ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
UNITED STATES ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

May 10, 1972

Honorable James R. Schlesinger
Chairman
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Dr. Schlesinger:

The ACRS has provided comments to the Director of Regulation regarding a proposed position for protection against anticipated transients without scram. These comments are based on discussions during several ACRS meetings and twelve meetings of ACRS generic Subcommittees as well as discussions with reactor vendors during various project reviews since February, 1969.

A copy of this letter is attached for your information.

Sincerely yours,

/s/
C. P. Siess
Chairman

Attachment:
Letter from C. P. Siess to
L. Manning Muntzing

cc: L. Manning Muntzing, DR

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
UNITED STATES ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

May 10, 1972

Mr. L. Manning Muntzing
Director of Regulation
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Muntzing:

Your letter of April 28, 1972, describes requirements for protection against anticipated transients without scram (ATWS) which the Regulatory Staff plans to impose on applicants for construction permits, and notes that ACRS comments on the proposed requirements received soon after the ACRS May meeting would be timely. The Committee wishes to make the following comments.

I. The ACRS recognizes ATWS as a low probability event. Nevertheless, it believes that, in consideration of the large number of water-cooled power reactors expected eventually to be in operation, and in view of the expected occurrence rate of anticipated transients (collectively, on the order of one per reactor per year), experience with scram systems of current design is insufficient to give assurance of an adequately low probability of occurrence of an ATWS event of possibly serious consequence. Accordingly, the Committee agrees with the intent of the ATWS position recommended, viz:

> "Applicants should be required to: (1) demonstrate that with their present designs the consequences of anticipated transients without scram (ATWS) are acceptable, or (2) make design changes which render the consequences of anticipated transients without scram acceptable, or (3) make design changes to improve significantly the reliability of the scram system."

II. The Committee has the following comments on the criteria proposed to be used in implementation of the basic position.

A. In respect to the proposed definition of "acceptable consequences" for implelemtation of either option 1 or option 2:

> 1. Concerning radiological consequences, we agree with the proposed condition: "The radiological consequences shall be within the guideline values set forth in 10 CFR Part 100".

2. Concerning primary system pressure:

a. We agree with the intent of the proposed condition: "The transient pressure shall be limited to less than that resulting in a maximum stress anywhere in the reactor coolant pressure boundary of the 'emergency conditions' as defined in the ASME Section III Nuclear Power Plant Components Code". However, we believe the wording should be changed so as to read along the following lines: "The transient pressure shall not be greater than that which results in reactor coolant pressure boundary stress conditions corresponding to those of 'emergency conditions' as defined in ASME Section III Nuclear Power Plant Components, 1971". We believe it should be noted that the intent of this provision is to obviate the need to consider a loss-of-coolant accident (LOCA) in conjunction with an ATWS event.

b. We agree with the intent of the proposed condition as expressed in the first sentence: "The transient pressure shall not exceed a value for which test and/or analysis demonstrate that there is no substantial safety problem with the fuel". However, we recommend that the second sentence be deleted.

3. Concerning fuel thermal and hydraulic effects:

a. The Committee believes that the proposed limit on enthalpy of the peak pellet of 280 calories per gram should not be adopted at this time. A single limit for all cases may not even be desirable. It is recommended that the criterion be changed to indicate that, in an ATWS involving a power excursion, the effects of rapid increase in fuel enthalpy shall not result in significant cladding degradation or in significant melting of fuel even in the hottest fuel zones.

b. We agree with the intent of the proposed condition: "A calculated initial heat flux event will not be acceptable unless the peak cladding temperature can be shown not to result in significant cladding degradation".

4. Concerning containment conditions, we agree with the intent of the proposed condition: "Calculated containment pressure shall not exceed the design pressure of the containment structure. Equipment which is located within the containment and which is relied upon to mitigate the consequences of ATWS shall be qualified by testing in the combined pressure, temperature and humidity environment conservatively predicted to occur during the course of the event".

B. We agree with the intent of the proposed requirement B:

"Any modifications made to comply with option 2 of the recommended position shall be shown not to result in violations of safety criteria for steady state, transient, or accident conditions and shall not substantially affect the operation of safety related systems."

C. We agree with the intent of the proposed requirement C:

"Design changes to make the consequences of ATWS acceptable should not rely on equipment or system designs which have a failure mode common with the scram system. The equipment involved in the design change shall, to the extent practical, operate on a different principle from equipment in the scram system. As an absolute mimimum, the equipment relied on to render acceptable the consequences of the ATWS event shall not include equipment identical to equipment in the associated scram system."

D. We agree with the intent of the proposed requirement D:

"Improvements must reduce considerably the potential for common mode failure of the scram system. Failures of identical equipment from a common mode should not disable sensing circuits, logic, actuator circuits or control rods to the extent that scram is ineffective. The addition of a separate protection system utilizing principles diverse from the primary protection system is indicated in order to meet this requirement."

III. In addition to the above comments on the proposed requirements, the Committee makes the following recommendations:

A. In any announcement of the basic position recommended, as well as in its implementation, care should be taken to make clear the fact that availability of options 1 and 2 is not to be construed as prejudicing in any way the importance of continuing effort to improve existing scram systems to the extent practical, irrespective of ATWS considerations.

B. As indicated in your letter, Regulatory Staff studies are continuing for the purpose of developing lists of transients to be considered, assumptions to be used, and acceptable evaluation models. We recommend that this effort be accelerated to the extent practical, in order that a maximum of guidance be available to the applicants upon commencement of implementation. It is also recommended that the list of transients to be treated be described as a minimum but not necessarily sufficient list, with the applicant responsible for identifying all relevant transients.

C. The Committee recommends that the proposed position, modified as above, also be implemented on a reasonable time scale in respect to those water-cooled power reactors under construction for which the ACRS letter and the Regulatory Staff safety evaluation associated with the construction permit identified the ATWS problem. The Committee assumes that, in due course, the Regulatory Staff will propose an appropriate course of action in connection with earlier plants.

IV. The Committee intends to continue working closely with the Regulatory Staff in the further study and development of criteria and procedures to be applied in the ATWS area.

Sincerely yours,

/s/

C. P. Siess
Chairman