



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

ACRSR-1388
PDR

February 15, 1990

The Honorable J. Danforth Quayle
President of the United States Senate
Washington, D.C. 20510

Dear Mr. President:

In accordance with the requirements of Section 29 of the Atomic Energy Act of 1954, as amended by Section 5 of Public Law 95-209, the Advisory Committee on Reactor Safeguards has reported each year to the Congress on the Safety Research Program of the Nuclear Regulatory Commission.

In our December 18, 1986 letter to the Congress, we proposed to provide more focused reports on specific research issues rather than one all-inclusive annual report. The Commission agreed with our suggestion, and then NRC Chairman Zech submitted a legislative proposal in the form of a draft bill to the 100th Congress on December 2, 1987 to amend Section 29 of the Atomic Energy Act of 1954 to accomplish this. Since the 100th Congress did not act on this matter, he submitted a similar, but somewhat modified, legislative proposal on February 2, 1989 to the 101st Congress for consideration. We expect that the Congress will consider this matter during this year.

In the past year we have reviewed the NRC safety research program and other closely related matters in the following areas:

- Accident Management Strategies
- Application of Leak-Before-Break Technology
- Containment Performance
- Containment Structural Integrity
- Embrittlement of Reactor Pressure Vessel Supports
- Fire Risk Scoping Study
- Human Factors Research Program Plan

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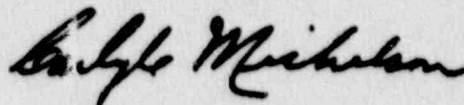
February 15, 1990

- Inservice Inspection of Boiling Water Reactor Pressure Vessels
- Occupational Radiation Exposure to Skin from Hot Particles
- Piping Integrity
- Severe Accident Research Program Plan
- Thermal-Hydraulic Phenomena.

We have provided reports to the Commission on several of the matters mentioned above and copies of these reports are attached.

We expect to continue to review various elements of the NRC Safety Research Program and provide reports to the Commission as warranted.

Sincerely,



Carlyle Michelson
Chairman

Attachments:

1. Report from Forrest J. Remick, ACRS Chairman, to Lando W. Zech, U.S. NRC Chairman, Subject: Additional Applications of Leak-Before-Break Technology, March 14, 1989
2. Report from Forrest J. Remick, ACRS Chairman, to Lando W. Zech, U.S. NRC Chairman, Subject: Proposed Severe Accident Research Program Plan, March 15, 1989
3. Report from Forrest J. Remick, ACRS Chairman, to Lando W. Zech, U.S. NRC Chairman, Subject: NRC's Human Factors Programs and Initiatives, May 9, 1989
4. Report from Forrest J. Remick, ACRS Chairman, to Lando W. Zech, U.S. NRC Chairman, Subject: NUREG-1150, "Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants," May 9, 1989
5. Report from Forrest J. Remick, ACRS Chairman, to Lando W. Zech, U.S. NRC Chairman, Subject: Generic Letter Related to Occupational Radiation Exposure of Skin from Hot Particles, May 9, 1989

6. Report from David A. Ward, Acting ACRS Chairman, to Lando W. Zech, U.S. NRC Chairman, Subject: NRC Thermal-Hydraulic Research Program, June 15, 1989
7. Report from Forrest J. Remick, ACRS Chairman, to Kenneth M. Carr, U.S. NRC Chairman, Subject: Proposed Staff Actions Regarding the Fire Risk Scoping Study (NUREG/CR-5088), July 18, 1989
8. Report from Forrest J. Remick, ACRS Chairman, to Kenneth M. Carr, U.S. NRC Chairman, Subject: Draft Supplement 2 to Generic Letter 88-20, "Accident Management Strategies for Consideration in the Individual Plant Examination Process," November 20, 1989



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

February 15, 1990

The Honorable Thomas S. Foley
Speaker of the United States
House of Representatives
Washington, D.C. 20515

Dear Mr. Speaker:

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In our December 18, 1986 letter to the Congress, we proposed to provide more focused reports on specific research issues rather than one all-inclusive annual report. The Commission agreed with our suggestion, and then NRC Chairman Zech submitted a legislative proposal in the form of a draft bill to the 100th Congress on December 2, 1987 to amend Section 29 of the Atomic Energy Act of 1954 to accomplish this. Since the 100th Congress did not act on this matter, he submitted a similar, but somewhat modified, legislative proposal on February 2, 1989 to the 101st Congress for consideration. We expect that the Congress will consider this matter during this year.

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- Inservice Inspection of Boiling Water Reactor Pressure Vessels
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- Piping Integrity
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- Thermal-Hydraulic Phenomena.

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We expect to continue to review various elements of the NRC Safety Research Program and provide reports to the Commission as warranted.

Sincerely,



Carlyle Michelson
Chairman

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D. C. 20556

March 14, 1989

The Honorable Lando W. Zech, Jr.
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Chairman Zech:

SUBJECT: ADDITIONAL APPLICATIONS OF LEAK-BEFORE-BREAK TECHNOLOGY

During the 347th meeting of the Advisory Committee on Reactor Safeguards, March 9-11, 1989, we discussed the NRC staff's proposal on this subject embodied in a November 22, 1988 draft of SECY-88-325, "Policy Statement on Additional Applications of Leak-Before-Break Technology." This matter was also discussed by our Subcommittee on Thermal Hydraulic Phenomena during a meeting on March 7, 1989. During these meetings, we had the benefit of discussions with representatives of the NRC staff, several industry groups, and Brookhaven National Laboratory. We also had the benefit of the documents referenced.

The central concept of leak-before-break (LBB) involves acceptance of the argument that, in a given piping system, small leaks through cracks in pipe walls can be detected before the cracks have grown to a size where they can cause a sudden gross failure of the pipe. Further, the argument says that when the leak is detected, the damaged pipe will be taken out of service before the crack has had a chance to grow to a size that is on the threshold of unstable propagation. In 1987, the NRC revised General Design Criterion 4 (GDC 4) to permit the use of the LBB concept for certain purposes and under certain circumstances in both existing and new nuclear power plants. This revision made it possible for licensees to exclude the dynamic effects of hypothetical sudden pipe ruptures from consideration in the design of certain pipe support structures, if the piping systems in question met certain conditions.

In granting its approval for the GDC 4 revision, the Commission recognized that there is nothing inherent in the LBB concept that limits the application to the use specified and stated that, "There are possibly other areas which could benefit from expanding the leak-before-break concept and simplification of requirements such as environmental qualification and ECCS." In response, the staff solicited public comments on this subject through a notice in the Federal Register dated April 6, 1988. A range of opinions was cited in 23 comment letters. After considering these comments, the staff recommended that no rulemaking be undertaken to apply the LBB concept to either ECCS or environmental qualification. They pointed out that any safety benefits associated with the application of the LBB concept to ECCS can be more readily

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obtained under the recently revised ECCS rule. In addition, the broad scope revision to GDC 4 permitted the use of exemptions for applying LBB to environmental qualification.

In our discussions with the NRC staff, it became apparent that they believe the potential safety enhancements that might result from extending the LBB concept would not be great enough to justify the large expenditure of resources needed to develop bases for rulemaking. They seemed to feel that the industry's failure to use the exemption option in the existing rule indicated a lack of industry interest. The staff indicated that requests for exemptions, suitably documented and supported, might eventually provide the basis for a rule extending the LBB approach to environmental qualification.

In presentations to the ACRS, some representatives of the industry expressed their belief that there was a real potential for substantial safety and/or economic benefits in applying the LBB concept to both ECCS and environmental qualification. However, they were reluctant to expend their own resources on activities that they felt would not lead to changes in the rules.

We agree with the staff's conclusions to the extent that rulemaking at this time would be premature. However, we believe an avenue for consideration of further extension of the LBB concept should exist. As a result of our most recent discussions of this issue with the staff and with industry representatives, we believe that the staff is open to a serious consideration of industry proposals to extend the concept to situations for which technical justification can be provided. We recommend that the policy statement contain language which makes it clear that this is the case.

Sincerely,



Forrest J. Remick
Chairman

References:

1. U.S. Nuclear Regulatory Commission, SECY-88-325: "Policy Statement on Additional Applications of Leak-Before-Break Technology" (Pre-decisional), received by ACRS on November 25, 1988.
2. Letter dated March 3, 1989 from Malcolm H. Phillips, Jr., and William A. Horin, representing the Nuclear Utility Group on Equipment Qualification, to David A. Ward, ACRS, Subject: Application of Leak-Before-Break Technology to Environmental Qualification of Electric Equipment.



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March 15, 1989

The Honorable Lando W. Zech, Jr.
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Chairman Zech:

SUBJECT: PROPOSED SEVERE ACCIDENT RESEARCH PROGRAM PLAN

During the 347th meeting of the Advisory Committee on Reactor Safeguards, March 9-11, 1989, we discussed with members of the NRC staff a draft Severe Accident Research Program Plan, dated February 1989. Our Subcommittee on Severe Accidents met with the staff on March 7, 1989 to discuss this matter. We also had the benefit of the document referenced.

Because of the staff's schedule for presentation of the plan to the Commission, we were unable to perform a detailed review before preparing this report. However, on the basis of a preliminary review, we make the following comments.

The NRC began the Severe Accident Research Program shortly after the TMI-2 accident. The emphasis was said to be on understanding severe accident phenomena, and in developing a capability to calculate the risks of severe accidents. Computer codes were expected to play a key role in these calculations, and development of these codes and experiments related to their validation have represented a significant part of the severe accident research. Our previous reviews of the program have frequently led us to question the relevance of this research to regulatory needs. As a result, we have written a number of reports to the Commission recommending that there be a closer correlation between the severe accident research proposed and the policy being formulated to ensure protection of the public from the risk of severe accidents. We saw much of the severe accident research as not properly focused to provide the information needed.

In contrast, the February 1989 program plan proposes a review of the information available from previous research to identify areas in which further information is needed for regulatory decisions. Existing and proposed research programs will be reviewed and, if necessary, redirected to make it more likely that the needed information will be developed. It is also proposed that a method of evaluation, such as Code Scaling, Applicability, and Uncertainty recently developed by the staff for analysis of thermal-hydraulic codes, be used to evaluate a number of the severe accident codes. Further, in

Attachment 2

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light of the fact that there appears to be duplication among some of the severe accident codes under development, it is proposed to examine which of these codes are needed for regulatory applications, and on the basis of the results, to decide which codes deserve further development. It is also proposed that documentation be required for both existing codes and those under development.


On the basis of our preliminary review, we believe that this program plan represents a substantial change and is a very positive step. We endorse the staff's requirement that all contractors show that their proposed and continuing work address analyses or phenomena important in the predictions of risk, and have clearly defined objectives. We recommend that the Commission encourage the staff to continue in the direction indicated. Because this represents a significant departure from previous practice, some parts of the program are likely to encounter opposition. It is important that this be monitored carefully to ensure that it does not deter the positive aspects of the proposed program.

We expect to continue our review. However, our initial examination leads to the following specific observations.

The near-term program dedicates a major fraction of the total resources to studies of various phenomena associated with direct containment heating (DCH). We believe that as an alternative, a greater priority should be given to studies that might very well demonstrate that risk from DCH is negligibly low, or could be made low by readily achievable plant modifications or procedural changes, thus making much of the proposed DCH related research unnecessary.

The draft plan we have does not indicate how results of previous work or expected results from existing research programs of U.S. industry or foreign organizations are to be factored into the NRC program. We expect to explore this further.

Sincerely,



Forrest J. Remick
Chairman

Reference:

Memorandum dated February 10, 1989, from Brian W. Sheron, Division Director, Office of Nuclear Regulatory Research, to Forrest J. Remick, Chairman, ACRS, Subject: "Revised Severe Accident Research Program Plan" (Draft plan predecisional).



UNITED STATES
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WASHINGTON, D. C. 20555

May 9, 1989

The Honorable Lando W. Zech, Jr.
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Chairman Zech:

SUBJECT: NRC'S HUMAN FACTORS PROGRAMS AND INITIATIVES

During the 349th meeting of the Advisory Committee on Reactor Safeguards, May 3-6, 1989, we discussed the draft Commission paper related to the NRC's human factors programs and initiatives. Our Subcommittee on Human Factors discussed this matter with the staff during a meeting held on April 19, 1989. The subcommittee previously discussed draft Revision 1 of the Human Factors Regulatory Research Program Plan with the staff on January 26, 1989. We also had the benefit of the document referenced.

We are pleased that the NRC again is devoting a portion of its research program to human factors issues. The list of topic areas being worked on or planned is extensive. This will require dedicated research program management attention to help ensure that the research progresses in a timely fashion and the results are provided in a form for possible use by the agency.

During the January 26, 1989 meeting of our Human Factors Subcommittee, it concluded that the Human Factors Regulatory Research Program Plan be expanded into a human factors plan for the entire agency, i.e., to include the human factors programs and initiatives of all of the NRC offices. We are pleased to see that the staff has subsequently reached the same conclusion. We believe that the more comprehensive document will be of greater use to the Commission and to the interested individuals. We recommend that the discussion of the other office programs and initiatives be retained in the NUREG document when issued.

We believe that the Office of Nuclear Materials Safety and Safeguards' human factors initiative, addressing material and fuel cycle activities, is a welcome and needed addition to the NRC human factors efforts. Because few human factors considerations have been included in these activities in the past, much effort will be required. It is likely that additional human factors personnel will be needed by NMSS to carry out these activities in an effective manner.

The utilization of a number of diverse institutions and organizations as human factors research providers is commendable. This is particularly

Attachment 3

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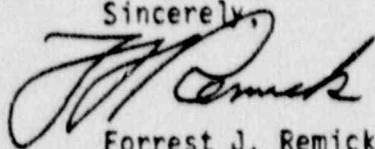
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noteworthy in the organization and management and in the reliability assessment program elements of the research plan. The use of diverse research providers has already generated new input to, as well as interest in, the human factors research program.

Finally, we have recommended to the staff that a human factors research effort be initiated to develop improved methodology for the selection and training of resident inspectors. These individuals play a significant role in the regulatory program for operating nuclear power plants. Effective resident inspectors can have an extremely positive impact on nuclear safety through their interfacing role between the NRC and licensees. Conversely, inspectors who are poorly qualified either technically or in their approach to regulation or their interpersonal skills can have a detrimental impact on nuclear plant safety performance. We believe that appropriate human factors research could develop aptitude testing to assist in the selection of resident inspectors and develop training material relating to their work assignments and their relationship to licensee personnel.

We recommend proceeding with the proposed human factors research program and initiatives. We would like to be briefed by the staff on the results of the research and any proposed implementation into the regulatory process at appropriate times.

Sincerely,



Forrest J. Remick
Chairman

Reference:

Letter dated March 31, 1989 from F. D. Coffman, Jr., Office of Nuclear Regulatory Research to Herman Alderman, ACRS, transmitting the Commission Information Paper on NRC's Human Factors Programs and Initiatives (PREDECISIONAL)