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

February 19, 1993

The Honorable Ivan Selin
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Chairman Selin:

SUBJECT: ISSUES PERTAINING TO THE ADVANCED REACTOR (PRISM, MHTGR, AND PIUS) AND CANDU 3 DESIGNS AND THEIR RELATIONSHIP TO CURRENT REGULATORY REQUIREMENTS

During the 393rd and 394th meetings of the Advisory Committee on Reactor Safeguards, January 7-8 and February 11-13, 1993, we reviewed a draft Commission paper on the cited subject. Our Subcommittee on Advanced Reactor Designs also met on January 6, 1993, to discuss this matter. We had the benefit of discussions with representatives of the NRC staff, the Department of Energy, and the preapplicants: Atomic Energy of Canada, Limited, Technologies (AECLT), General Electric Nuclear Energy (GE), and General Atomics (GA). We also had the benefit of the referenced documents.

The draft Commission paper lists ten issues that need policy direction from the Commission for proposed deviations from existing regulations. These deviations arise either because existing regulations are generally specific to light water reactors (LWRs), or because the criteria proposed by the designers of the four reactor types listed are significantly different from those in the existing regulations. The draft paper also classified these ten issues into two categories: (1) those issues for which the staff agrees that departures from current regulations should be considered and (2) those issues for which the staff does not believe a departure from current regulations is warranted at this time. Not all of these issues are relevant to each reactor type; the draft paper contains a matrix identifying plant applicability. The paper contains some general comments and recommendations, as well as specific comments and recommendations on each of the ten issues.

Everything we say is predicated on our understanding of the applicable safety policies, which we would describe as follows:

- The safety objective for the nuclear enterprise was described in the 1986 Policy Statement on Safety Goals, and has not been rescinded. There is no distinction drawn in there between existing plants and new plants.

- The ACRS has recommended that the principal use of the goals be to judge the effectiveness of the entire enterprise, including regulation, in producing a plant population consistent with the goals. The Commission has never rejected that view.

- If the industry chooses to do better, we can only applaud its zeal, but ought not to stifle initiative by transforming initiatives into requirements.

Our views on the various items in the referenced draft paper are given below.

GENERAL COMMENTS

1. We find that the identified issues are important and that the staff should receive guidance from the Commission. (There are other policy issues affecting these reactor designs that are being addressed in connection with the evolutionary and passive LWR designs.) There may well be additional policy issues that appear during the preapplication review process. The staff has committed to identify any such issues in subsequent Commission papers.

2. The staff has grouped these ten issues into the two categories described above. We note that all of the affected preapplicants who appeared before us would treat Issue I (Control Room and Remote Shutdown Area Design) as a Category 1 issue, whereas the staff proposes it as a Category 2 issue. We will discuss this difference of opinion below in our opinion on Issue I.

3. For Category 1 issues, the staff proposes more conservative alternatives than the preapplicants propose, in order to account for uncertainties associated with the conceptual design. We are concerned that such an approach might well freeze an unnecessarily large degree of conservatism into the designs, and the preapplicants would have great difficulty persuading the staff to relax this conservatism on the basis of more precise information available in the final design.

4. We support the staff recommendation that "a prototype CANDU 3 is not required for design certification."

5. We support the staff intention to notify the Commission if its position on any of these ten issues should change, or if new issues are identified.

6. We have no objection to the staff recommendation that the highest priority be given to issues that are applicable to the PRISM design.

7. We understand and sympathize with the staff recommendation to defer decisions on generic rulemaking on these ten issues. Nevertheless, we urge the Commission to address these decisions in the near future. (The generic rulemaking question may arise in connection with passive LWR designs.)

8. In several places in the draft Commission paper, there occurs qualitative language, e.g., "appropriate conservatisms" or "credible severe accidents." This language must ultimately be translated into quantitative guidance. We believe that the quantitative guidance is, to a large measure, policymaking, and should not be relegated to low-level reviewers.

SPECIFIC COMMENTS

Category 1 Issues

A. Accident Evaluation

The staff proposal to develop a single approach with certain specified characteristics appears reasonable. We would like to review that approach when it is ready. We believe, however, that the staff should identify at an early stage quantitative guidelines and criteria for accident selection and evaluation. We note that AECL has taken exception to some of the statements in the draft Commission paper that relate to its approach to this issue. We believe that this disagreement can be resolved by AECL and the staff.

B. Source Term

The staff proposal to base the source terms on mechanistic analyses appears reasonable, although it is clear that the present data base will need to be expanded. We note that the staff is now developing for LWRs a revision to the TID-14844 source term. It will be appropriate for the staff to consider using the newer approach when it develops source terms, and to take specific account of the unique features of each of the reactor types.

C. Containment

The staff proposal "to postulate a core damage accident as a containment challenge ..." appears reasonable. We would like to review the list of postulated accidents when it is ready.

D. Emergency Planning

The staff proposes that advanced reactor licensees be required to develop offsite emergency plans which will include a requirement for onsite and offsite exercises. This proposal appears reasonable under the present circumstances, except that we would follow existing LWR guidance that permits the omission of offsite exercises when it can be shown that the design would preclude any accidental release exceeding the EPA Protective Action Guides. The staff has agreed to consider, after a review of Accident Evaluation (Issue A, above), whether some relaxation from current requirements may be appropriate. We urge that work on Issue D be closely correlated with work on Issues A and B, in order to avoid unnecessary conservatism.

E. Reactivity Control System

The staff proposal that the absence of control rods need not disqualify a reactor design, provided that an applicant can show a level of safety in reactor control equivalent to that of a traditional rodded system, appears reasonable. We note that this issue is applicable only to the PIUS concept, and that we have not yet had the benefit of presentations by the PIUS designers.

F. Operator Staffing and Function

The staff intends to review the justification for a smaller crew size by evaluating the function and task analyses for normal operation and accident management. This intention appears reasonable, although we believe that particular attention needs to be given to multiple module designs. We note that this issue is related to a similar issue for passive reactors. We believe that the Commission policy should be the same for the advanced reactors and CANDU 3 as it is for the passive reactors.

G. Residual Heat Removal

The staff belief that reliance on a single, completely passive, safety-related residual heat removal (RHR) system may be acceptable appears reasonable, although we would have liked to see the criteria to be used by the staff in deciding acceptability. We agree with the staff that NRC regulatory treatment of non-safety-related backup RHR systems for these reactors should be consistent with design requirements (not yet identified) for passive LWRs.

H. Positive Void Reactivity Coefficient

We agree with the staff that the existence of a positive void reactivity coefficient is a significant concern, but that it should not necessarily disqualify a reactor design. The burden of showing that the consequences of those accidents that would be aggravated by a positive void reactivity coefficient are either acceptable or could be satisfactorily mitigated by other design features surely falls on the preapplicant. On the other hand, the staff should state the criteria it will use to judge "acceptable" or "satisfactorily."

Category 2 Issues

I. Control Room and Remote Shutdown Area Design

We do not agree with the staff decision to treat this issue as a Category 2 issue, and the concomitant recommendation to apply current LWR regulations and guidance until passive LWR policy in this area is finalized. We believe that this issue should be a Category 1 issue, and that the preapplicants should accept the burden of convincing the staff that a proposed design is satisfactory, according to some criteria that should be specified by the staff.

J. Safety Classification of Structures, Systems, and Components

This issue is relevant only to the MHTGR concept. GA makes a persuasive case that the MHTGR is sufficiently different that the LWR criteria for identification of safety-related structures, systems, and components should not arbitrarily be applied to the MHTGR. We concur with this view and believe that Issue J should also be classified as a Category 1 issue. This would not preclude coordination of the policy for passive reactors with the policy for the MHTGR.

Our interest in all these matters continues. We would like an opportunity to review any significant change in staff or preapplicants position, as well as any significant developments in the implementation of the policies.

Dr. Thomas S. Kress did not participate in the Committee's deliberations regarding issues related to the MHTGR.

Sincerely,

Paul Shewmon

Paul Shewmon
Chairman

References:

1. Memorandum dated December 2, 1992, from James M. Taylor, Executive Director for Operations, NRC, for the Commission, transmitting Advance Information Copy of Forthcoming Commission Paper - Issues Pertaining to the Advanced Reactor (PRISM, MHTGR, and PIUS) and CANDU 3 Designs and Their Relationship to Current Regulatory Requirements
2. Letter dated January 28, 1993, from David P. Hoffman, Gas-Cooled Reactor Associates, Management Committee, for D. M. Crutchfield, Office of Nuclear Reactor Regulation, NRC, Subject: Commission Papers on Policy Issues Concerning the Preapplication Reviews of Advanced Reactors
3. Letter dated January 25, 1993, from Peter M. Williams, Department of Energy, to J. Donohew, Office of Nuclear Reactor Regulation, NRC, commenting on the draft Commission Paper
4. Letter dated January 25, 1993, from N. Grossman, Department of Energy, to S. Sands, Office of Nuclear Reactor Regulation, NRC, Subject: Commission Papers on Policy Issues and Schedules Concerning the Preapplication Reviews of Advanced Reactor and CANDU 3 Designs