-21 dated May 23, 1980.

2. TECHNICAL APPROACH

During the course of rule development over the next two years, it is not anticipated that significant technical improvement over the material in the

DOR Guidelines and NUREG-0588 will be forthcoming from national standards committees. In fact, a proposed revision (update) to IEEE 323-1974 is based on the technical material in NUREG-0588. Additional new material may, however, be developed as a result of the various equipment qualification research programs currently underway. Therefore, the technical approach will be to codify the programs of the DOR Guidelines and NUREG-0588 as applied at the time the final rule is published, with additional supplementary material to reflect acceptable technical advances in this area.

3. PROCEDURAL APPROACH

Rulemaking has been mandated by the Commission in its Memorandum and Order cited above.

4. STATUTORY CONSIDERATIONS

4.1 NRC Authority

Authority for this rulemaking is derived from the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974, as amended.

4.2 Need for NEPA Assessment

The proposed action does not require an environmental impact statement in accordance with 51.5(d)(3) of 10 CFR Part 51.

5. RELATIONSHIP TO OTHER EXISTING OR PROPOSED REGULATIONS OR POLICIES

No conflicts or overlaps with requirements promulgated by other agencies are foreseen.

6. SUMMARY AND CONCLUSIONS

This rulemaking mandated by the Commission should be initiated immediately and conducted in a timely manner.

NRC PROPOSES RULEMAKING ON ENVIRONMENTAL AND SEISMIC QUALIFICATION OF ELECTRIC EQUIPMENT

The Nuclear Regulatory Commission is proposing a rule on Environmental and Seismic Qualification of Electric Equipment.

The current requirements for qualification of structures, systems, and components important to safety are contained in General Design Criteria 1, 2, 4, and 23 of Appendix A to Part 50, Criterion III and XI of Appendix B to Part 50 and paragraph 50.55a(h) of 10 CFR Part 50. These are general requirements stating the principle that structures, systems, and components important to safety in a nuclear power plant must be designed to accommodate the effects of environmental conditions and that design control measures such as testing must be used to verify the adequacy of design.

Specific qualification methods have evolved over the past decade to ensure that these general requirements are met for electric equipment. Although documented in various national standards, regulatory guides, and NRC publications, these specific methods have not been codified in NRC's regulations.

The proposed rule would codify the current NRC practice with respect to qualification of electric equipment. Regulatory Guide 1.89 on this subject is being revised to provide guidance on methods acceptable to the NRC for meeting the requirements of the proposed rule for the environmental qualification of electric equipment.

The full text of the proposed rule is being published in the Federal Register on _____. Interested persons are invited to submit written

comments and suggestions on the proposed rule and the supporting value/impact statement to the Secretary of the Commission, ATTN: Docketing and Service Branch, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.

Single copies of the proposed rule and the value/impact statement may be obtained upon request from Mr. Satish K. Aggarwal, Electrical Engineering Branch, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Telephone: (301)443-5946.

Copies of the comments received by the Commission will be available for public inspection at the Commission's Public Document Room, 1717 H Street NW., Washington, D.C.

ANALYSIS WITH RESPECT TO PERIODIC AND SYSTEMATIC REVIEW OF REGULATIONS
(TMI ACTION PLAN TASK IV.G.2)

SUBJECT: Section 50.49 pertaining to environmental and seismic qualification of electric equipment

Criteria for Periodic and Systematic Review of Regulations	NRC Compliance
1. The proposed regulations are needed.	Specific environmental equipment qualification methods and criteria currently contained in national stantards, NRC regulatory guides, and other publications have been given different interpretations and have not had the legal force of Commission's regulation. The proposed rule is needed to clarify and strengthen the methods and criteria for environmental qualification of electric equipment.
2. The direct and indirect effects of the regulations have been adequately considered.	There will not be any significant cost impact on the industry because of backfit. The licensees are required by the Commission's Memorandum and Order CLI-80-21 dated May 23, 1980 to meet the requirements contained in the DOR "Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors," (November 1979) and NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment," which form the basis of this proposal. Consequently, this rule codifies existing requirements and imposes no new costs or obligations on licensees.
3. Alternative approaches have been considered and the least burdensome of the acceptable alternatives has been chosen.	Rulemaking was chosen as the least burdensome to codify the requirements pertaining to environmental qualification of electric equipment.
4. Public comments have been considered and an adequate response has been prepared.	The proposed rule will be issued for public comments.

SUBJECT: Section 50.49 pertaining to environmental and seismic qualification of electric equipment

Criteria for Periodic and Systematic Review of Regulations	NRC Compliance
5. The regulation is written so that it is understandable to those who must comply with it.	The proposed rule has been reviewed and edited for the specific purpose of ensuring that the regulation is clear and can be understood by persons who are required to comply with it.
6. An estimate has been made of the new reporting burdens or recordkeeping requirements necessary for compliance with the regulation.	There are no reporting requirement in the proposed rule. Additional burden on applicants with respect to recordkeeping will result from (a) requirement for a central file under the control of the applicant, (b) expansion of the central file to include qualification data for the additional equipment covered by the proposed rule and seismic qualification data beyond General Design Criteria XVI of Appendix B to 10 CFR 50.
7. The name, address, and telephone number of a knowledgeable agency official is included in the publication.	The Federal Register notice promulgating the proposed rule contains the name, address, and telephone number of a knowledgeable agency official.
8. A plan for evaluating the regulation after its issuance has been developed.	Licensee and staff experience with the regulation will be used to evaluate the regulation. This subpart will be reviewed in the second cycle of NRC's periodic and systematic review process (1986-1991).

SEISMIC AND DYNAMIC QUALIFICATION OF ELECTRIC EQUIPMENT

CRITERION: ELECTRIC EQUIPMENT SHOULD BE QUALIFIED FOR SEISMIC CONDITIONS IF ITS MALFUNCTION OR FAILURE DUE TO SEISMIC CONDITIONS WILL NEGATE THE SAFETY FUNCTION OF THE ESSENTIAL SYSTEMS AND EQUIPMENT.

ISSUE: HOW TO APPLY THIS CRITERION TO OPERATING AND FUTURE NUCLEAR POWER PLANTS, CONSIDERING THE IMPACT OF BACKFITTING. THERE ARE THREE POSSIBLE ALTERNATIVES.

ALTERNATIVE NO. 1

NO BACKFITTING:

APPLY SEISMIC REQUIREMENTS TO NUCLEAR POWER PLANTS WHOSE APPLICATIONS FOR CONSTRUCTION PERMITS WERE DOCKETED AFTER THE EFFECTIVE DATE OF THE RULE. ADDRESS THE ISSUE OF SEISMIC QUALIFICATION OF EQUIPMENT TO ALL OTHER NUCLEAR POWER PLANTS IN AN ADVANCE NOTICE OF PROPOSED RULEMAKING.

ADVANTAGES:

1. THERE WILL BE NO IMMEDIATE COST IMPACT.
2. BACKFITTING, IF NEEDED, WILL BE MORE FIRMLY JUSTIFIED BASED ON CAPABILITIES OF TESTING LABORATORIES, THE COST OF TESTING, AND BENEFITS OF TESTING TO REDUCE RISK (VALUE/IMPACT).

DISADVANTAGES:

1. PUBLICATION OF BACKFITTING REQUIREMENTS MAY TAKE 2-3 YEARS.
2. ESSENTIAL EQUIPMENT MAY NOT OPERATE DURING EARTHQUAKES IN THE OPERATING POWER PLANTS.

ENCLOSURE E

ALTERNATIVE NO. 2

PARTIAL BACKFITTING:

APPLY SEISMIC REQUIREMENTS TO NUCLEAR POWER PLANTS WHOSE APPLICATIONS FOR CONSTRUCTION PERMITS WERE DOCKETED AFTER OCTOBER 27, 1972. ADDRESS THE ISSUE OF SEISMIC QUALIFICATION OF EQUIPMENT IN OPERATING POWER PLANTS IN AN ADVANCE NOTICE OF PROPOSED RULEMAKING.

ADVANTAGES:

1. REQUIREMENTS IN NATIONAL STANDARDS EXISTED SINCE 1971. VOLUNTARY COMMITMENTS TO IEEE 344-1971 AND IEEE 344-1975 HAVE BEEN MADE IN FSAR'S CURRENTLY UNDER REVIEW. THEREFORE, MINIMAL IMPACT ON THE INDUSTRY RESOURCES (FINANCIAL/MANPOWER).
2. THIS IS CONSISTENT WITH CURRENT NRC PRACTICE AND THEREFORE WILL HAVE MINIMAL IMPACT ON THE NRC STAFF.
3. THE LEVEL OF CONFIDENCE WILL BE ENHANCED FOR THE NUCLEAR POWER PLANTS UNDER REVIEW.
4. BACKFITTING FOR OPERATING PLANTS, IF NEEDED, WILL BE MORE FIRMLY JUSTIFIED BASED ON CAPABILITIES OF TESTING LABORATORIES, THE COST OF TESTING, AND BENEFITS OF TESTING TO REDUCE RISK (VALUE/IMPACT).
5. DEFICIENCIES DETECTED DURING PARTIAL BACKFITTING CAN BE CORRECTED AS WELL AT OPERATING PLANTS, IF APPLICABLE.

DISADVANTAGES:

(SEE NEXT PAGE)

ALTERNATIVE 2

DISADVANTAGES: 1. PUBLICATION OF BACKFITTING REQUIREMENT FOR OPERATING PLANTS.

2. ESSENTIAL EQUIPMENT MAY NOT OPERATE DURING EARTHQUAKES IN THE OPERATING POWER PLANTS.

ENCLOSURE E

ALTERNATIVE NO. 3

COMPLETE BACKFITTING:

APPLY THE CRITERION UNIFORMLY TO ALL NUCLEAR POWER PLANTS (OPERATING AS WELL AS FUTURE).

ADVANTAGES:

1. NRC SEISMIC REQUIREMENTS ARE MADE KNOWN TO LICENSEES AT ONE TIME.
2. BACKFITTING HAS POTENTIAL FOR DETECTION OF SIGNIFICANT DEFICIENCIES IN OLDER EQUIPMENT AND EFFECTING TIMELY CORRECTIONS.

DISADVANTAGE:

1. COMPLETE VALUE/IMPACT INFORMATION IS NOT AVAILABLE.
   (A) COST OF BACKFITTING: UNKNOWN (MAY COST 0.2-1 BILLION DOLLARS) MAY INVOLVE ADDITIONAL STRUCTURAL ANALYSIS TO SPECIFY SEISMIC INPUT LEVELS.
   (B) UNQUANTIFIED SAFETY BENEFITS: UNKNOWN RISK ANALYSIS IS IN EARLY STAGE
2. SEISMIC QUALIFICATION INVOLVES THE WHOLE PLANT - ELECTRICAL EQUIPMENT IS ONE PART.