Enclosure 3

January 18, 1984

POLICY ISSUE
(Information)

SECY-83-457C

For: The Commissioners

From: William J. Dircks, Executive Director for Operations

Subject: DISCUSSION/POSSIBLE VOTE ON EQUIPMENT QUALIFICATION POLICY AND PROPOSED RULE; NRC RESPONSE TO COURT OF APPEALS DECISION

Purpose: To provide the Commissioners with information on the status of resolution of Sandia concerns about the NRC's EQ program and other matters.

Discussion: In the Commission Meeting of January 6, on the subject agenda item, A. W. Snyder and D. A. Dahlgren of Sandia discussed Sandia concerns regarding the NRC's EQ program, fire protection, and pressures Sandia perceives it has experienced in conducting research programs. Sandia's written explanation of their concerns was transmitted to the Commission by my memorandum on this subject of January 10, 1984.

Per the staff requirements memorandum to me from John C. Hoyle dated January 10, 1984, the staff and Sandia have jointly addressed Sandia's concerns with the exception of the issue of timing of the release of research results in implementation of foreign information exchange arrangements. This issue will be the subject of a separate Commission background paper.

The staff prepared responses to each of Sandia's concerns and discussions were held with appropriate Sandia staff to assure that these concerns have been correctly interpreted and are being addressed. In some cases the staff's responses were modified to reflect feedback from Sandia. The resolution basis includes a commitment on the part of the staff for additional discussions on the subject of NRC pre-approval of Sandia travel. Dr. Dahlgren has stated in Enclosure 1 Sandia's position regarding the staff responses (Enclosure 2) to Sandia concerns.

CONTACT:
B. Morris, RES
44-37946

Dr. Dahlgren has specifically stated his belief that all Sandia issues related to environmental qualification of electrical equipment and the EQ rule have been satisfactorily addressed in the staff responses. It should be noted that although there was agreement between Sandia and staff that the fire protection issues raised were being addressed as documented in Enclosure 2, these issues are not within the scope of the subject policy issue or the EQ rule.

During our January 12, 1984 meeting with Sandia, they reviewed the Duke Power D.G. O'Brien Test Report and have since notified us of concerns regarding the way the test was conducted. A copy of this report has been sent to Sandia and in addition, this report is scheduled to be reviewed by our staff consultants for the Catawba licensing review. The staff will keep the Commission informed on this item.

William J. Dircks
Executive Director for Operations

Enclosures:
1. Ltr to W. J. Dircks frm D. A. Dahlgren, SNL, 1/12/84
2. NRC Response to Issues Raised by SNL During NRC Commission Meeting of January 6, 1984

JAN 12 1984

Mr. William J. Dircks
Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Dircks:

The NRC staff and Sandia representatives have met and discussed the issues and concerns raised by Sandia with Chairman Palladino and at the NRC meeting of January 6, 1984. The staff appears to have understood the concerns of Sandia, and all parties have come to a consensus understanding of the issues raised. Sandia agrees that the staff has addressed or is addressing the issues (concerns) raised by Sandia. We believe that all the issues we raised which directly or indirectly relate to environmental qualification of electrical equipment in nuclear plants, as defined by the EQ Rule 10 CFR 50.49, have been addressed. This is based on the Sandia review of the NRC staff responses to our concerns which are Enclosure 1.

Sincerely,

D A Dahlgren

D. A. Dahlgren

Enclosure:
1. NRC Response to SNL Concerns

NRC Response to Issues Raised by

Sandia National Laboratories

During NRC Commission Meeting

of January 6, 1984

1. Qualification Methodologies Have Shortcomings

Work has been performed under NRC research on many of the items indicated in Attachment A. The results indicate shortcomings are present in some of the current criteria and qualification methodologies as currently practiced. Where issue determination is complete and a good data base has been established, the NRC is acting to revise the relevant rules, regulations or other guidance.

Attachment A

- Should LOCA be simulated by sequential or simultaneous exposure to steam and radiation?
- Can gamma sources adequately simulate effects of beta radiation?
- Is it necessary to include oxygen in LOCA simulation chambers?
- What is an acceptable acceleration method for radiation doses and rates in pre-aging and accident simulations?
- Under what circumstances is the Arrhenius methodology for accelerated thermal aging valid?
- Are mechanical stresses significant in aging of electrical equipment (cables, seals)?
- Are the procedures of IEEE standards for qualifying specific types of electric equipment adequate?
- Can electrical cabinets cope with the environments produced during fires?
- Will adverse fire environments (e.g., suppression agents, smoke, corrosive gases, humidity) damage equipment such that sufficient equipment does not remain free of fire damage?
- Do the spatial separation options of Appendix R and associated exemption requests truly ensure the operability of sufficient safety systems during fire?
- Should barriers, penetration seals, and other barrier elements be tested at positive pressures?
- Should cable tests assess cable functionality, as well as burnability, requirements?
- Should ventilation systems be qualified to handle smoke and other combustible products without jeopardizing cooling functions?

NRC Response (Environmental Qualification of Electrical Equipment)

The first seven issues listed in Attachment A to "Qualification Methodologies Have Shortcomings" are major elements of the scope of work taken from the SNL ongoing Electrical Equipment Qualification Research Program Plan being conducted for the NRC. They represent areas of equipment qualification where an additional understanding and verification of the test procedures is believed to be needed. The SNL equipment qualification research has made significant contributions to our understanding of these issues and has identified the need for improvements to the qualification procedures. Those improvements which have been thoroughly researched are being implemented by NRC by revisions to regulatory guides and used in the licensing review of equipment qualification. However, it has not been demonstrated in the SNL research tests that nuclear plant safety equipment, properly qualified to existing IEEE standards and NRC regulatory requirements, would not perform its safety function.

The qualification methodologies as represented by the national consensus standards must be properly implemented. The NRR review of qualification test programs and IE reviews of test performance and test quality assurance and control programs are being carried out to assure that this is accomplished.

NRC Response (Fire Protection)

The NRC does not require tests to qualify electrical cabinets needed for safe shutdown to fire environments in the same sense as safety related equipment qualification is done for LOCA environments. We do, however, perform reviews to assure that safe shutdown can be achieved when electrical cabinets or other equipment might be exposed to fire environments. The NRC research program will develop test data to assess limitations of equipment and effects on equipment operability and responses under fire related environments to verify these evaluations. The fire related environments to be considered will include suppression agents, smoke, corrosive gases, and humidity. In addition, data to better characterize fire sources and the resulting environments in fire areas will be obtained to give insights into the safety margin provided by spatial separation. Functionality of cables will also be considered.

With regard to the question of whether fire barriers, penetration seals, and other basic elements should be tested at positive pressures, Sandia has performed an extensive research program to evaluate this issue for penetration seals. These tests showed that if the penetration seals contain highly combustible material (in this case urethane foam), or permit communication through cracks or other openings, positive pressure during the test makes a difference in the performance of the seal. The staff requires that approved penetration seals be constructed of non-combustible materials and that they do not permit communication through the seal. Therefore, positive test pressures are not required. Technical specifications require licensees to regularly inspect fire penetrations for cracks which could degrade their performance. When seals are disturbed or removed for other reasons other compensating measures are instituted. If fire doors or fire barriers are subjected to positive pressure during a fire, some smoke and fire will leak to the unexposed side. The research on responses of equipment to fire related environments will lead to additional insights on the importance of such effects.

We agree with Sandia that if ventilation systems are to be designed and proposed for use to handle smoke and other combustible products so as to not jeopardize vital cooling functions, then these must be shown to be capable of performing this intended function. It is the staff's experience, however, that ventilation systems are not usually used in this way. In most cases, the ventilation system is isolated and the staff requires alternative means (e.g., portable blowers) to be available for this function.

2. Design Bases (Acceptance Criteria) Have Shortcomings

SNL Concern

Based on the following examples, we are led to believe that there are some shortcomings in design bases:

A. Qualification test procedures and/or requirements do not always reflect application conditions, such as

   (a) Acceptance criteria for terminal blocks under certain use conditions as identified in SAND83-1965C.

   (b) Acceptance criteria for coaxial and triaxial cables are not documented as related to use conditions as identified in Vendor Inspection Program Docket 99900277.

   (c) Interface conditions during testing do not always reflect use interface conditions. An example is venting of the internals of limit switches during qualification testing (as identified by FRC evaluation of 79-01B submittals p.75 of TER-C5257-532).

B. Type testing reporting does not insure full reporting of all test results. An example was identified in the Vendor Inspection Program participation associated with Docket 99900277.

C. Fire protection guidelines do not specifically require equipment qualification for the environments expected during a fire (e.g., HCl, humidity, sprays).

D. Fire protection guidelines permit the use of spatial separation as a fire protection measure, despite evidence that separation alone may be inadequate to ensure fire safety.

NRC Response (Design Bases Have Shortcomings)

NRR is aware of the concerns expressed by Sandia and they are being addressed in NTOL and OR equipment qualification reviews (ref: SER for Byron/Braidwood, Callaway/Wolf Creek).

Applicants and Licensees in their review must ascertain that the test acceptance criteria is applicable to the end use of the equipment. Specifically:

Item 2A(a) - Insulation resistance and leakage current values are reviewed in the acceptance of terminal block qualification.

Item 2A(b) - If the acceptance criteria are not documented nor reviewed then the equipment (coaxial and triaxial cables) is not properly qualified. The final EQ Rule, NUREG 0588, and R.G. 1.89 (which generally endorse IEEE 323-74) require that the safety-related equipment must perform its safety function. Other regulatory guides covering qualification of specific equipment, for example cables, are daughter guides and are by themselves not adequate to demonstrate qualification. In all cases, the requirements of the Final Rule must be met.

Item 2A(c) - In all licensing reviews the equipment qualification files are audited to assure that the equipment is tested in a manner representative of its installed configuration. IE/Regional inspection activities further ensure consistency between testing and installation configurations.

Item 2B - The staff is aware of concerns about the adequacy of requirements and practices for reporting qualification test failures and is currently considering actions which should be taken to address this issue.

Items 2C and 2D have been addressed in our response to Sandia's first concern ("Qualification Methodologies Have Shortcomings") in the discussion relating to fire protection.

3. Some Inadequate Equipment is in Plants

SNL Concern

Varied evidence indicates inadequate equipment is in plants. This evidence includes the FRC reviews of utility submittals, I&E Information Notices, as well as the Sandia testing experiences. Further evidence has been identified via the NRC Region IV Equipment Qualification Section inspections of industry qualification activities (e.g., Docket No. 99900277/83-01 regarding Rockbestos cables). Other examples are: terminal blocks which can be inadequate in certain applications; D.G. O'Brien connectors; recent tests of EPR cable performance in simultaneous environment; behavior of RTDs and pressure switches. Therefore, since all such equipment has not been removed from plants, they exist and are "inadequate." In all instances, NRC is aware of these test results and action has been taken.

NRC Response

The FRC reviews identified the equipment in operating reactors which have not been demonstrated fully qualified. The percentage of equipment so identified is not a measure of equipment inadequacy. All equipment which has not been shown to be qualified must either be qualified, be replaced by qualifed equipment or be justified for continued operation. The JCOs have addressed the requirements for plant safety.

A number of I&E notifications have identified specific concerns with qualification of some components. The licensee is required to review the notification for applicability and take appropriate action.

NRC is aware of the test failures experienced by the Rockbestos cables cited and an information notice is being prepared. The safety implications have been addressed and it was concluded that an immediate safety problem does not exist.

NRR is aware of the Sandia concerns regarding the items listed as examples:

- Insulation resistance and leakage current values are reviewed in the acceptance of terminal block qualification. IE Information Notice 82-03 which originally notified licensees of this issue will be updated in the near future to further clarify the results of research.

- D.G. O'Brien penetrations, including the connectors referred to by Sandia, have been retested at Wyle Labs by Duke Power Company. These penetrations were certified by Duke Power to have passed the tests.

- EPR Cables tested at Sandia, as a part of the research program, used a saturated steam LOCA profile. The staff has requested additional testing.

- Pressure Switches - Those models that failed were not vendor qualified and are not to be used for safety related functions in applications where they would experience high pressure and steam/spray environments. An IE Information Notice has been issued giving the results of the Sandia tests stating that the models that failed should be replaced with qualified models.

- RTDs - Only one plant has the affected model inside containment. The licensee has provided a JCO. The staff will discuss this item with the licensee in an upcoming meeting.

Pressure

SNL Concern

We perceive that the decision process in the regulatory environment is such that new observations and interpretations cannot be accommodated without simultaneously involving a commitment to initiate a change ("ratchet"). We perceive further that this condition tends to foreclose an adequate understanding of technical issues.

NRC Response

The Commission's 1983 Policy and Planning Guidance to the staff includes the following guidance on the relation between research and NRC regulations:

> "The research resources identified in NRC's budget should be allocated to support a balanced program between supportive research for regulatory needs, research to reinforce or revise the current regulatory base, and conceptual research for improved reactor safety. The staff should be alert to research which shows that we ought to change our regulations. NRC regulations should be changed when research shows them to be either too stringent or not stringent enough."

Although new observations and interpretations evolving from research may result in plant changes or "rachets" in acceptance criteria, additional efforts to understand technical issues are not necessarily foreclosed once licensing decisions are made. There are many examples where related research has continued after significant regulatory decisions were made. Specific examples include the continued research on fire protection after Appendix R was issued, the continued research on equipment qualification after the EQ rule was issued, and the continued research on loss of coolant accident analysis after Appendix K was issued. There may be differing opinions regarding what constitutes an adequate understanding of a technical issue, but further study is never foreclosed whenever a significant safety issue is identified.

The staff will try to assure that Sandia research perspectives and NRC licensing perspectives are mutually understood.

Pressure, not to Impact Previous/Current Licensing Decisions

SNL Concern

Example

- The board notification procedure has a 48-hour notification requirement, upon identification of problems, and a tendency to inhibit in-depth and rational analysis of the information and its implication. This has occurred on terminal block tests, D.G. O'Brien connector tests and EPR cable test results.

NRC Response

Sandia's interest in engaging in an in-depth analysis of identified problems is reasonable. The near-term process followed by the staff in evaluation of new information from research programs involves a rational and sufficiently complete technical analysis to make appropriate decisions regarding the immediate actions to be taken, whether notification of hearing boards or issuance of IE Information Notices. The necessity of rapid notification of hearing boards precludes lengthy deliberations in the initial phase. However, this does not preclude or inhibit development of information necessary to resolve the issue. In fact, most initial board notifications are followed with detailed analyses to resolve the issue and in some cases this process takes many months.

In addition, in each of the cases mentioned by Sandia, additional research or testing has been pursued. Sandia has continued to test and evaluate terminal blocks, and will re-test EPR cables in the near future, and Duke Power has performed follow-on tests of D.G. O'Brien connectors.

The staff believes that what underlies Sandia's concern is the rapidity with which initial decisions must be made and a lack of continuity of Sandia's involvement in the complete resolution process, including decisions about follow-on activities. On this basis, the staff will make special efforts to keep Sandia informed and to call on them for participation as appropriate in future deliberations regarding new information they have provided.

Pressure to Resolve the Problem Today

SNL Concern

Pressure related to the resolution of issues related to severe accidents has been quite high. The NRC has taken steps which have resolved the issue.

NRC Response

This issue apparently resulted from NRC requests that Sandia perform rapid turn-around reviews of analyses of severe accidents performed by industry (IDCOR). The schedules for these reviews have been relaxed. It has been agreed that this issue is not related to the subject of equipment qualification.

Pressure to Control External Interactions

SNL Concerns

Sandia is subjected to NRC control of the timing and distribution of reports in the severe accident area which fall under international cooperative funding agreements. It is Sandia's opinion that this inhibits the free exchange of information which in turn reduces the opportunity for peer review and the related checks on the quality of the results.

Sandia and other laboratories have work statements from NRC containing directions to have all travel plans pre-approved by the NRC sponsor. Sandia and other laboratories feel that this control should only be present if it is used and that use of this control is detrimental to the efficient conduct of its work.

NRC Response (External Interactions)

This issue is to be the subject of a further discussion within the NRC.

NRC Response (Travel)

The decision to have travel pre-approved by the NRC program manager is the prerogative of the cognizant NRC organization. For most of the research programs related to equipment qualification research at Sandia, such pre-approval has not been required; when the practice has been implemented, it has not resulted in disapproval of any travel requests. We believe that NRC's limited practice of travel pre-approval has not had any adverse impact on the quality of research carried out by Sandia or on plant safety as related to equipment qualification. Pre-approval of travel by NRC is not meant to inhibit research or information exchange. We will discuss Sandia's concerns in this area further to try to arrive at a mutually satisfactory resolution.