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CLI-78-6

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

COMMISSIONERS:  
Joseph M. Hendrie, Chairman  
Victor Gilinsky  
Richard T. Kennedy  
Peter A. Bradford

In the Matter of

PETITION FOR EMERGENCY  
AND REMEDIAL ACTION

April 13, 1978

Upon petition by the Union of Concerned Scientists requesting various actions related to fire protection for electrical cables and environmental qualification of electrical components in nuclear power reactors, the Commission (1) directs the staff to review whether the Commission's fire protection research program may be beneficially expedited; (2) affirms the staff's practice of independently reviewing licensee designs and analyses, qualification documentation, and quality assurance programs, rather than certifying particular components as qualified for nuclear service; (3) denies petitioner's request to halt licensing until applicants show compliance with specified regulations; (4) denies petitioner's request to suspend all construction activities involving connectors or relating to electrical cables; and (5) denies petitioner's request to shut down all operating reactors until the operators show compliance with specified regulations.

**NRC: HEALTH AND SAFETY RESPONSIBILITIES**

Public safety is the first, last, and a permanent consideration in any decision on the issuance of a construction permit or a license to operate a nuclear facility. *Power Reactor Development Corp. v. International Union of Electrical Radio and Machine Workers*, 367 U.S. 396, 402 (1961). The Commission must have reasonable assurance that public health and safety are not endangered by its licensing actions.

**ATOMIC ENERGY ACT: RIGHT TO HEARING**

While revocation, suspension, or modification of a license must generally be in accord with Administrative Procedure Act procedures of notice and

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NUCLEAR REGULATORY COMMISSION

Docket No. 18/364-LWR Reg. No. 3  
to the Alabama Power Company

Sent 3:14 p.m. 2/19/92  
RECEIVED 3:15 p.m. 2/19/92  
OBJECTED \_\_\_\_\_

DATE 2/19/92  
WITNESS \_\_\_\_\_

By [Signature]

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opportunity to comply, 5 U.S.C. 558(b), if public health or safety requires, such actions may be taken with immediate effect. 5 U.S.C. 558(c), 42 U.S.C. 2236b; 10 CFR §§2.202(f), 2.204.

### REGULATIONS: INTERPRETATION

General design criteria (GDC) are intended to provide engineering goals rather than precise tests or methodologies by which reactor safety can be fully and satisfactorily gauged. *Nader v. NRC*, 513 F.2d 1045, 1052 (1975). They are the minimum requirements for the principal design criteria of water-cooled nuclear power plants.

### REGULATORY GUIDES: STATUS

Acceptable methods for implementing the general design criteria are found in regulatory guides, standard format and content guides for safety analysis reports, Standard Review Plan provisions, and Branch Technical Positions, but nonconformance with regulatory guides, etc., does not mean that the GDC are not met; applicants are free to select other methods to comply with GDC.

### ATOMIC ENERGY ACT: SANCTIONS

Emergency powers which radically and summarily affect the rights and interests of others, including licensees and those who depend on their activities, must be responsibly exercised. *Licensees Authorized to Possess or Transport Strategic Quantities of Special Nuclear Material*, CLI-77-3, 5 NRC 16, 20 (1977). In taking any remedial measures, the Commission must choose action sufficient to deal with the risk involved.

### RULES OF PRACTICE: SUSPENSION OF PERMITS

A violation of a regulation does not of itself result in a requirement that a license be suspended. *Petition for Shutdown of Certain Reactors*, CLI-73-31, 6 AEC 1069, 1071 (1973).

### ATOMIC ENERGY ACT: SANCTIONS

Both the Atomic Energy Act and the Commission's regulations support the conclusion that the choice of remedy for regulatory violation is within the sound judgment of the Commission and not foreordained. 42 U.S.C. 2236, 2282, 2280; 10 CFR §50.100.



## ATOMIC ENERGY ACT: DUTIES OF APPLICANTS/LICENSEES

Licensees provide the first line of defense to ensure the safety of the public, and are obligated to conduct their own detailed safety reviews. NRC is dependent upon licensees for accurate and timely information. NRC's role is primarily one of review and audit of licensee activities.

**TECHNICAL ISSUES DISCUSSED:** Electrical equipment qualification, 10 CFR §50.55a (h); fire protection measures; General Design Criteria 3 and 4, Appendix A of 10 CFR Part 50; single failure criterion, Appendix A of 10 CFR Part 50.

## MEMORANDUM AND ORDER

### I. BACKGROUND

On November 4, 1977, the Union of Concerned Scientists (UCS) filed with the Nuclear Regulatory Commission a "Petition for Emergency and Remedial Relief" which requested actions related to fire protection for electrical cables and environmental qualification of electrical components in nuclear power reactors. In particular the UCS sought the following Commission actions:

- a. The Commission shall direct the staff to accelerate a testing program to determine the type of physical separation between electrical cables necessary to maintain independence and to meet the single failure criterion<sup>1</sup> for redundant safety systems.
- b. The Commission shall direct the staff to accelerate a testing program for environmental qualification of connectors.
- c. The Commission shall direct the staff to independently verify the environmental qualifications of all safety-related systems, components, and structures.
- d. All licensing and appeal boards should immediately be notified that

<sup>1</sup>The single failure criterion is explained in NRC regulations, 10 CFR Part 50, Appendix A. "A single failure means an occurrence which results in the loss of capability of a component to perform its intended safety functions. Multiple failures resulting from a single occurrence are considered to be a single failure. Fluid and electric systems are considered to be designed against an assumed single failure if neither (1) a single failure of any active component (assuming passive components function properly) nor (2) a single failure of a passive component (assuming active components function properly) results in a loss of the capability of the system to perform its safety functions." [Footnote not in petitioner's request]

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no further construction permits or operating licenses can be issued until such time as applicants can demonstrate compliance with the applicable regulations, including specifically General Design Criteria 3 and 4 of Appendix A to 10 CFR Part 50, 10 CFR §50.55a(h), and the single failure criterion of Appendix A to 10 CFR Part 50.

e. All holders of construction permits shall immediately be notified to cease all construction activities involving the connectors identified as defective and all activities relating to electrical cables.

f. All operating reactors shall immediately be ordered to shut down until such time as the operators can demonstrate compliance with the applicable regulations, including specifically General Design Criteria 3 and 4 of Appendix A to 10 CFR Part 50, 10 CFR §50.55a(h), and the single failure criterion of Appendix A to 10 CFR Part 50.

The bases of the UCS petition are results reported August 5, 1977,<sup>2</sup> from the Qualification Testing Evaluation Programs and Fire Protection Research Programs conducted for NRC at Sandia Laboratories. The results of those tests are alleged to demonstrate that NRC regulations have been violated and that a public health and safety threat exists.

In reviewing this petition, the Commission has had the benefit of, and has fully considered, a number of detailed technical submissions by the staff and by UCS, as well as comments from the public. For clarity, the Commission will treat the legal aspects of the petition before discussing fire protection and electrical equipment qualification.

## II. LEGAL CONSIDERATIONS

Before addressing the merits of the various aspects of the petition, three

<sup>2</sup>The Commission notes with concern the long interval which elapsed from the time connector test results were available ("Quick-look" test reports of January, March, and July 1977) until decisive action was taken to obtain information from licensees (Inspection and Enforcement Bulletin 77-05 dated November 8, 1977). During this time a research staff report of August 5 was transmitted on August 26 to the Offices of Nuclear Reactor Regulation, Standards Development, and Inspection and Enforcement (IE). Not until October 14 did Nuclear Reactor Regulation formally respond, at which time it was indicated that IE would conduct a survey of licensees. However, this survey was not initiated until November 8, 4 days after receipt of the UCS petition.

As a consequence of this long delay, the Commission requests that the staff review the procedures by which the Commission, appropriate staff offices, and licensing boards are notified of research information which is of safety significance, and follow-up actions are taken with licensees and applicants. The results of this staff review, along with any recommended improvements to existing procedures, are requested within 1 month.



matters of a legal nature raised in the petition and in subsequent filings warrant discussion—the emergency nature of some of the relief sought, the relevance of alleged violations of the Commission's regulations, and whether such alleged violations have occurred. As a backdrop for this discussion, a brief summary of the Commission's statutory authority and regulatory responsibility is useful.

The Atomic Energy Act of 1954, as amended, 42 U.S.C. 2011, *et seq.*, and the Energy Reorganization Act of 1974, 42 U.S.C. 5801, *et seq.*, impose on the Commission the responsibility for administering a licensing procedure for, *inter alia*, nuclear power reactors. In large part the licensing procedure is devoted to assuring that the health and safety of the public is adequately protected. See, *e.g.*, 42 U.S.C. 2133, 2134. Thus the Commission has stated that "... public safety is the first, last, and a permanent consideration in any decision on the issuance of a construction permit or a license to operate a nuclear facility." *Power Reactor Development Corp. v. International Union of Electrical Radio and Machine Workers*, 367 U.S. 396, 402 (1961). The Commission must have "reasonable assurance" that public health and safety are not endangered by its licensing actions. *Id.*

The Commission's responsibility does not cease with the issuance of a license. If, in the Commission's judgment, the public health and safety so requires, the Commission may take action to revoke, suspend, or modify licenses, impose civil penalties, or issue cease-and-desist orders. 42 U.S.C. 2236, 2237, 2282; 10 CFR §§2.200-2.205. While revocation, suspension, or modification actions generally must be in accord with Administrative Procedure Act procedures of notice and opportunity to achieve compliance, 5 U.S.C. 558(b), if public health or safety so requires, such actions may be taken with immediate effect. 5 U.S.C. 558(c), 42 U.S.C. 2236b; 10 CFR §§2.202(f), 2.204.

Three actions which the petitioner requests are styled "emergency relief." The Commission was asked to shut down immediately all operating power reactors, to order immediately cessation of all construction involving connectors and electrical cables conducted under permits previously issued, and to impose immediately a moratorium on all power plant license issuances until licensees and applicants could demonstrate compliance with applicable regulations. Emergency actions, such as those requested, are procedures which obviously "can radically and summarily affect the rights and interests of others, including licensees and those who depend on their activities. Our emergency powers must be responsibly exercised." *Licensees Authorized to Possess or Transport Strategic Quantities of Special Nuclear Material*, CLI-77-7, 5 NRC 16, 20 (1977).

In determining whether or not to take any or all of the immediate steps requested by the petitioner, the Commission must decide whether the Sandia test results relied upon by the petitioner mandated the requested relief in

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order to provide reasonable assurance that the public health and safety are protected. See *Nader v. NRC*, 513 F.2d 1045, 1055 (D.C. Cir. 1975). In particular, the Commission must determine whether information from these tests or the UCS reveals risks in the operation of nuclear power reactors not previously perceived. If such risks are in fact identified, the Commission must determine their magnitude and take appropriate remedial actions. Where the information demonstrates an undue risk to public health and safety, the NRC will, of course, take prompt remedial action, including shutdown of operating facilities, as it has in the past.<sup>3</sup> In taking any remedial measures, the Commission must choose actions sufficient to deal with the risk involved.

The second legal matter raised by the petition concerns the relevance of alleged violations of NRC regulations to the relief requested. Petitioner claims that certain of the Commission's regulations are being violated. In enclosure (3) to the staff's filing of November 18, 1977, the Office of the Executive Legal Director (OELD) responded to what it termed the petitioner's argument that the mere existence of a question of full compliance with Commission regulations automatically compels the shutdown of operating nuclear power plants. OELD disagreed with that proposition. Petitioner, on November 23, 1977, responded to OELD's legal position and stated that it "does not allege, nor is it necessary to allege, that any violation of the regulations calls for a shutdown of operating reactors." (Emphasis in the original.) Rather, petitioner argued that a shutdown and other relief are required because of both a violation of regulations and a risk to public health and safety. In the December 15 filing, the staff has expressed general agreement with this latter formulation. The staff position is that while a violation of a regulation does not by itself result in a requirement that a license be suspended, if public health and safety is threatened as a result of a discovered violation, prompt remedial action must be taken. The staff submits that a wide range of remedial actions are available to the Commission, including shutdown of reactors.

The Commission agrees with the staff that a violation of a regulation does not of itself result in a requirement that a license be suspended. As the Atomic Energy Commission noted in denying a petition to shut down 20 reactors some years ago:

It goes without saying that a violation posing an undue risk to public health and safety will, of course, result in prompt remedial action, including shutdown if necessary. In other instances, however, the Com-

<sup>3</sup>As an example, shortly after the NRC succeeded to the regulatory duties of the former Atomic Energy Commission, it ordered the operators of 23 boiling water reactors to shut down within 20 days to inspect for possible cracks in emergency core cooling system piping. See Office of Inspection and Enforcement Bulletin No. 75-01, January 30, 1975, and NRC Press Release No. 75-12, January 29, 1975.



mission has a wide spectrum of remedies for dealing with violations of regulations. These include show cause proceedings and proceedings for civil monetary penalties. The choice of appropriate mechanism for correction of an assumed violation rests within the sound discretion of this agency. In exercising this discretion, our paramount concern is with the public health and safety. *Petition for Shutdown of Certain Reactors*, CLI-73-31, 6 AEC 1069, 1071 (1973).

Both the Atomic Energy Act and NRC regulations support the conclusion that the choice of remedy for regulatory violation is within the sound judgment of the Commission, and not foreordained. See 42 U.S.C. 2236, 2282, 2280; 10 CFR §50.100.

The final legal matter requiring discussion is whether any Commission regulations are violated. If there are violations, consideration of appropriate enforcement actions is required.

Petitioner alleges that the Sandia tests demonstrate that nuclear power plants do not conform to General Design Criterion 3,<sup>4</sup> which deals with fire protection, General Design Criterion 4,<sup>5</sup> which deals with environmental qualification, and the single failure criterion. General design criteria (GDC), as their name implies, are "intended to provide engineering goals rather than precise tests or methodologies by which reactor safety [can] be fully and satisfactorily gauged." *Nader v. NRC*, 513 F.2d 1045, 1052 (1975). They are cast in broad, general terms and constitute the minimum requirements for the principal design criteria of water-cooled nuclear power plants. There are a variety of methods for demonstrating compliance with GDC. Through regulatory guides, standard forms and content guides for safety analysis reports, Standard Review Plan provisions, and Branch Technical Positions, license applicants are given guidance as to acceptable methods for implementing the general criteria. However, applicants are free to select

<sup>4</sup>Criterion 3—Fire protection. Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions. Noncombustible and heat resistant materials shall be used wherever practical throughout the unit, particularly in locations such as the containment and control room. Fire detection and fighting systems of appropriate capacity and capability shall be provided and designed to minimize the adverse effects of fires on structures, systems, and components important to safety. Firefighting systems shall be designed to assure that their rupture or inadvertent operation does not significantly impair the safety capability of these structures, systems, and components.

<sup>5</sup>Criterion 4—Environmental and missile design bases. 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. These structures, systems, and components shall be appropriately protected against dynamic effects, including the effects of missiles, pipe whipping, and discharging fluids, that may result from equipment failures and from events and conditions outside the nuclear power unit.

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other methods to achieve the same goal. If there is conformance with regu-  
latory guides, there is likely to be compliance with the GDC. Even if there  
is nonconformance with the staff's guidance to licensees, the GDC may still  
be met.

With regard to the single failure criterion (SFC), the requirements of  
Appendix A to 10 CFR Part 50 and §50.55a(h) applicable to fire protection  
and environmental qualification do not establish a set of design basis events.  
Rather, they establish standards for design and performance of electrical  
systems to assure that such systems are capable of performing as required.

The Commission has determined, based on all the information made  
available to it in the course of this proceeding, that plants under construc-  
tion or in operation are in compliance with GDC 3 and 4 and that the Sandia  
test results do not demonstrate violations of those GDC. In the succeeding  
portions of this decision, the reasons supporting this determination are set  
forth in detail.

### III. ELECTRICAL EQUIPMENT QUALIFICATION

#### 1. Research Program

The purpose of the NRC Qualification Testing Evaluation Program is to  
obtain data to examine the validity of methods for environmental testing of  
safety-related equipment as set forth in current standards and regulatory  
guides. The Sandia tests were to examine the testing program specified by  
the Institute of Electrical and Electronic Engineers (IEEE) Standard 323  
(1974), endorsed by the NRC Regulatory Guide 1.89 (for qualifying Class  
IE<sup>6</sup> equipment for nuclear power generating stations), *i.e.*, these were to be  
tests of the environmental testing methodology and not tests for component  
qualification.<sup>7</sup> The IEEE standard allows the environmental testing to be  
performed sequentially.<sup>8</sup> The Sandia tests were to subject qualified electrical

<sup>6</sup>Class IE is the safety classification of electric equipment and systems essential to emer-  
gent reactor shutdown, containment isolation, reactor core cooling, and reactor heat  
removal, or otherwise essential in preventing significant release of radioactive material to  
the environment.

<sup>7</sup>NRC has not conducted qualification tests of specific components incorporated in nuclear  
power plants, but rather has reviewed the results of licensees' qualification programs  
and quality assurance practices. However, the Commission is requesting the staff to provide it  
with an analysis of alternatives (including estimates of cost and manpower resource require-  
ments along with potential benefits) for conducting independent verification testing of  
environmentally qualified equipment which is required to operate safety systems.

<sup>8</sup>Environmental testing is testing performed on representative equipment to verify adequacy  
of design and manufacturing processes and to confirm satisfactory operation under accident  
conditions. The environmental parameters for sequential testing include separate exposure of

(Continued on next page.)



components to both simultaneous and sequential exposure to environmental conditions, to determine if there were any synergistic effects. (These tests were intended to answer questions such as—would exposure to steam, caustic spray, and nuclear radiation at the same time have a different degrading effect on materials than separate, sequential exposures to each environmental parameter?) Comparison of the test results was intended to assess the adequacy of the sequential testing (specified in the standard) as being representative of actual accident conditions where all environmental parameters exist simultaneously. In three tests conducted on January 21, March 4, and July 12, 1977, all 12 of the connectors<sup>9</sup> tested eventually failed under either sequentially or simultaneously imposed conditions. The staff subsequently determined that none of these connectors were, in fact qualified to the IEEE standard.<sup>10</sup> As a result, the Commission finds that definitive conclusions pertaining to the test methodology were not obtained. Retesting with qualified connectors under the NRC program has not yet been conducted.<sup>11</sup>

## 2. Regulatory Approach

Fundamental to NRC regulation of nuclear power reactors is the principle that safety systems must perform their intended functions in spite of the environment which may result from postulated accidents.<sup>12</sup> For example, if an electrical component is required to function in a safety system which was designed to mitigate the consequences of certain accidents, that component must perform its intended function for postulated accidents such as (a) loss-of-coolant accident (LOCA), (b) main steam line break (MSLB), or (c) failure of any other high-energy confining system. Confirmation of the adequacy of this equipment to remain functional under postulated accident conditions constitutes environmental qualification. Environmental qualifica-

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*(Continued from previous page.)*

a component to nuclear radiation, steam at high temperature and pressure, and for pressurized water reactors only, caustic solution spray.

<sup>9</sup>Electrical connectors are devices used in some systems to allow attachment or removal of electric supply to certain components, without requiring cutting of electric cables.

<sup>10</sup>The vendor for one set of connectors asserted that it had been qualified to IEEE-323 (1971). However, the test profile used to support the assertion made by the supplier was less severe than that of the IEEE standard. As a result, the staff has concluded that none of the connectors in the Sandia tests were fully qualified to IEEE-323 as required for service in a LOCA environment. See staff memoranda: January 20, 1978, p. 2; November 22, 1977, Enclosure 1, p. 33, and Enclosure 2, pp. 2-3.

<sup>11</sup>However, the Commission is directing the staff to:

(a) repeat the test program with connectors qualified in accordance with IEEE-323 (1974) and Regulatory Guide 1.89, and (b) provide a plan for a review of the adequacy of the quality assurance practices for NRC-sponsored confirmatory research programs.

<sup>12</sup>The controlling regulation here is 10 CFR Part 50, Appendix A, General Design Criterion

sure to environmental effects. (These tests assure to steam, caustic a different degrading to each environmental ded to assess the adequacy as being representative environmental parameters July 21, March 4, and July 11, 1977. The staff subsequently retested with qualified to the IEEE-323 and reached definitive conclusions. Retesting with qualified to the IEEE-323 has been conducted.<sup>11</sup>

reactors is the principle reason in spite of the fact that the staff has been qualified to the IEEE-323. For example, if a safety system which was identified as a component of the accident sequence, such as (a) loss-of-break (MSLB), or (c) failure of the reactor. Confirmation of the adequacy of the reactor postulated accident sequence and environmental qualification.

pressure, and for pressurized

low attachment or removal of electric cables. The staff has been qualified to IEEE-323 and the adequacy of the design made by the supplier was less than adequate. The staff has concluded that none of the tests as required for service in a reactor. (p. 2; November 22, 1977.

conformance with IEEE-323 (1974) and the view of the adequacy of the design of the research programs. (A. General Design Criterion

tion may be achieved by actual testing of components, by engineering analysis, or a combination of both.

### 3. NRC Actions

On November 7, 1977, the Commission directed the NRC staff to report in writing by November 9, 1977, on any matters of safety significance raised by the UCS petition which required immediate Commission action and to discuss the three specific requests for immediate actions set forth above as items d., e., and f.<sup>13</sup> An order was issued by the Commission on November 9, 1977, which directed the staff to evaluate the entire petition and provide its views on all questions raised therein by November 25, 1977.<sup>14</sup> The views of licensees and the public were also solicited.<sup>15</sup> In an open meeting on November 11, 1977, the Commission received a briefing from the NRC staff on the emergency aspects of the petition, and on the basis of information provided at this briefing and the staff's filing of November 9, 1977, the Commission determined that no immediate actions were required at that time. The staff indicated that it was conducting a telephone survey on the use of connectors inside containment. In addition to the telephone survey, the staff issued two Inspection and Enforcement (IE) Bulletins 77-05<sup>16</sup> and 77-05A<sup>17</sup> which directed licensees and permit holders to provide

<sup>13</sup>While Section 2.206 of the Commission's Rules of Practice, 10 CFR §2.206, provides that petitions such as this should be addressed to the appropriate NRC office director, the Commission does have inherent power to exercise jurisdiction in the first instance. The Commission's election in this case to exercise its prerogative to rule on the petition rather than refer the matter to the Director, Office of Nuclear Reactor Regulation, is not intended to establish a precedent for circumventing the procedure set forth in Section 2.206. Sound allocation of Commission resources dictates that this inherent power be used sparingly.

<sup>14</sup>The Commission subsequently granted two staff requests for extensions of time within which to file its response to all questions raised, because the staff's efforts had been directed to evaluation of the emergency aspects of the petition on a priority basis. The staff response was received on December 15, 1977.

<sup>15</sup>Forty-six responses were received from licensees (or their representatives), public interest groups, and members of the public. Twenty-five of these commentators urged denial of the petition, 15 supported the petition, four expressed no position, and two requested continuances (and subsequently provided responses which are included in the categories above). These responses were considered by the Commission in reaching its decision in this matter.

<sup>16</sup>On November 8, 1977, IE Bulletin 77-05, "Electrical Connector Assemblies," was sent to all licensees and permit holders directing them to provide information on connectors used in safety systems located inside containment, subject to LOCA environment and required to be operable during LOCA. Information was requested within 30 days for operating reactors and 60 days for reactors under construction.

<sup>17</sup>On November 14, 1977, supplemental IE Bulletin 77-05A was sent to all licensees and permit holders directing them to provide information on all connectors in safety systems located either inside or outside containment and required to function to mitigate an accident where the accident itself could adversely affect the ability of the system to perform its safety function.



information on connectors used in safety systems inside and outside containment.

Upon completion of the IE bulletin survey of the use of electrical connectors, the staff was directed to prepare a written report containing the results of that survey and the status of the qualification test review, and to address the questions raised in petitioner's letter and supplemental affidavit of November 10, 1977, to the Commissioners. The staff was also requested to provide written answers to questions posed by Commission offices on the subject of the petition. On November 17, 1977, the UCS filed a Second Supplemental Affidavit of Robert D. Pollard, its expert, which responded to the staff's submissions up to that time.

The staff reported the completion of its preliminary survey on the use of electrical connectors in safety systems inside containment in operating plants on November 18, 1977. The staff reaffirmed the conclusion of its report of November 9, 1977, that the immediate Commission actions requested by UCS were not warranted for all operating reactors. However, action was required for D.C. Cook, Unit No. 1. This unit was taken out of service on November 18, by the licensee. This action, confirmed by a staff order issued at the same time, followed a meeting between the licensee and the staff during which the licensee was unable to adequately document the qualification of the electrical connectors used in plant safety systems. The staff also informed the Commission of the actions the staff had taken regarding 12 other plants which had been identified as using connectors in such systems. For these plants the staff had requested licensee submittal of documentation of test procedures and results to demonstrate that connectors used are capable of performing in a LOCA environment by a specified date. If such data were lacking, justification for operating beyond that date was required. The staff also provided a legal analysis of petitioner's arguments regarding enforcement of NRC regulations. UCS subsequently reiterated their legal arguments in a filing dated November 23, 1977, which the staff responded to in its December 15, 1977, report, pg. 78.

On November 22, 1977, the staff filed its response to the UCS letter and supplemental affidavit of November 10, 1977, and the questions posed by Commission offices. It also included copies of letters sent to several licensees requesting further information on electrical connectors in their plants. The staff stated that upon review of the supplemental affidavit its view was that the affidavit contained no new information not previously considered in the staff's report of November 9, 1977, and was essentially a restatement of the concerns raised originally in the UCS petition. In addition, the staff provided its analysis of each of the statements in the supplemental affidavit.

On November 25, 1977, the staff supplemented its reports of November 9, 18, and 22, 1977. In its November 25 memorandum, the staff discussed actions taken regarding the Oyster Creek reactor (which was identified as

inside and outside contain-

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The staff was also re-  
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7, 1977, the UCS filed a  
petitioner Pollard, its expert, which  
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and conclusion of its report of  
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connectors. However, action was  
not taken out of service on  
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between the licensee and the  
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plant safety systems. The

the staff had taken re-  
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to demonstrate that connectors  
in compliance by a specified date.  
Operating beyond that date was  
in violation of petitioner's arguments  
The UCS subsequently reiterated  
its request on December 23, 1977, which the staff  
responded on page 78.

in response to the UCS letter and  
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the staff letters sent to several licensees  
regarding connectors in their plants. The  
supplemental affidavit its view was that  
connectors previously considered in the  
supplemental affidavit, the staff provided  
supplemental affidavit.

In its reports of November  
1977 memorandum, the staff discussed  
the petitioner (which was identified as

having connectors in safety systems within the containment), and reported  
results of the staff review of the use of connectors inside the containment on  
Target Rock safety relief valves used on some boiling water reactors  
(BWR's).<sup>18</sup> The staff also provided a further status report on the D.C. Cook  
plant, which had been shut down earlier. The staff further reported that  
work was continuing on another environmental qualification matter cited in  
the UCS submittal of November 17, concerning electrical penetrations.  
Office of Inspection and Enforcement (IE) Bulletins 77-06 and 77-07 were  
issued on November 22 and December 19, respectively, requiring licensees  
to provide information on the use of certain electrical penetration assemblies.  
Penetrations of this type at Millstone, Unit No. 2, had experienced electrical  
shorts.

On December 6, 1977, the staff issued another supplement to its previous  
reports. It discussed the further results of its preliminary survey of electrical  
connector use, provided the initial results of the preliminary survey of  
containment electrical penetrations in operating plants, a review of the  
petitioner's more recent filings, a summary of activities taken by staff, and  
future actions under consideration with regard to the environmental quali-  
fication of other safety-related electrical equipment in nuclear plants.

The Commission received a second briefing on the emergency aspects  
of the petition by the staff in an open meeting on December 8, 1977. At his  
own request, the petitioner's expert, Mr. Pollard, was accorded an opportu-  
nity to comment on matters relevant to the UCS petition.<sup>19</sup> Mr. Pollard  
availed himself of this opportunity to make a presentation and answer ques-  
tions of the Commissioners.

<sup>18</sup>In the course of conducting its preliminary survey the staff thought it had identified  
additional plants using connectors in safety systems inside the containment. The staff had  
advised the Commission in its November 22, 1977, filing that they were concerned with  
connectors associated with Target Rock safety relief valves used on certain BWR systems.  
The staff noted, at that time, they would continue evaluation of these connectors to determine  
whether they must function in the event of a LOCA. On November 25, 1977, the staff  
adequately explained why it had later concluded that these electrical connectors were not  
required to function in an accident environment, because these connectors did not serve a  
safety system function.

<sup>19</sup>Counsel for petitioner had requested in a letter dated November 17, 1977, that the  
Commissioners call Mr. Pollard to appear before them if they had any questions and that he  
be allowed to participate in any further staff briefings of the Commission. At an open  
meeting on December 7, 1977, the Commission voted to grant petitioner's request. The  
granting of petitioner's request in this instance, however, is not to be construed as a pre-  
cedent and the Commission does not intend to make such arrangements a regular feature of  
Commission practice. An attorney (Mr. Troy Conner), who had provided comments on the  
petition pursuant to the Commission's order of November 9, 1977, filed an objection to the  
UCS participation request. In the event that the Commission granted the UCS request, he  
asked that those opposed to the granting of the petition, himself included, be afforded a  
similar opportunity. In the interest of fundamental fairness, the Commission accordingly

(Continued on next page.)



Subsequently, on December 15, 1977, the staff submitted its report on the totality of the matters raised by the petition. The staff explained the actions it had taken concerning the qualification of electrical connectors, containment electrical penetrations, and other safety-related electrical equipment in response to the Sandia tests, recent operating experience, and the UCS petition. The Commission met in open session on December 22, 1977, for a briefing on the December 15 report by the staff, including questioning of the staff.

On January 6, 1978, the staff provided a report which updated the status of the investigation of the use of electrical connectors. In particular, the staff had determined that environmental qualification information for the Pilgrim, Unit 1, was incomplete. In meetings with the licensee, the staff determined that additional information was required to permit evaluation regarding safety of extended operation, but that operation until a planned shutdown on January 21 would not endanger public health and safety. Additional qualification testing of electrical connectors would be required prior to resumption of power operations after this planned shutdown.

In a subsequent report of January 13, the staff stated that Pilgrim, Unit 1, was shutdown by the licensee on January 9 as the result of unsatisfactory performance of a typical connector during a preliminary screening test. Inspection of this connector indicated problems associated with the method of installation in the facility. The Pilgrim, Unit 1, was to remain shut down until satisfactory testing was completed, or qualified devices were substituted for these connectors.

In this January 13 report the staff also provided a current status of the review of electrical connectors. Additional qualification testing was to be performed for six reactors<sup>20</sup> other than Pilgrim. In addition, the staff stated that the Connecticut Yankee (Haddam Neck) licensee had replaced connectors (for which no adequate qualification documentation existed) with terminal blocks inside sealed junction boxes.

The staff's January 13 report also gave the results of investigations of electrical penetration assemblies. Based on reviews of test results and com-

*(Continued from previous page.)*

scheduled time equal to that afforded the UCS to hear from those opposed to the petition at a subsequent briefing on December 22. Prior to that briefing the Commission was advised that those invited to present their opposition viewpoint did not wish to exercise this opportunity. Even in assessing this request for relief of an emergency nature, the Commission had continued the policy established in its general handling of the petition, of formulating a framework for principled decisionmaking "including the crucible of debate through the clash of informed but opposing scientific and technological viewpoints," as suggested by Chief Judge Bazelon of the United States Court of Appeals for the District of Columbia in *Friends of the Earth v. AEC*, 485 F.2d 1031 (1973).

<sup>20</sup>Six reactors for which tests of qualification under LOCA radiation exposure conditions were planned (steam and, as appropriate, caustic spray testing have been satisfactorily completed) were Browns Ferry, Units 1, 2, 3; Nine Mile Point; Maine Yankee; and Oyster Creek.

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parative design analysis the staff has concluded that penetrations in all operating reactors are environmentally qualified for LOCA conditions. In a later report dated March 23, 1978, the staff indicated that some followup confirmation tests are planned by July 1978 for penetrations used in Connecticut Yankee (Haddam Neck); periodic checks will be made on penetrations at Yankee Rowe. At Millstone, Unit 2, (where the problem was initially identified) penetrations will be replaced prior to resumption of operations.

On January 20, 1978, the staff provided its response to a "Draft Memorandum and Order" filed by UCS on January 9.<sup>21</sup> The staff's position was that UCS had provided no new facts, but rather the January 9 filing was a restatement of previous UCS positions. In this submission the staff provided responses (or referenced responses in its earlier submission) for each of the UCS contentions. The staff recommended that the Commission not adopt the "Draft Memorandum and Order."

On January 27 the staff reported that the licensee of the Connecticut Yankee Plant had informed them that environmental qualification data did not exist for electrical terminal blocks,<sup>22</sup> which had been used as replacements for unqualified connectors. In addition, the staff reported that a large number of similar terminal blocks were in use by this licensee in safety-related systems inside containment. Environmental qualification screening tests were conducted by the licensee in which one type of terminal block failed while two other types passed the tests. The staff concluded that this failure demonstrates that this type of terminal block is not environmentally qualified.

The staff promptly initiated a telephone survey of all operating plants to determine if other plants used any type of terminal block for which there is not complete environmental qualification. An IE Bulletin 78-02 was issued on January 30 requiring all power reactor licensees to provide followup documentation.

On February 3, 1978, the staff provided another report updating the status of both the Pilgrim connectors and the results of the telephone survey on the use of "unprotected" terminal blocks inside containment in safety-

<sup>21</sup>In this filing, UCS requested Commission permission to make reference to the unofficial transcript of the December 22, 1977, Commission meeting. The Commission has decided, as a matter of public convenience, that transcripts of open Commission meetings will be available solely for general informational purposes. These transcripts are not reviewed, corrected, or edited and may contain inaccuracies. They are not part of the formal or informal record of decision of the matters discussed. Expressions of opinion in transcripts do not necessarily reflect final determinations or beliefs. The Commission does not believe in this case it is appropriate, or necessary, to authorize reference to this transcript. However, the Commission does note that the information is included in written staff transmittals.

<sup>22</sup>Although not specifically raised by the petitioner, the Commission believes the problems identified with terminal block qualification (which are another means of making connections within electrical systems) are pertinent to the issues raised by the petitioner. Consequently a brief discussion of the use of terminal blocks is considered appropriate here.



related systems (unprotected terminal blocks are those which are not enclosed in metal boxes). In the Pilgrim case, the licensee has replaced all safety-related electrical connectors with fully qualified splices. From the telephone survey on terminal blocks, three facilities (Yankee Rowe, Rancho Seco, and Ginna) in addition to Haddam Neck were identified as using unprotected terminal blocks in safety systems. The staff met with the licensee responsible for each of these facilities.

The staff provided another report on February 10, 1978, which included the status of qualification programs for electrical connectors in use at the previously identified six reactors. Furthermore, additional information was provided in response to issues raised by UCS in a letter dated January 20, 1978.

On February 17, 1978, the staff supplied information which corrected a portion of the February 10 memorandum. In the February 10 report, the staff had indicated that electrical connector qualifications for the Browns Ferry, Units 1, 2, and 3, had been completed. On February 13 the staff reported that although the licensee had earlier informed them that testing was incomplete, due to a misunderstanding within the staff, this led to an error in the February 10 report which indicated that this testing was completed. On that same day, the licensee notified the staff that certain electrical connectors for Unit No. 3 had failed under test. Followup information was provided by the staff in a February 18 memorandum. Failure of the electrical connectors for Browns Ferry 3 had occurred due to excessive temperatures and nonrepresentative environment being applied during an accelerated aging test. The staff reported that the licensee had made a commitment to replace these connectors with environmentally qualified splices at the next refueling (scheduled for September 1978), and for the interim, a detailed test plan was being developed by the licensee to provide the results of environmental qualification testing by March 17, 1978.

In this February 18 memorandum the staff also reported that successful environmental testing had been completed for terminal blocks in use at the Rancho Seco plant. Accordingly, corrective actions have been taken for all four of the identified plants (Haddam Neck,<sup>23</sup> Yankee Rowe, Ginna, and Rancho Seco) either to qualify terminal blocks in use or make a replacement with qualified components.

<sup>23</sup>In a staff report of March 23, 1978, the Commission was informed that further testing of terminal blocks being conducted separately for D.C. Cook, Units 1 and 2, and Haddam Neck has raised questions about their environmental qualification. Subsequently, failure of Haddam Neck terminal blocks enclosed in aluminum boxes (which previously had been satisfactorily tested in steel boxes), resulted in plant shutdown and replacement with steel protective boxes. In a report on March 30, the staff confirmed that steel boxes are now in place at Haddam Neck and that other corrective actions have been taken based on testing results. They also reported that all questionable terminal blocks at D.C. Cook, Units 1 and 2, had been replaced with qualified splices.

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On March 2, 1978, the staff reported that a detailed test plan had been submitted for electrical connectors used in Browns Ferry, Unit 3, and that testing was planned to be completed March 20, 1978. Also the staff corrected some information regarding the aging tests, which had been given in their earlier memorandum of February 18. The staff concluded that continued operation until completion of the planned tests would not result in an unsafe condition, in light of a successful screening test in November 1977 of unaged connectors and of the short time remaining until properly aged components were tested.

On March 18, 1978, the staff reported that 2 days earlier Browns Ferry, Unit 3, had been taken out of service by the licensee upon failure of several Bendix electrical connectors during qualification tests. In a meeting<sup>24</sup> between the licensee and the staff, it was concluded that failures were due to the lack of epoxy potting compound on the outboard end of the connectors. It was further concluded that potting the outboard end would result in qualified connectors, justifying continued operation until the planned shut-down for refueling in September 1978. Potting compound has been added to all connectors in safety systems, and inspections have been made. The licensee has made a commitment to conduct further testing in the interim. In September, the licensee will submit for staff approval a recommendation whether potted connectors are fully qualified for the life of the plant or if replacement of connectors with qualified splices is necessary.

In a staff report dated March 23, 1978, a summary was provided of all actions taken to qualify electrical connectors, terminal blocks, and penetrations. Details on measures taken to meet specific qualification criteria and a current qualification status of each type of electrical component were provided. A number of ongoing tests were discussed, the results of which will be provided to the Commission and the public. In addition, a summary of inspection and enforcement activities was provided.

#### 4. Results of Staff Actions

Responses to IE Bulletins concerning electrical connectors have been received from all licensees for operating reactors, as reported in staff memoranda dated January 13 and March 23, 1978. Of the 67 operating power reactors, 18 were identified as having electrical connectors required to function in the LOCA environment inside the containment structure. A tabulation and summary status of these reactors is given in Appendix I. In cases where connectors are used in safety systems outside the containment structure, the staff has confirmed that these connectors are either adequately

<sup>24</sup>A representative of UCS attended meetings on Browns Ferry held on February 17 and March 16, 1978. UCS was notified of other meetings but did not attend.



protected from failures of high-energy line breaks or that these connectors will have performed their safety function before being affected by the accident environment.

In addition to the operating plants, 33 plants under construction have been identified (in response to IE Bulletins 77-05 and 77-05A) as having electrical connectors included in the design of safety systems. The licensees of these plants have made a commitment to having environmental qualification for these connectors completed prior to initial operation, and the staff has instructions to specifically review bases for such qualification.<sup>25</sup> As detailed in Appendix I, licensees of operating power plants presented data for staff review to support the qualification of electrical connectors. This data consisted of certified test results or engineering analyses, and was intended to support the conclusion that such equipment is capable of withstanding, with adequate margin, the environmental conditions which are predicted to result from accidents during which the equipment must function.<sup>26</sup> The staff review of licensee documentation determined whether that testing was conducted under appropriate conditions (*e.g.*, steam, temperature, pressure, etc.) and whether acceptable engineering practices and data were utilized to review materials and designs used for this equipment. In some cases, comparative analyses were made of equipment where similar materials and designs had been previously demonstrated as being environmentally qualified.

Of 18 plants identified as having electrical connectors in safety systems, 15 of these plants (Appendix I Table, Category A) eventually had documentation which the staff concluded supported environmental qualification for the worst-accident conditions calculated for a LOCA<sup>27</sup> (with a conservative margin) of temperature, humidity, steam pressure, caustic spray, flooding, and irradiation. The Commission agrees that the staff's conclusions are based on sound engineering practice. For the remaining three plants, Browns Ferry 3, Nine Mile Point, and Maine Yankee, (Appendix I, Category B)

<sup>25</sup>D. C. Case, Unit 2, became operational during the period of review of this petition. (This reactor is counted in the 33 noted above.) As a precondition for initial operation, the staff required the licensee to document adequate environmental qualification of numerous electrical components, including connectors and terminal blocks. (See also footnote 23.)

<sup>26</sup>Of 18 plants having connectors, nine were determined to be environmentally qualified without any additional testing. However, for the other nine, extensive additional testing and analyses have been carried out by the licensees and reviewed by the staff specifically in response to the questions raised by the petitioner.

<sup>27</sup>A main steam line break (MSLB) in PWR plants could result in predicted ambient temperatures higher than that of a LOCA, but only for a short period of time (*i.e.*, 60 to 100 seconds). Engineering evaluations of the surface temperature of components inside containment of a MSLB indicate that LOCA conditions would not generally be exceeded (ref. staff filing of December 15, 1977, Appendix E). Additional review of qualification for MSLB will be undertaken during the first phase of the staff's Systematic Evaluation Program, which is discussed below.

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environmental qualification is not yet fully documented. Each of these reactors will be discussed in turn.

For Browns Ferry 3, epoxy potting has been placed in portions of 11 connectors which originally did not have this material (as already discussed, lack of this material was the cause of failures during environmental tests). The staff determined that test results for properly potted connectors justify continued operation until the planned shutdown for refueling in September 1978. The Commission agrees with the staff and finds that this will not constitute an undue risk to the public health and safety. The licensee has made a commitment to further testing in the interim. In September, the licensee will submit for staff approval, a recommendation whether potted connectors are fully qualified for the life of the plant or if replacement of connectors with qualified splices is necessary.

Nine Mile Point and Maine Yankee both employ the same type of electrical connectors. Thus testing for the Nine Mile Point licensee will satisfy requirements for both plants. Testing has been reported by the licensee to have been satisfactorily completed, with preliminary test results reviewed and concurred in by the staff. The Commission agrees that continued operation of both of these plants will not be an undue risk to the public health and safety, in light of the reported successful tests and confirmation of adequacy made by the staff based on review of the preliminary test results.

For each of the above three plants, the Commission and the public will be informed of any subsequent results and staff conclusions.

If, during this interim period, the results of these testing programs or any other information suggests that the public is exposed to undue risks NRC will take prompt remedial action, including power reactor shutdowns if necessary. With issuance of the shutdown order for D.C. Cook, Unit No. 1, reactor, the staff has clearly demonstrated they will, when appropriate, take definitive action.

In the Commission's judgment, the staff's review of the use of electrical connectors in the Pilgrim reactor deserves special mention. In the staff's initial review, reported in its November 18, 1977, memorandum, Pilgrim was not identified as a reactor which used electrical connectors in safety systems. This conclusion was based on information received by the staff from the architect-engineering (A-E) firm for Pilgrim. On December 7, contrary to the information from the A-E, the staff was notified by the nuclear steam supply system vendor that electrical connectors were in use. In the December 15 staff report, Pilgrim was listed for the first time as having connectors, with formal documentation of their qualification being awaited by the staff. When the documentation was finally received on December 27 (3 weeks later than requested in IE Bulletin 77-05, dated November 8) the staff determined that adequate qualification data had not been provided. In lieu of qualification data, the licensee submitted only unsubstantiated letters of certification. A meeting was promptly held between



the staff and licensee, with the conclusion reached that continued operation would be allowed until a planned shutdown scheduled 3 weeks later. This continued operation was determined to afford no undue risk to the public primarily because (a) limited environmental testing had established that the connectors would remain operable during at least the initial period of a LOCA; (b) however, if the connectors failed during a LOCA, then backup systems existed to mitigate accident consequences, which would be less severe because of low power operation; and (c) connectors were protected within steel boxes. Plans were made by the licensee to initiate qualification testing of typical connectors, and restart of the reactor was contingent upon satisfactory qualification. During the course of preliminary qualification testing, a connector failed, resulting in a shutdown by the licensee on January 9, 1978. All connectors were eventually replaced with qualified splices.

The sequence of events in the Pilgrim case is not an acceptable model for regulatory or industry performance. Events moved from failure to identify connectors in use, to plant shutdown due to failure of connectors under test, and finally to replacement with splices. Because NRC is dependent upon information from licensees, the Commission is particularly concerned that at first apparently inaccurate information was forthcoming from the licensee and subsequently complete information was delayed well beyond the requested date for response. With respect to staff actions in the Pilgrim case, the delay in obtaining and reviewing the Pilgrim documentation was not satisfactory.

In order to fulfill its regulatory obligations, NRC is dependent upon all of its licensees for accurate and timely information. Since licensees are directly in control of plant design, construction, operation, and maintenance, they are the first line of defense to ensure the safety of the public. NRC's role is one primarily of review and audit of licensee activities, recognizing that limited resources preclude 100 percent inspection.

As the Commission has stated in the past:

Our inspection system is not designed to and cannot assume such tasks [to provide full inspection of construction activities]. Rather, we require that licensees themselves develop and implement reliable quality assurance programs which can assume the major burden of inspection. *Consumers Power Company* (Midland Plant, Units 1 and 2), CLI-74-3, 7 AEC 7, 11 (1974)

We require instead a regime in which applicants and licensees have every incentive to scrutinize their internal procedures to be as sure as they possibly can that all submissions to this Commission are accurate.

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Furthermore, the Commission notes that some of the licensees' initial responses indicated a lack on their part of detailed knowledge of the quality of installed plant equipment. Licensees must have this detailed understanding of their own plants in order to meet their obligations for public safety by ensuring a sound basis for making assessments of plant safety. The NRC establishes general safety criteria, sets specific requirements for many aspects of reactor design and operation, and ensures compliance with these criteria and requirement by independent audit. While, in the Commission's view, these activities play a vital role in ensuring safe plant operation, they are not a substitute for licensee safety reviews. The licensees must be knowledgeable and vigilant and must take more initiative in ferreting out details of potential plant weaknesses.

The Commission is requesting that the NRC staff carefully review this matter. This review should consider the need for further regulatory actions to include a possible NRC policy statement to reemphasize the important safety responsibilities of licensees.

In addition, the Commission endorses the staff's planned inspection and enforcement activities, as generally outlined in its March 23, 1978, memorandum. The Commission emphasizes that a comprehensive "lessons learned" evaluation needs to be made, to include (a) review of all licensee responses (with particular attention to the Pilgrim case), to determine conformance to applicable quality assurance documentation requirements, as well as the accuracy and timeliness of information provided (where justified, appropriate enforcement action should be taken); (b) review how electrical equipment, not fully qualified, came to be installed in those plants where found; and (c) review staff actions in the Pilgrim case so that similar delays may be avoided in the future. The staff is requested to provide a report to the Commission which also will be available to the public.

In addition to environmental qualification of electrical connectors, the petitioner in its submittal of November 10, 1977, questioned the qualification of electrical penetrations, because they were "similar in design, materials, and function to electrical connectors." Operating experience from Millstone, Unit 2, also led the staff to question the environmental qualification of the electrical penetrations. As a result, the staff conducted a survey of all power reactors. The information thus provided by operating facilities gave reasonable assurance that their penetrations were capable of performing in the LOCA environment. The Commission agrees with the staff conclusions on electrical penetrations. Qualification of penetrations in service at



Operating reactors was established by review of documented testing or by comparative design analysis. One remaining question on penetrations exists. Although penetrations are qualified without nitrogen pressurization, the staff is reviewing whether nitrogen gas pressure should be maintained within these penetrations where design permits to provide additional protection. The Commission is requesting that it be informed by the staff on the outcome of its review. This information will also be made available to the public.

Confirmation of the safety adequacy and environmental qualification of all Class IE electrical equipment (not limited to connectors, penetrations, or terminal blocks) in operating plants will be examined as a first priority matter in the NRC Systematic Evaluation Program (SEP).<sup>28</sup> It is expected that in about 1 month the staff review will be reported to the Commission, and made available to the public. The staff review will be sufficient to assess any safety implications in detail to adequately decide whether or not additional review of plants other than those included in the SEP are required.

#### IV. FIRE PROTECTION

##### 1. Research Program

The purpose of the Fire Protection Research Program initiated after the 1975 Browns Ferry fire is to provide a data base for evaluation of design standards and regulatory guides for fire protection and control. This program includes, among other research projects, cable fire tests. On July 6, 1977, Sandia conducted a cable fire test with a cable tray configuration consisting of stacked columns of cable trays simulating two safety divisions. These cable tray divisions were arranged in accordance with the minimum separation guidelines of IEEE Standard 384 (1974), endorsed by Regulatory Guide 1.75 for protection against propagation of internally initiated electrical fires: 5 feet vertical and 3 feet horizontal spacing between divisions. The fires were initiated by two different means: one test used internal electrical heating, while the other used external propane burners (exposure fire) to produce a sustained fire.

Fire propagation did not occur for internal electrically initiated fires. However, an exposure fire initiated in one of the bottom cable trays resulted in fire propagation from one division to the other. For these tests an external source was required to achieve the fully developed fire.

The Sandia tests<sup>29</sup> serve as confirmation of the conclusions from the

<sup>28</sup>In the first phase of the SEP review the staff will review a group of 11 reactors, including the oldest operating units. These reactors are Dresden 1 and 2, Yankee Row, Big Rock Point, San Onofre 1, Haddam Neck, LaCrosse, Oyster Creek, Ginna, Millstone 1, and Palisades.

<sup>29</sup>The results of the Sandia fire tests on electric cables were (1) electrically induced fires in cables in these tests did not spread beyond those separation minima set forth in IEEE-384 and

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review of the Browns Ferry fire. As a result of the Browns Ferry review, the staff had made the assumption that exposure fires may propagate beyond the distances set forth in Regulatory Guide 1.75, and has since required additional fire protection measures for nuclear power plants.

## 2. Regulatory Approach

NRC regulations call for fire protection in nuclear power plants because damage to electrical cables (as well as other equipment) as a result of fire may result in loss of ability to safely perform plant shutdown functions (GDC-3). The fire protection program is intended to ensure, through the defense-in-depth principle, that a fire will not prevent safe shutdown and will not significantly increase the risk of radioactive releases to the environment. Through the defense-in-depth principle the regulations aim at achieving fire protection through adequate balance by:

1. Preventing fires from starting.
2. Detecting and quickly extinguishing fires and limiting their damage.
3. Designing the plant to minimize the effects of fires on essential safety functions.

The Commission endorses the staff's position that no one level of defense-in-depth can be made invulnerable. Strengthening one of the levels can compensate in some measure for reduced safety margins in the others. Cable separation at nuclear power plants is but one design feature to mitigate the consequences of fires. Other fire protection measures include fire detection and extinguishing systems and equipment, administrative controls and procedures, and trained personnel.

## 3. NRC Actions

In the staff filings dated November 9, 10, 22, December 15, 1977, and January 20, 1978, and during the open Commission meetings on November 11, and December 8 and 22, the staff set forth the actions already taken or underway in accordance with NRC's Fire Protection Action Plan. The staff presented its conclusion that these actions provide adequate assurance that the safety of the public is protected.

*(Continued from previous page.)*

Regulatory Guide 1.75; and (2) exposure (i.e., externally initiated) fires under cable trays in these tests did spread, causing the cables to burn and the fire to propagate beyond the distances set forth in Regulatory Guide 1.75. The exposure fire employed in the Sandia test (i.e., 5 minutes burn time for two propane burners at 70,000 Btu/h, the use of heat deflectors to concentrate the heat source, burning of the fire for a period of approximately 30 minutes) may well be in excess of the fire reasonably expected to occur, considering current requirements for elimination of combustible materials from cable area, employment of fire watches, provisions of fire detecting, and firefighting equipment.

Among the staff actions on fire protection are the following:

- (a) issuance of IE Bulletins on March 24, 1975, and April 3, 1975, ordering certain controls over ignition sources, review of procedures for controlling plant maintenance and modifications that might affect safety, review of emergency procedures for alternate shutdown, and cooling methods, and review of flammability of materials;
- (b) inspections of all operating power reactors in April and May 1975 covering the installation of fire stops on electrical cables and penetration seals;
- (c) incorporation in the NRC Operating Reactor Inspection Program more detailed procedures for inspection of fire prevention and protection measures;
- (d) improved inspection of licensee quality assurance practices for fire protection;
- (e) development of new guidelines on fire protection for use in the Standard Review Plan, applicable to all nuclear power plants;
- (f) retention of the Factory Mutual Research Corporation as a technical consultant on fire protection;
- (g) improvement of standards in coordination with the Executive Committee of Nuclear Standards Management Board of the American National Standards Institute (ANSI);
- (h) NRC-sponsored research conducted by Sandia Laboratory, which includes testing of cable separation criteria, as well as other fire protection measures (e.g., barriers, coatings);
- (i) initiation of a fire protection evaluation program for all power reactor licensees and applicants; and
- (j) issuance of interim technical specifications for fire protection of operating power plants to cover the period until a full evaluation of plants to achieve conformance with the Appendix A (to Branch Technical Position 9.5-1) guidance.

#### 4. Results of Staff Actions

The need for emergency action was previously considered in the report of the Special Review Group on the Browns Ferry Fire (NUREG-050) in

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February 1976 and discussed in testimony before the Joint Committee on Atomic Energy on September 16, 1975, and on March 2, 1976. The Special Review Group concluded that emergency action was not required. The following quotation from their report summarizes the basis for that recommendation (NUREG-0050, Section 1.3):

A probabilistic assessment of public safety or risk in quantitative terms is given in the Reactor Safety Study (WASH-1400). As the result of a calculation based on the Browns Ferry fire, the study concludes that the potential for a significant release of radioactivity from such a fire is about 20% of that calculated from all other causes analyzed.<sup>30</sup> This indicates that predicted potential accident risks from all causes were not greatly affected by consideration of the Browns Ferry fire. This is one of the reasons that urgent action in regard to reducing risks due to potential fires is not required. The study (WASH-1400) also pointed out that "rather straightforward measures, such as may already exist at other nuclear plants, can improve fire prevention and firefighting capability and can significantly reduce the likelihood of a potential core melt accident that might result from a large fire." The Review Groups agrees.

Fires occur rather frequently; however, fires involving equipment unavailability comparable to the Browns Ferry fire are quite infrequent (see Section 3.3). The Review Group believes that steps already taken since March 1975 (see Section 3.3.2) have reduced this frequency significantly.

\* \* \*

Based on its review of the events transpiring before, during, and after the Browns Ferry fire, the Review Group concludes that the probability of disruptive fires of the magnitude of the Browns Ferry event is small, and that there is no need to restrict operation of nuclear power plants for public safety.

However, the Special Review Group recommended improvements in four broad categories: (1) guidance to applicants and licensees; (2) evaluation, inspection, and enforcement procedures; (3) the fire protection programs at licensed facilities; and (4) local governments' emergency procedures. To implement these recommendations, the NRC established an agencywide action plan called the Fire Protection Action Plan which involves the major program offices, *i.e.*, Nuclear Reactor Regulation, Inspection and Enforcement, Standards Development, Nuclear Regulatory Re-

<sup>30</sup>In addition, the Commission notes that the report of the Reactor Safety Study (WASH-1400, NUREG-75/0145, Appendix XI, page 3-51) states that this 20% value is within the band of uncertainty of the Reactor Safety Study; *i.e.*, the contribution of a Browns Ferry-type fire to overall risk is not statistically significant.



search, Nuclear Materials Safety and Safeguards, and State Programs. In addition, research laboratories including Brookhaven National Laboratory and Sandia Laboratory have been engaged to provide technical assistance to this program. This action plan brings together all NRC fire protection activities into a single integrated program and is the subject of an agencywide management by objective program (MBO VIII). Periodic reviews of the progress on this MBO and monthly reports are provided to the Commission. In May 1976, as part of this plan, the staff revised Section 9.5.1 of the Standard Review Plan and issued new fire protection guidelines for the implementation of General Design Criterion 3, 10 CFR Part 50, Appendix A.

Progress made since the Browns Ferry fire in reducing the potential severely damaging fires includes:

- a. requiring strict administrative controls over the handling and storage of combustibles and ignition sources in areas containing safety-related systems;
- b. modifications to operating power plants to provide fire-retarding, fire-detecting and firefighting capability (e.g., flame-retardant blankets over cable trays, covered cable trays, line detectors, area smoke detectors, sprinklers, etc.);
- c. operating procedures that have been developed by licensees to assure safe shutdown in the event of fire;
- d. additional modifications<sup>31</sup> now being made to operating power plants to decrease the severity of a fire and increase the plant's capability to cope with an unmitigated fire; and
- e. issuance<sup>32</sup> and implementation of interim fire protection technical specifications covering the availability of existing fire protection systems and administrative controls, including fire brigade strength and training, and control of combustibles and ignition sources.

Since no new information was forthcoming from the Sandia tests beyond confirmation of the current staff assumption for review of fire protection measures, i.e., that exposure fires may propagate beyond the minimum separation distances of Regulatory Guide 1.75, the Commission concludes that no immediate action is necessary as a result of these tests. Furthermore, the Commission reaffirms that the longer-term actions underway by the staff are both necessary and adequate for the present.

<sup>31</sup>These modifications are being made as a result of the staff's plant-by-plant reviews leading to the issuance of staff Safety Evaluation Reports (SER's). To date 11 such SER's have been issued covering 16 operating units.

<sup>32</sup>Thus far, the staff has issued technical specifications covering 63 operating units.

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## CONCLUSIONS

Specific Commission responses to the petitioner's request are as follows:

### Petitioner Request

- a. The Commission shall direct the staff to accelerate a testing program to determine the type of physical separation between electrical cables necessary to maintain the independence and to meet the single failure criterion for redundant safety systems.

### Commission Response

NRC's Fire Protection Research Program is intended to provide a data base for use in evaluating design standards and regulatory guides for fire protection and control. At the present time, the major emphasis is directed toward the study of the effects of cable tray spacing on fire propagation; however, the program includes other aspects of fire research, such as the effects of materials, coating, barriers, detection, and suppression. We agree with the thrust of the petitioner's contentions that there should be an examination of the fire-testing program to determine if it may be beneficially expedited. This examination, however, should not be limited to the portion of the program sought in the petition. The staff is being asked to review this program and to provide the Commission with advice on how the schedule for this program can be improved along with an estimate of the resource requirements. In addition, we expect that the staff will use its best efforts to maintain current schedules for implementation of the reactor plant backfits required for fire protection. The Commission is to be advised in advance if any slippage is anticipated, along with suggested corrective actions.

### Petitioner Requests

- b. The Commission shall direct the staff to accelerate a testing program for environmental qualification of connectors.
- c. The Commission shall direct the staff to independently verify the environmental qualifications of all safety-related systems, components, and structures.

### Commission Response

The Commission's Qualification Testing Evaluation Program was specifically developed to obtain data to examine current standards and regulatory guides for the environmental testing of safety-related equipment required to operate in a LOCA environment. The purpose of the Sandia tests was not to



verify the qualifications of any particular electrical component to withstand a LOCA event but rather to evaluate the adequacy of the testing methodology. The environmental qualification of plant-specific electrical equipment is the responsibility of the licensee. One aspect of the NRC role in regulating nuclear power plants is to provide criteria forming the engineering baseline against which licensee system designs, including component specifications, are judged for adequacy. It has not been the staff's practice to certify that any particular components are qualified for nuclear service, but rather the staff independently reviews designs and analyses qualification documentation, and quality assurance programs of licensees to determine adequacy. The Commission affirms this staff practice as being consistent with NRC's responsibilities for administering a licensing program for reactors under the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2011, *et seq.*, and the Energy Reorganization Act of 1974, 42 U.S.C. 5801, *et seq.*

As discussed earlier, expedited NRC and licensee actions have been taken to review, in depth, the environmental qualification of electrical connectors, penetrations, and terminal blocks. UCS has highlighted an area of regulatory review which heretofore had not been adequately addressed. As a result, under the NRC Systematic Evaluation Program (SEP) the staff will be reviewing and evaluating as a first-priority matter the safety adequacy and environmental qualifications of all Class IE electrical equipment. One outcome of this SEP will be recommendations as to whether this review needs to be extended to other plants, beyond those reviewed in the first phase of the SEP.

In addition, because the Sandia tests on environmental qualification were inconclusive, the Commission is directing that this testing be repeated on qualified connectors with the results reported to the Commission and made available to the public. These connectors, qualified in accordance with IEEE-323 (1974), should include a representative sample of those commercially available and in use in nuclear power reactor safety systems.

Finally, the Commission is directing the staff to provide it with an analysis of alternatives (including estimates of resource requirements and potential benefits) for conducting independent verification testing of environmentally qualified equipment which is required to operate in safety systems.

#### **Petitioner Request**

- d. All licensing and appeal boards should immediately be notified that no further construction permits or operating licenses can be issued until such time as applicants can demonstrate compliance with applicable regulations, including specifically General Design Criteria 3 and 4 of Appendix A of 10 CFR §50.55a(h) and the single failure criterion of Appendix A to 10 CFR Part 50.



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### Commission Response

Except insofar as it has already been complied with in particular cases, this portion of the petition is denied. The licensing reviews performed on construction permit and operating license applications ensure that General Design Criteria 3 and 4 of Appendix A of 10 CFR Part 50, §50.55a(h), and the single failure criterion of Appendix A to 10 CFR Part 50 are met. The Commission notes, however, that due to the issues raised by the petitioner, relevant information developed by the staff has been provided to the following licensing boards: McGuire Nuclear Station, Docket Nos. 50-369, 50-370 (under construction—in OL review); Oyster Creek Nuclear Power Plant, Docket No. 50-219 (operating plant); Peach Bottom Atomic Power Station, Docket Nos. 50-277, 59-278 (operating plants); and Ginna Nuclear Power Plant, Docket No. 50-244 (operating plant). Furthermore, in the future, in those instances where items or components are identified for which sufficient basis cannot be demonstrated to assure qualification, the staff is directed to bring this information to the attention of any licensing board considering an application for any facility in which such components are to be used.

The single failure criterion requirements of Appendix A to 10 CFR Part 50 and §50.55a(h) applicable to fire protection and environmental qualification requirements do not establish a set of design basis events. Rather, they establish standards for design and performance of electrical systems to ensure that such systems are capable of performing as required.

The staff reviews, as discussed in Section III of their submittal on December 15, 1977, show that plants meet the requirements and that the Sandia tests do not bear upon consideration of single failure requirements, but rather upon the basic question of conformance with overall design goals.

### Petitioner Request

- e. All holders of construction permits shall immediately be notified to cease all construction activities involving the connectors identified as defective and all activities relating to electrical cables.

### Commission Response

This request is denied, because (1) the licensees for the 33 plants under construction with electrical connectors in safety systems made a commitment to have full environmental qualification prior to operation; (2) NRC inspectors have specific instructions to review the licensees' bases for such environmental qualification; (3) fire protection reviews for the electrical cables are being conducted (since January 1978) in accordance with the current guidance on the Standard Review Plan prior to issuance of an operating license; and (4) in the normal licensing review both fire protection and environmental qualification reviews are conducted to ensure compliance with General Design Criteria 3 and 4 of Appendix A to 10 CFR Part 50,

§50.55a(h), and the single failure criterion of Appendix A to 10 CFR Part 50.

#### **Petitioner Request**

- f. All operating reactors shall immediately be ordered to shut down until such time as the operators can demonstrate compliance with the applicable regulations, including specifically General Design Criteria 3 and 4 of Appendix A to 10 CFR Part 50, 10 CFR §50.55a (h), and the single failure criterion of Appendix A to 10 CFR Part 50.

#### **Commission Response**

Although D.C. Cook, Unit 1, Pilgrim 1, Haddam Neck, and Browns Ferry, Unit 3, have been shut down (Ginna and Yankee Rowe were already shut down and experienced a longer outage) as the result of investigations in response to this petition, the Commission denies the requested relief sought by the petitioner as it applies to all other power reactors because (1) in view of the additional improvement of fire safety made in operating power plants since the Browns Ferry fire, coupled with the current Fire Protection Action Plan, those plants can continue to operate without undue risk to the public health and safety; (2) the qualification of electrical penetrations, terminal blocks, and connectors (as detailed earlier) has been demonstrated, or a qualification testing program is underway; and (3) the single failure requirements and GDC, as discussed earlier in the Commission response to request "d" of the petitioner, have been met.

#### **Required Staff Actions**

The staff is directed to take certain actions, as detailed in Enclosure II. It is so ORDERED.

By the Commission

Samuel J. Chilk  
Secretary to the Commission

Dated at Washington, D.C.,  
this 13th day of April 1978.

[Appendixes I and II have been omitted from this publication but are available at the NRC Public Document Room, 1717 H Street, N.W., Washington, D.C.]

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General Design  
10 CFR §50.55a  
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The following table summarizes the qualification criteria and current status of electrical connectors used in safety systems within containment of eighteen operating power reactors. This table is divided into two categories, viz.:

- Category A - Plants for which electrical connectors are fully qualified, or replaced, and
- Category B - Plants for which electrical connectors are currently only partially qualified.

Nine of the plants in Category A were found to be fully qualified based on documentation which predates filing of the UCS petition. The balance of the plants in both categories A and B undertook qualification programs in response to the UCS petition.

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N.B.: The Hatch power reactor -- Unit 1 was originally identified as having connectors which were in safety systems inside containment. Response to IE Bulletin 77-05 indicated this original identification was in error; no connectors exist which are required to perform in a LOCA environment. This accounts for the difference in the number of affected plants identified by UCS (19) and in this table (18).



**Electrical Connectors Used in Safety Systems Within Containment of Operating Power Reactors**

PLANT	ENVIRONMENTAL QUALIFICATION CRITERIA					REMARKS
	FUNCTIONAL OPERABILITY DURING TEST	STEAM ENVIRONMENT	CAUSTIC SPRAY DURING TEST	RADIATION (PRE-TEST) (SEE NOTE 4)	AGING (PRE-TEST) (SEE NOTE 2)	
<i>A. Electrical Connectors Fully Qualified or Replaced (15 Plants)</i>						
Surry 1 & 2	Yes	Yes	No*	NA**	None	LOCA (Loss of Coolant Accident) *Connector assemblies protected from spray — **No long term functional requirements — used only for initial actuation of Safety Injection System Status: Qualified (SEE NOTE 1)
Oconee 1/2/3	Yes	Yes	No*	Yes	Yes	LOCA *Connector assemblies protected from spray Status: Qualified (SEE NOTE 1)
Ft. St. Vrain	No*	NA	NA	NA because of location**	None	Design Basis Accident *Pre/post functional test performed. ** HTGR — Connector located outside primary enclosure Status: Qualified (SEE NOTE 1)
Peach Bottom 2/3	Yes	Yes	Yes	Yes	Yes	MSLB (Main Steam Line Break) Status: Qualified (SEE NOTE 1)
D.C. Cook 1	Yes	Yes	Yes	Yes*	Yes*	MSLB Replaced connectors with qualified splices. *Used Raychem data for separate effects test of radiation & aging. Splices qual. to MSLB profile 340°F (1 hr.), 250°F (5 <sup>1/2</sup> hr.) Status: Qualification of splices complete (SEE NOTE 5)

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D.C. Cook 1	Yes	Yes	Yes	Yes*	Yes*	(By Mat) MSLB	Replaced connectors with qualified splices. *Used Raychem data for separate effects test of radiation aging. Splices qual. to MSLB (340°F (1 hr.), 250°F (5 hr.)) Status: Qualification of splices complete (SEE NOTE 5)
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Electrical Connectors Used In Safety Systems Within Containment of Operating Power Reactors

PLANT	ENVIRONMENTAL QUALIFICATION CRITERIA					TEST PROFILE FOR TEMPERATURE AND PRESSURE	REMARKS
	FUNCTIONAL OPERABILITY DURING TEST	STEAM ENVIRONMENT	CAUSTIC SPRAY DURING TEST	RADIATION (PRE-TEST) (SEE NOTE 4)	AGING (PRE-TEST) (SEE NOTE 2)		
Palisades	Yes	Yes	No*	Yes	Yes	LOCA	*License Submittal References response by Duke Power Company (Oconec) Status: Qualified (SEE NOTES 1 and 3)
Pilgrim 1	Yes	Yes	NA	Yes*	Yes*	MSLB	Connectors replaced with qualified splices. *Used Raychem data for separate effects tests of radiation and aging. Status: Qualification completed
Browns Ferry 1/2	Yes	Yes	NA	Yes	Yes	MSLB	Initial test followed by full tests with aging and irradiation. Status: Qualification completed
Connecticut Yankee (Haddam Neck)	Yes	Yes	No*	By Materials Analyses	None	LOCA	Connectors replaced with 4 terminal blocks. *No automatic spray and protected location. (SEE NOTE 5)
Oyster Creek	Yes	Yes	NA	Yes	None	MSLB	Repeated tests to confirm initial reliance on earlier Target - Rock Valve Tests. Status: Qualification Completed

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**Electrical Connectors Used in Safety Systems Within Consignment of Operating Power Reactors**

PLANT	ENVIRONMENTAL QUALIFICATION CRITERIA					REMARKS
	FUNCTIONAL OPERABILITY DURING TEST	STEAM ENVIRONMENT	CAUSTIC SPRAY DURING TEST	RADIATION (PRE-TEST) (SEE NOTE 4)	AGING (PRE-TEST) (SEE NOTE 2)	
<i>B. Electrical Connectors Partially Qualified (3 Plants)</i>						
Browns Ferry 3	Yes	Yes	NA	Yes	Yes	MSLB Some connectors failed under test due to unpotted ends. Epoxy potting completed. Fully potted connectors tested and qualified for operations until September 78 refueling, then connectors to be replaced with splices or long term qualification established by further tests to be completed by September 78.
Nine Mile Point	Yes	Yes	NA	Yes	None	LOCA Tests include radiation (also applies to Maine Yankee). Status: Testing satisfactorily completed. Final report to be completed in Mid-April, 1978.
Maine Yankee	Nine Mile Point 1 tests will provide confirmatory information to support previous tests completed by Maine Yankee.					See Nine Mile Point Remarks

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- Note 1: Original test and test documentation found acceptable. (Applies to action taken prior to UCS petition of November 4, 1977)
- Note 2: The staff has not required backfit of the aging requirement of IEEE-323-1974 to any of these plants. Instead, these tests served to provide a severe stress condition (pre-conditioning) which provides margin to assure the adequacy of prototype (one of a kind) testing.
- Note 3: The licensee inspected cable connectors during recent refueling outage and found a few missing blank inserts (used as seal for unused pins in multi-pin cable connectors). I&E was notified and licensee is in process of sealing back end portion of all safety-related cable connectors with potting compound, using approved procedures.
- Note 4: The radiation exposure levels reported by the licensees are in the range of values routinely accepted by the staff since about 1970. Some more conservative values which flow from some interpretations of Regulatory Guide 1.89 are under active generic consideration in connection with the implementation of the guide and the NRC's environmental qualification research program at Sandia (see discussion in Appendix A, pg. 26, or staff December 15, 1977 report).
- Note 5: Recent tests of terminal blocks inside metal boxes in safety systems in D.C. Cook 1/2 and Connecticut Yankee 1 had raised questions about the adequacy of their environmental qualifications. Staff's report of March 30, 1978, indicated that corrective actions had been taken. D.C. Cook 1/2 replaced all questionable terminal blocks with qualified splices and Connecticut Yankee replaced aluminum enclosures for terminal blocks with steel.

## REQUIRED STAFF ACTIONS

## Appendix II

The following provides, in one place, a listing of all the actions which the Commission is directing the staff to take as a result of this decision: (All reports to the Commission resulting from these actions will also be made available to the public).

1. Conduct a prompt review of the fire protection testing program to determine if it may beneficially be expedited, including an estimate of additional resources required if any. To be completed within one month.
2. Use best efforts to maintain the current schedules for implementation of Fire Protection Action Plan for operating plants and those under licensing review. The Commission is to be advised in advance if any slippage is anticipated, along with the suggested corrective actions. 7.
3. Arrange for a repeat of the tests to obtain data for verification of current methodology for environmental qualification of electrical components. These tests should be performed with a representative sample of commercially available electrical connectors qualified in accordance with IEEE-323 (1974) and in use in nuclear power reactor safety systems. When available, the test results are to be promptly provided to the Commission. 8.
4. Review the procedures by which the Commission, appropriate staff offices and Licensing Boards are notified of research information which is of safety significance, and follow up actions are taken with licensees and applicants. To be completed within one month. 9.
5. Provide the Commission with an analysis of alternatives (including estimates of resource requirements and potential benefits) for conducting independent verification testing of environmentally qualified equipment which is required to operate in safety systems. Alternatives to be provided for information of the Commission in one month, with the full analysis to be completed one month later. 10.
6. Conduct a comprehensive "lessons learned" evaluation to include the following: (a) review all licensee responses (with particular attention to the Pilgrim case), to determine conformance



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to applicable quality assurance documentation requirements, as well as the accuracy and timeliness of information provided. (Where justified, appropriate enforcement actions should be taken.); (b) review how electrical equipment, not fully qualified, came to be installed in those plants where found; (c) review staff actions in the Pilgrim case so that similar delays may be avoided in the future; and (d) review the need for further regulatory actions to include a possible NRC policy statement to re-emphasize the important safety responsibilities of licensees. Evaluation to be completed within two months.

7. Develop a plan to investigate the adequacy of quality assurance practices for NRC-sponsored confirmatory research program and provide recommendations to the Commission. This plan is to be developed as a coordinated effort among appropriate NRC offices to include RES, NRR, IF and SD. Consultation with the Department of Energy and appropriate national laboratories is suggested. The plan is to be completed within six weeks.
8. Inform the Commission of results of the staff review of further qualification testing by licensees for which fully documented test results are not yet available. (Browns Ferry 3, Nine Mile Point, and Maine Yankee.)
9. Inform the Commission of the decision made on the question of whether nitrogen gas will be required for those containment penetrations which can accommodate such pressurization. To be completed within one month.
10. Review the results of the first phase of the Systematic Evaluation Program concentrating on the safety adequacy and environmental qualification of all Class IE electrical equipment. Provide recommendations whether this review needs to be extended to other plants. To be completed within one month.



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