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

July 18, 1979

Honorable Joseph M. Hendrie
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUBJECT: RESEARCH TO IMPROVE REACTOR SAFETY

Dear Dr. Hendrie:

The relationship between the programs of research to improve reactor safety in the Department of Energy (DOE) and the Nuclear Regulatory Commission (NRC) was reviewed by the ACRS at its 231st meeting, July 12-14, 1979, and the Committee has some recommendations to make in this regard.

The FY 78 Budget Authorization Act for the NRC modified Section 205 of the Energy Reorganization Act to require that the NRC prepare a long-range plan for the development of new or improved safety systems for nuclear power plants. In its 1977 Report to the Congress, "Review and Evaluation of the NRC Safety Research Program" (NUREG-0392), the ACRS recommended that the NRC become more involved in research that has the potential of leading to the development of improved safety system concepts, and said:

> "It is both desirable and appropriate for the NRC to conduct research on new safety concepts, but their development and implementation should be carried out by the nuclear industry or the Department of Energy."

The Office of Nuclear Regulatory Research of the NRC submitted to the Congress on April 12, 1978 its "Plan for Research to Improve the Safety of Light-Water Nuclear Power Plants" (NUREG-0438). This plan selected five research projects as having significant potential for improving the safety of light-water nuclear power plants, and recommended them for the initial phase of the program. NUREG-0438 estimated that most of the research projects proposed would require one to two years for completion. The NRC estimated that implementation of the proposed plan would require about $15 million over a three-year period from the time work was started. The NRC noted that additional funding was likely to be required in future years because scoping studies as well as other efforts might identify more projects that should be undertaken.

In its second annual report to the Congress, "1978 Review and Evaluation of the NRC Safety Research Program" (NUREG-0496), the Committee stated:

> "The ACRS approved the Program Plan presented by the NRC in NUREG-0438 and believes that this program should be given high priority. ... The ACRS recommends that the program receive substantial funding ($1.5 million) in FY 79, by reprogramming of other funds if necessary. The ACRS recommends that in subsequent years, this program be funded at the level needed to permit effective pursuit of all the research projects and the scoping studies in NUREG-0438. ...
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> "The ACRS believes that there are complementary roles for both NRC and DOE in research to improve light-water reactor safety and that aggressive programs at the multi-million dollar level should be pursued by each agency with appropriate coordination."

In a letter dated January 31, 1979 to NRC Chairman Joseph M. Hendrie, Mr. J. McIntyre of the Office of Management and Budget (OMB) provided the following guidance:

> "Funds are provided in FY 1980, $1.0 million, for the initiation of an LWR Improved Safety Research Program. These funds shall not be used for physical experimentation on improved reactor safety systems or components. The Department of Energy (DOE) has been provided $7 million to carry out such experiments and to develop improved safety systems. This division of responsibility between NRC and DOE will maintain NRC's normal independent role as the agency responsible for reviewing licensing applications for new reactor safety systems and concepts. This approach also provides sufficient funds to enable NRC to assess concepts for improving reactor safety and to give guidance to the DOE program based on these assessments and NRC's recognized expertise in the reactor safety area. It is intended that NRC participate in DOE's development of a program plan for DOE's safety research program. This will influence the direction of DOE's experimental effort to focus them on the most important new safety concepts."

At an ACRS Subcommittee meeting on March 7, 1979, Mr. F. Gavigan of DOE and Mr. D. Dahlgren of Sandia Laboratories described the DOE program in LWR safety and technology. Of the $7 million in the DOE program, Mr. Gavigan stated that $4 million was in DOE's Improved Safety Systems Program and the other $3 million was assigned to the In-plant Radiation Dose Reduction Program. Of the $4 million, a significant fraction was to be committed to the development of higher burnup LWR fuel and to other programs which fell within DOE's defined scope and objectives, but not in categories listed in the NRC plan, NUREG-0438.

The DOE representatives stated that they had no technical basis on which to justify a study of Class 9 accident mitigation and they did not plan any program in this area, even though filtered, vented containment was a priority item on the NRC list, and molten core retention was one of the scoping studies.

At an ACRS Subcommittee meeting on June 26, 1979, Mr. M. Norin and Mr. J. Griffith of DOE and Mr. D. Dahlgren of Sandia Laboratories discussed in general terms the new plans for the changed, probably much larger DOE program which was being developed in light of the accident at Three Mile Island 2. Mr. J. Kearney of OMB described the basis for the directive sent by OMB to the NRC and to DOE in January 1979 concerning the division of responsibility and the budget for the program of research to improve reactor safety, and requested that the ACRS provide comments on the general matter. Mr. Kearney stated that idea generation should occur in the NRC, that NRC should study acceptable levels of risk and improvements in risk by design changes. NRC should provide guidance on the program to be performed by DOE, and DOE would then initiate the necessary experiments and concept development and demonstration, working with industry if appropriate. The NRC would, of course, review any eventual specific design proposed for acceptability prior to its implementation.

The ACRS continues to give strong support to a research program to improve reactor safety of nature and focus like that portrayed in NUREG-0438. The ACRS continues to believe that this program should have strong elements both in the NRC and DOE and that the DOE program must be truly responsive to NRC needs. The ACRS believes it is appropriate for the NRC to examine design concepts which might improve safety, and that the NRC program should be permitted to include any relatively small-scale experiments needed to confirm or disprove the potential usefulness of specific design approaches or to examine phenomena important to a sound evolution of the concept. The ACRS believes that the type of physical experimentation that it and the NRC envisage as being required under this program to be conducted by NRC will not compromise in any way the independence of the NRC. It is not expected that the NRC will carry out the physical research necessary for the development, engineering, design, or implementation of new safety concepts that it finds to be promising; such research, both physical and analytical, is properly the function of the DOE or the industry. However, it is expected that some physical research will be required to obtain data needed to evaluate the potential of a new concept or to determine its feasibility. Such research should properly be done by the NRC, and the ACRS sees no potential for such research to compromise NRC's independence.

The ACRS believes that the NRC program of research to improve reactor safety will still be funded at less than a desirable level, even if the proposed budgets totaling $4.4 million in FY 80 and $6.6 million in FY 81 are approved. In proportion to the total NRC safety research program, and in light of the importance and the possible significance of such improvements in safety, the ACRS believes the NRC and OMB should endorse still greater funding levels for this program in FY 80 and FY 81.

The ACRS believes there are potentially at least three roles that DOE could play concurrently with regard to safety improvements for light-water reactors. First, DOE may develop a program of research on light-water reactor safety which complements or extends ongoing programs in the industry or in the previously existing NRC program of confirmatory research. Second, DOE could develop its own ideas for a program of research to improve reactor safety in the spirit of NUREG-0438, and third, as OMB has recommended, DOE could pursue a program whose basic formulation, priorities, and pace are established by formal guidance from NRC, with appropriate interaction between NRC and OMB on budgetary matters and a continuing coordination between NRC and DOE via committees or designated representatives.

In its discussions with the ACRS, DOE has stated that it will not initiate research programs that deal with accidents beyond the current design basis accidents. DOE has said it would be responsive to recommendations from the NRC on research to improve safety. However, this was qualified by a statement that DOE would plan to perform research on matters on which they could logically expect applications to follow either because the industry so chose or the NRC so required.

The ACRS believes that if the approach defined by OMB for the program to improve reactor safety is to be responsive to the spirit of NUREG-0438 there should be a formal understanding between NRC, DOE, and OMB that DOE is to follow NRC guidance in this area, and that NRC should provide this guidance. It is our understanding that no NRC guidance has been provided to DOE for FY 80 or FY 81, although there have been meetings between representatives of the two agencies and steps have been taken to establish a coordinating committee. Since the DOE program is now in a formative stage, the ACRS believes that NRC guidance should be provided as soon as practical.

In summary, the ACRS believes that, if the procedure designated by OMB for a program of research to improve reactor safety is to be effective and timely, this program must be amply funded both in NRC and DOE; a clear understanding must exist concerning the responsibility of NRC to establish the basic guidance for that part of the DOE program

intended to support the NRC effort; and NRC must exercise this guidance expeditiously.

Sincerely,

Max W. Carbon
Chairman

cc: Honorable James R. Schlesinger, DOE
Honorable James M. McIntyre, OMB