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Mr. Andrew J. Szukiewicz
Instrument and Control Systems Branch
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Szukiewicz:

In the Federal Register notice of January 16, 1980, (45 FR 3124) the NRC requested comments on NUREG-0588, Interim Staff Position on Environmental Qualification of Safety-related Electrical Equipment. Enclosed are comments submitted by the Atomic Industrial Forum's Committee on Power Plant Design, Construction and Operation. In general, we believe that:

- The idea of a comprehensive programmatic approach to equipment qualification is a good one as long as it recognizes the impact of applying the "state-of-the-art" technology to the older plants. We note that this NUREG is incorporated into IE Bulletin 79-01B by reference as "Supplemental information to be used" with 79-01B guidelines. The final draft of NUREG-0588 should recognize this fact and also explain that additional tests or replacements of equipment are required only subject to a NRC finding that substantial additional protection required for the public health and safety is provided.

- The "systems analysis method" reflected in IE Bulletin 79-01B would be of benefit in this document also; i.e., the thrust of qualification of equipment for a given event is to that equipment, exposed to a harsh environment, that must operate to restore the plant to a safe condition.

- Treatment of environmental qualification related to high energy line breaks outside containment needs to be defined independently of pipe break inside containment. This distinction must be made both from a criteria and an analytical standpoint.

In addition, we believe that the introduction to NUREG-0588 should stress the fact that the document is an attempted resolution of the LOCA/Regulatory Guide 1.89 issue. If NUREG-0588 is adopted as the new revision to R.G. 1.89, then we believe that industry should also have an opportunity to comment on this revision of the Regulatory Guide. Other source terms that may result from future post-TMI studies should be addressed separately as to their likelihood and consequences.

Mr. Andrew J. Szukiewicz

Enclosed are additional general and specific comments on NUREG-0588. If you have any questions we would be pleased to discuss them with you.

Sincerely,

STEPHEN H. HOWELL, Chairman
Committee on Power Plant Design,
Construction & Operation

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Enclosure

COMMENTS ON INTERIM STAFF POSTION ON
ENVIRONMENTAL QUALIFICATION OF SAFETY-RELATED
(CATEGORY I/CATEGORY II REQUIREMENTS TABULATION)

General Comments

1. There are a number of substantially completed plants that will be affected by NUREG-0588, from those with construction activities well advanced to those in the "near term operating license" category. Changes in qualification and documentation requirements have significant cost and schedule impacts on such plants. We strongly question the benefit of across-the-board application of the document in its current form, especially in regard to plants committed to meeting IEEE 323-1971 (Category II). These plants are currently being handled on a case-by-case basis in this area, as is appropriate. Changes in requirements should only be made where there is demonstrable significant additional protection of public health and safety.

   The IREP program should provide stong indications of particular areas where improved reliability may be required, and these areas should be given attention. The February 5, 1980, NRC letter (from D.F. Ross) discussing NUREG-0588 appears to have a substantial measure of a "common-sense" approach, more of which should be reflected in the NUREG itself.

2. There is a significant lack of evidence of consideration of the "systems analysis method" required in the guidelines accompanying IE Bulletin 79-01B. This is especially notable in the treatment of high energy line breaks (HELB) outside containment. The words in the introduction to the NUREG indicate that all equipment is required to meet the worst environments resulting from all events. The NRC Branch Technical Position on HELB outside containment clearly indicates that only that equipment required to mitigate the HELB, that is to achieve safe plant shutdown, is required to be qualified to the HELB environment. The introduction and the body of the NUREG (e.g. paragraphs 1 and 2 of Section 1.5) should be revised accordingly. We suggest the Supplement to IE Bulletin 79-01B provides some clarification in this area.

3. Along the lines indicated in 1. above, analytical approaches to determine HELB environment should be clearly identified. HELB outside containment, in some cases, is calculated in a different manner from HELB inside containment. Longer time frames and multi-compartment steam migration can be considered, and, accordingly, different computer codes are often used.

Specific Comments

Section 1.2(5)(b)and(c)

This section indicates that if the calculated surface temperature exceeds the qualification temperature, the component must be requalified or protection must be provided. The qualification temperature should be that which applies to the critical part of the component and not the surface temperature of the component. The peak surface temperature may exceed the required qualification temperature but the component would still function correctly. Furthermore, time-at-temperature is an important consideration which should be factored into any qualification evaluations.

Section 1.4

The concept of a qualified life is not a requirement for Category II plants.

It is not clear whether the Category I subparagraphs apply to Caregory II.

Section 1.4(1)

The requirement to assume an instantaneous, non-mechanistic release of activity from the fuel is inconsistent with the time-dependent, mechanistic approach required for radioactivity redistribution analyses in containment and auxiliary building volumes. As briefly discussed in Appendix D to NUREG-0583, any core damage and subsequent release of activity will require a significant amount of time which would depend

on the accident scenario. Since this NUREG is establishing more realistic and rational bases for estimating radioactivity levels after release from the fuel the same approach should be applied to fuel releases themselves. This time dependent fuel release fraction is particularly significant for equipment which is required to function for only a short time following a LOCA/MSLB. Enforcement of this requirement will cause significant equipment replacement for Category II plants. We do not believe enforcement of this position can be defended on a cost/benefit basis.

Section 1.4(7)

The argument given in Section 1.4(9) for reducing, by a factor of at least 2, the beta dose for qualification of cables arranged in trays based on localized or self shielding effects can be extended to other components. Any exposed components will be sufficiently massive to attenuate beta radiation from the containment atmosphere on the opposite side. Hence, the beta dose at the surface of unshielded equipment should, in general, be half the beta dose calculated at the containment center.

Section 1.4(12)

Inclusion of equipment qualification testing for equipment with radiation doses below 10^4 Rads would require substantial expenditures of time and money for qualification testing.

with no corresponding benefit to health and safety. Of the general classes of materials or components (organic compounds, ceramics, metallics, electronic components), only organic compounds and electronic components are susceptible to damage from moderate amounts of gamma or beta radiations. Numerous studies have compiled radiation effects data on all the classes of organic compounds and show that the least radiation resistant compounds have damage thresholds greater than 10^4 Rads and would remain functional with exposures substantially above the threshold value. Thus, for organic materials, an exposure level of 10^4 Rads is a reasonable threshold value below which proper qualification is assured without adding the substantial costs of testing.

For electronic components, studies have shown failures of metal-oxide-semi-conductor devices at 3.5×10^3 Rads. Therefore, a lower minimum qualification value should be assigned probably in the range of 1×10^3 Rads. This would also provide adequate margin for safety without an unreasonable qualification test requirement.

o Section 1.5(2)(3)

For equipment not subject to a design basis accident environment, documentation of environmental qualification to the limits of normal and abnormal environments was not required for plants committed to IEEE 323-1971. Rather, equipment specifications included such environmental limits to be considered in the design and purchase of the equipment. A

requirement to document qualification by test or analysis would constitute a major impact for Category II plants.

- Section 2.1(3)(b)

  The words "qualified by test" should read "qualified by test or analysis". Otherwise, the testing program would expand considerably to no apparent benefit, especially for nonsafety-related materials and equipment.

- Section 2.1(3)(c)

  The word "qualified" in this section presents problems. We do not "qualify" non-Class 1E equipment. We recommend deletion of both paragraphs of this section as, otherwise, we may have to obtain documentation for items of no safety significance.

- Section 2.2(1)

  It has not always been practicable to determine failure criteria prior to testing of Category II equipment.

- Section 2.2(2)

  Margin was not part of IEEE-323-1971 test requirements. Therefore, this requirement should be deleted for Category II.

- Section 2.2(5)

  Full duration testing for extended periods of submergence is impractical and unnecessary. Short duration testing to demonstrate seal integrity plus an assessment of potential corrosion mechanisms, by test or analysis, is adequate.

- Section 2.2(6)

  Refer to the comment on Section 1.2(5)(c) above.

- Section 2.2(9)

  This is only applicable when the design range of voltage and frequency is significant. For Class 1E devices fed from a stabilized power source such a demonstration is unnecessary.

- Section 2.3(1)

  IEEE Standard 323-1974 permits deviations from the recommended test sequence provided there is adequate justification.

- Section 2.3(4)

  Separate effects testing may have been done on penetrations, etc. It may be very difficult to retest such equipment. This requirement should be revised to a "best efforts" basis.

- Section 3.(4)

  Implementation of this requirement will negate extensive qualification testing already completed by industry and, furthermore, will severely impact qualification test schedules established for the lead plants committed to IEEE 323-1974. As a minimum, a review of equipment capability to meet these revised requirements will be necessary prior to embarking on an expensive test program and, at worst, an equipment development program may be required to meet this arbitrarily imposed functional requirement. Tests and analyses of Category II equipment in some cases did not include a requirement to remain functional for at least an hour longer than assumed in the accident analysis.

This requirement should be considered on a case-by-case basis, especially for such items as isolation valves.

- Section 4.(2)

For Category II equipment, indintificaiton of mateirials susceptible to aging would require a long list compiled from literature of test data. Also, each manufacturere uses his own formulation and may be reluctant to release information. Going back to manufacturer, and particularly their sub-suppliers, of equipment delivered several years ago will be extremely time-consuming and probably inconclusive. The benefits, in the form of improvement in safety, do not appear to be commensurate with the potential effort required.

- Section 4.(3)

This position on synergistic effects implies that every qualification report must include doncuemtation to show that synergistic effects were investigated or that st lease a document search was conducted. This is an artificial requirement. Synergistic effects are not "testing" parameters but are the subject of research projects. Even the existence of synergistic effects is questionable depending on how the data is evaluated in the limited research conducted thus far.

This position should be dropped or at least modified to say that synergistic effects need only be addressed where they have been indentified. The following rewrite of this paragraph is recommended:

> "Synergistic effects should be considered in accelerated aging. Synergistic effects need only be addressed, however, if known synergistic effects exist for the materials of concern. See NUREG/CR-0276 (SAND 78-0799) and NUREG /DR-0401 (SAND 78-1452), "Qualification Testing Evaluation Quarterly Reports."

APPENDICES

APPENDIX A: METHODS FOR CALCULATING MASS AND ENERGY RELEASE

General

The acceptable methods referred to in Appendix A are all used for PBIC analysis of DBA LOCAs with ECCS. These may not be reasonable for equipment qualification purposes, especially outside containment.

APPENDIX B: MODEL FOR ENVIRONMENTAL QUALIFICATION FOR LOSS-OF-COOLANT ACCIDENT AND MAIN STEAM LINE BREAK INSIDE PWR AND BWR DRY TYPE OF CONTAINMENT

Note: By reference, NUREG-0588 applies this section to PBOC, also.

Section 1.a -- Heat Transfer Coefficient

When the containment is superheated and $T_s > T_w$, both convective and condensing heat transfer act simultaneously. The convective heat transfer driving potential is the temperature difference between T_v and T_s and the condensing heat transfer driving potential is the temperature difference between T_s and T_w.

Section 2.b -- Convective Heat Transfer

The velocity equation used in this section is overly conservative. If applied as is, it may yield velocities of several hundred feet per second or more in all areas of the containment. While these high velocities may exist in the region very near the pipebreak, they are unreasonably high for remote areas of

the containment. This equation does not consider the effects of containment geometry which will affect the convective velocity. Certainly, in the case of PBOC, where the compartment being analyzed is downstream from the break compartment, these velocities are inappropriate. The option should be allowed to calculate velocities for components on a case-by-case basis.

APPENDIX D: SAMPLE CALCULATION AND THE METHODOLOGY FOR RADIATION QUALIFICATION DOSE

Section 7

The handling of daughter products by a simple multiplication factor of 1.3 is not a rigorous approach for a contribution of such magnitude. The emphasis in this improved NUREG has been on mechanistic and analytical treatment in such areas as activity redistribution and spray removal. Therefore, explicit treatment of daughter products should be included.

Section 7a

For beta radiation, the shielding effects of the humidity in the containment atmosphere (i.e., a density greater than that of dry air) can be significant in reducing doses, particularly during steam release and containment spray periods. Credit for these effects should be explicitly allowed.

Section 7b

It is stated that the gamma dose for coatings due to plateout is negligible because the absorbed dose in the coatings is small. Since the purpose of the model in Appendix D is to determine the radiation environment to which the coatings should be subjected in qualification tests rather than the

absorbed dose in the coatings, the gamma dose in Rads (C) or Rads (air) should be determined on the basis of the total dose due to both airborne and plated out sources at the surface of the coatings.