UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D. C. 20555

R-0915

February 10, 1981

The Honorable John F. Ahearne
Chairman
U. S. Nuclear Regulatory Commission
Washington, DC 20555

SUBJECT: ACRS REPORT ON REQUIREMENTS FOR NEAR-TERM CONSTRUCTION PERMITS AND MANUFACTURING LICENSES

Dear Dr. Ahearne:

During its 250th meeting, February 5-7, 1981, the ACRS again reviewed the status of requirements for near-term construction permits (NTCPs) and manufacturing licenses (MLs). The Committee reported to you previously on this subject in letters dated May 6, 1980 and January 12, 1981. In the present review we had the benefit of a Subcommittee meeting on February 4, 1981 and of discussions with members of the NRC Staff and representatives of the Houston Lighting and Power Company, Offshore Power Systems, Boston Edison Company, and the General Electric Company.

In our letter dated January 12, 1981, we agreed with the general position outlined by Harold Denton to the ACRS but recommended that a decision be deferred while the NRC Staff better defined its proposal and the Houston Lighting and Power Company was provided an opportunity to present the results of their study of the merits of possible preventive and mitigative design features for the proposed Allens Creek boiling water reactor.

During the 250th ACRS meeting, the NRC Staff presented the attached proposed position regarding requirements for NTCP and ML applicants. We have the following comments on these proposed requirements:

Item 1 - Site/plant specific probabilistic risk analysis

The current NRC Staff position is similar to the Staff position of January 9, 1981 which the ACRS supported. The new position on reliability engineering is more specific in that it would require the applicant to submit the risk assessment within two years after issuance of the construction permit and call for an NRC review at that time to determine possible requirements for preventive and mitigative actions. The criteria which would be used in this selection process have not been specified nor are they easily specified at this time. The Committee suggests that the Commission consider stating as an aim the seeking of such improvements in the reliability of core and containment heat removal systems as are significant and practical and do not impact excessively on the plant, with the intent of encouraging each applicant to take those steps which are in harmony with such an aim.

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Item 2 - Dedicated penetration for possible installation of systems to prevent containment failure

This is identical to the Staff position discussed in January and has the support of the ACRS.

Items 3 and 4 - Hydrogen control measures and containment strengthening requirements

These represent a modified statement of the position proposed by Harold Denton in January to strengthen relatively low-design pressure containments against internal pressure as practical, within the existing design concept and without excessive impact. Items 3 and 4 require hydrogen control measures and pose some specific requirements with regard to minimum internal pressure capability. The ACRS believes that the NRC Staff approach in this regard is acceptable. However, while the ACRS wishes to encourage applicants to provide containment strengthening of the type proposed in Item 4 a., we believe that, if proposed by any of the applicants, modest deviations from the specific requirements should be considered on their merits.

In a letter to you dated September 8, 1980 providing additional comments on hydrogen control and improvement of containment capability, the ACRS stated its belief that each licensee should be required to perform design studies of possible hydrogen control and filtered venting systems which have the potential for mitigation of accidents involving large scale core damage or core melting, including an estimate of the cost, the possible schedule, and the potential for reduction in risk. The Committee believes that such studies should also be made by NTCP and ML plants during construction and that the final choice of hydrogen control system for each plant should be made with the benefit of such broader studies.

Sincerely,

J. Carson Mark

J. Carson Mark
Chairman

Attachment:
Staff Position With Regard to NTCP Requirements With Respect to Degraded Core Rulemaking, dated 2/6/81

STAFF POSITION WITH REGARD TO NEAR-TERM CONSTRUCTION PERMIT REQUIREMENTS WITH RESPECT TO DEGRADED CORE RULEMAKING - FEBRUARY 6, 1981

1. Applicants shall commit to performing a site/plant-specific probabilistic risk assessment and incorporating the results of the assessment into the design of the facility. The commitment must include a program plan, acceptable to the Staff, that demonstrates how the risk assessment program will be scheduled so as to influence system designs as they are being developed. The assessment shall be completed and submitted to NRC within two years of issuance of the construction permit. The outcome of this study and the NRC review of it will be a determination of specific preventive and mitigative actions to be implemented to reduce these risks. A prevention feature that must be considered is an additional decay heat removal system whose functional requirements and criteria would be derived from the probabilistic risk assessment study.

2. In order not to preclude the installation of systems to prevent containment failure, such as a filtered vented containment system, the containment design shall include provisions for one or more dedicated penetrations, equivalent in size to a single three foot diameter opening.

3. Hydrogen control measures shall be provided.

4. Applicants shall provide preliminary design information at a level consistent with that normally required at the construction permit stage of review sufficient to demonstrate that:

   a. Containment integrity will be maintained (i.e., for steel containments, ASME Service Level C based on ASME code specified minimum yield values and considering pressure and dead load alone. For concrete containments, an equivalent approach based on ASME Div. 2) during an accident that releases hydrogen generated from 100% fuel clad metal-water reaction accompanied by either hydrogen burning or the added pressure from post-accident inerting assuming carbon-dioxide is the inerting agent depending upon which option is chosen for control of hydrogen. As a minimum, for steel containments ASME Service Level C (based on ASME Code specified minimum yield values and considering pressure and dead load alone) will not be exceeded at an internal pressure of 45 psig. For reinforced concrete containment structures, an equivalent standard based on ASME Division 2 is satisfied at the same internal pressure. Systems necessary to ensure containment integrity shall also be demonstrated to perform their function under these conditions.

b. The containment and associated systems will provide reasonable assurance that uniformly distributed hydrogen concentrations do not exceed 10% associated with an accident that releases hydrogen generated from 100% fuel clad metal-water reaction, or that the post-accident atmosphere will not support hydrogen combustion.

c. The facility design will provide reasonable assurance that, based on a 100% fuel clad metal-water reaction, combustible concentrations of hydrogen will not collect in areas where unintended combustion or detonation could cause loss of containment integrity or loss of appropriate mitigating features.

d. If the option chosen for hydrogen control is post-accident inerting:

   (1) Containment structure loadings produced by an inadvertent full inerting (assuming carbon dioxide) but not including seismic or design basis accident loadings, will not produce stresses in excess of the acceptable maximum for Service Level A specified in ASME Code Section III, Subsection NE (ASME Div. 2 for concrete containments).

   (2) A pressure test of the containment at 1.15 times the pressure calculated to result from carbon dioxide inerting can be safely conducted.

   (3) Inadvertent full inerting of the containment can be safely accommodated during plant operation and demonstrated by test.