ATOMIC INDUSTRIAL FORUM INC.

March 30, 1967

Mr. Milton Shaw
Director - Division of Reactor
Development and Technology
U. S. Atomic Energy Commission
Washington, D. C. - 20545

Dear Mr. Shaw:

This is in reply to your letter of February 23, 1967, in which you invite the comments of the Forum's Committee on Reactor Safety on the draft report, "Summary Description - Water-Reactor Safety Program - January 1967," which was prepared by the Water-Reactor Safety Program Office for the Division of Reactor Development and Technology.

These comments have been developed by a Task Force set up by the Forum Committee early in 1966 to work with the AEC's Steering Committee on Reactor Safety Research and to review the Commission plans for an augmented AEC nuclear safety program. The membership of the Task Force is comprised of the following members of the Forum Committee on Reactor Safety:

Theodore Rockwell - MPR Associates, Inc. -- Task Force Chairman Edwin A. Wiggin - Atomic Industrial Forum - Committee Secretary J. L. Everett - Philadelphia Electric Company Roger F. Griffin - Bechtel Corporation R. J. McWhorter - General Electric Company David L. Morrison - Battelle Memorial Institute Robert A. Wiesemann - Westinghouse Electric Corporation

In addition to internal meetings, members of the Task Force have met with AEC officials in both the regulatory and the development staffs, and with industrial personnel at both management and technical levels. The Chairman of the Task Force met with the senior members of the AEC Safety Steering Committee, and was also privileged to attend an extended review of the LOFT Porgram given primarily for AEC personnel. In addition, Messrs. Vann, Rockwell, and Wiggin met informally

8707080243 870527 PDR FOIA THOMAS87-40 PDR with the Director and the Deputy Director of Regulation, the incoming and the retiring Directors of Reactor Licensing, the Director of Safety Standards, and his Assistant Director for Reactor Standards. A number of informal exploratory discussions with other AEC representatives have also been held from time to time.

It was suggested during discussions with Steering Committee officials, and later with senior regulatory personnel, that the recommendations of the Steering Committee be made available to the Task Force as an indication of the Commission objectives for the R&D Safety Program. It was believed these recommendations would constitute an excellent point of departure from which the Task Force could develop comments and recommendations. However, no comments or conclusions developed by the Steering Committee have been made available to the Task Force.

In developing the comments which follow on the January 1967 "Summary Description," the Task Force has not solicited the views of the membership at large of the Forum's Committee on Reactor Safety. We are aware, however, that you have invited comments from a number of the organizations represented within the Committee membership, and that many of these organizations plan to provide you directly with detailed technical analyses of the R&D program. This letter therefore presents a consensus of general views and does not cover the detailed technical points to be made by the various member organizations.

The current program, as outlined in the "Summary Description," appears to be more than adequate for the stated objective of "obtaining an understanding of the behavior of reactor systems, components, and materials, and the laws which govern their thermal, hydraulic, mechanical, chemical, and neutronic behavior, as they relate to safety."

Our principal concern is whether a program so large and so diffuse can also be sufficiently responsive to two other objectives stated therein, namely, to provide "an important source of information to be used by the nuclear industry in the design, location, and operation of commercial nuclear power plants" and to provide "the technology needed for the safety assessment and expeditious licensing of commercial reactors." The Task Force was concerned that no further reference was made in the "Summary Description" to either of these two program objectives.

The "Summary Description" reinforces this concern by subsequently describing as the first and second major areas of activity of the safety program "accident understanding" and "fission product behavior." Implicit throughout the "Summary Description" are the assumptions that: (1) not until one has acquired "the ability to predict and analyze the major postulated reactor accidents in all their phases -- the modes and credibility of initiation, the system response, and consequences, " (2) not until one is able "to understand the nature and magnitude of potential flows of fission products from their normal location within the fuel, through the cladding, printry system and containment barriers, and thence into the environment. all inder realistic accident conditions," and (3) not until one knows how "to interrupt the course or to limit the consequences of potential accidents," is it possible to design systems and develop operating procedures to prevent accidents. The Task Force does not concur with these assumptions.

It is not clear that such an understanding can ever be achieved, because of the difficulty of simulating "realistic accident conditions" which are well beyond the realm of our practical experience and likely to remain so. Too great an emphasis on trying to achieve this "basic understanding" may be detrimental to the cause of safety. The industry, the regulatory groups, and the R&D contractors all have limited resources. Too much attention to one aspect of the problem results in compromising effort in other areas. Preoccupation with developing a "complete understanding" of the details of hypothetical accidents, which are not likely to follow the exact path predicted today must result in less attention being paid in the R&D program to the more important problem of evaluating realistic situations. The overall safety of present-day water reactors would be enhanced if more emphasis were placed in the R&D program on preventing serious accidents from happening, as opposed to studying the consequences of such accidents after they have occurred. There is too much emphasis being placed on questions associated with very low probability accidents.

Another aspect of this situation is that reactor safety is becoming a separate discipline, an end in itself. Its postulated accidents become accepted as the norm. A danger in this is that real accidents seldom follow predictions; if we follow a particular artificial postulate through too many improbable stages, the resulting complications added to the plant may create unnecessary hazards in themselves. We consider that the continuing trend of imposing more and more complications on plants in order to meet highly improbable situations, does not necessarily lead to safer plants, and in fact may work the other way.

If the nuclear safety program could keep pace with the type and amount of information being requested by AEC's Division of Reactor Licensing and the ACRS, a fundamental research approach might conceivably have some merit. However, the nuclear safety program is already seriously lagging the needs of the AEC regulatory bodies and the nuclear power industry. Results to date of the R&D program have contributed little to an understanding of the need for or the benefit to be derived from the type of engineered safeguards being required of today's plants. Too few of the projects have been assigned a specific, practical, engineering objective or a definitive completion schedule. Admittedly, engineering-type tests will from time to time require compromising the scope of a project

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in order to meet a practical schedule. Personnel directing the work must face up to this practical limitation.

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As the Forum Committee on Reactor Safety pointed out in two sets of detailed recommendations submitted to the AEC in 1963, there is an urgent need for a meaningful program of short-term tests. The Task Force is aware of the limitations inherent in short-term engineering tests, %.g., they may provide one or only a few points on a complex curve. However, if the limited data provide a needed answer, approximate a needed answer, or can serve as a scoping experiment to predict the usefulness of a longer-range study, the tests will in most instances have been well justified.

By curtailing or eliminating some of the lower priority projects in the current program, sufficient money would be available within the present level of funding to permit a significant short-term engineering test program to be undertaken. Some of this work might better be accomplished by industrial contractors who have an incentive for expeditiously producing definitive results.

We appreciate the frustration of the R&D program planners in not being able to elicit from the Regulatory Staff or the ACRS answers to the questions of what data will prove acceptable and how much data will suffice to satisfy their concerns. The nuclear industry is harassed by the same frustrations. And even though these frustrations have understandably led nuclear safety researchers to pursue long-range and thorough investigations to provide "all the answers," there appears to be a general lack of focus to make the nuclear safety program responsive to requirements imposed during the licensing process. For example, experimental data already produced by the program, even in the case of completed projects, have not significantly served either the industry or the AEC Regulatory Staff in their review and evaluation of license applications. There appears to be little correlation between the program and the few "guidelines" which have been issued by the AEC Regulatory Staff and the ACRS.

In summary, the Task Force offers the following recommendations:

 We recommend that the Commission, perhaps through its Steering Committee on Reactor Safety Research, establish a mechanism for determining the acceptability for licensing purposes of R&D data and analytical techniques. This mechanism should operate outside of the case-by-case license review process so that these determinations will not be subject to the pressures of individual project deadlines.

> R&D data and analyses are worth little until a mechanism is established for applying them to the license review process. This

mechanism must be capable of explicitly determining whether or not existing data are adequate and specifically what additional data are required for a finding of adequacy. This mechanism could be tested now on existing information. This is a matter of urgency; it would be better to try out a few test cases soon than to dwell too long on trying to develop an optimum mechanism. By way of example:

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- a. For many years, the Commission has sponsored several programs on fission product release and transport. Yet little of this information is being utilized in the licensing review process. Published Regulatory Staff safeguards
 analyses still use TID-14844, dated March 1962, for this purpose. Meanwhile, the R&D work on fission projuct release and transport continues with little assurance that the new data will prove any more acceptable than the old.
- b. Considerable R&D work has been performed on metalwater reactions. Yet, there is still no accepted basis for estimating the extent of metal-water reaction for purposes of evaluating containment design. Meanwhile, the work on metal-water reactions continues without the benefit of any explicit guidance as to what is needed.
- c. Considerable effort has been expended on determining forces during blowdown after a hypothetical major pipebreak-accident; this included some careful engineering tests by reactor manufacturers, data from which have been used in current license applications. Yet there has been no indication of whether or not these data are considered acceptable. From questions raised, it appears that more data may be required. But it is not clear how much or what kind of data will ultimately prove acceptable from a licensing standpoint.
- 2. As a corollary to Recommendation No. 1, we recommend that the Commission translate appropriate R&D information into specific criteria and guides which can be used by both the nuclear industry and the AEC regulatory bodies in the licensing review and evaluation process. The Forum would be particularly interested in working with the Commission in this area.
- 3. We recommend that the mechanism established in Recommendation No. 1 be used to re-direct the AEC's nuclear safety R&D program toward achieving specific solutions to existing problems by stated dates. Any general research needed to support these major projects can then be readily identified.

Unless the R&D program can be responsive to the test of an acceptability mechanism, it will provide little of value to those concerned with designing, licensing and operating commercial reactors. It is important to set priorities and schedules to permit the important and urgent tasks to be focused on. However, this cannot be done properly until goals and criteria have been agreed on, as provided for in the previous recommendations. Otherwise, some work might be stopped which would prove necessary if more restrictive criteria were adopted. Each R&D project should be examined from the following standpoint:

> "If this work were to achieve its objective fully, how would one design, build or operate reactors differently?"

If a satisfactory answer cannot be developed in any particular case, the Commission should consider discontinuing that project, or redirecting it toward finding specific information which would provide greater assurance of safety in real reactor plants, or would demonstrate that certain complicating features, added in ignorance, can be eliminated. There appear to be a number of projects which tend to pursue research for its own sake, or to aim at merely describing a phenomenon without leading to any basis for action, but the lack of a suitable acceptability mechanism for gauging R&D results makes it difficult to pass judgment on them now.

- 4. We recommend that the nuclear safety program focus more emphasis on tests and investigations which will contribute to the prevention of realistic accidents as well as to minimize their consequences. Toomuch emphasis is currently being focused on studying the cause and course of accidents which have only a remote probability of occurrence. By way of example:
 - a. In the loss-of-coolant accident, emphasis should be focused on preventing a serious break from occurring, and on providing adequate emergency core cooling to prevent a major meltdown of the core. Extending the R&D effort beyond this stage takes the postulated accident beyond a reasonable probability.
 - b. The same guidelines should be applied to studies of fission product release and transport and to metal-water reactions. Specifically, the design and evaluation of reactor containment systems and fission product release should be consistent with the principle that a major meltdown of the core will not be permitted to occur. Programs on fission product release, transport and deposition, and on chemical reactions, should be primarily oriented toward realistic accident assumptions consistent with this principle.

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- c. Reactivity accident <u>demonstration tests</u> involving very large reactivity additions, which are well beyond those considered credible and which are expected to result in extensive primary system damage, are unrealistic and of dubious value. The experimental program should be directed toward determining consequences of realistic, even though improbable, reactivity addition accidents; this would permit a more quantitative assessment of the margins available and the consequences of such reactivity transients.
- 5. We recommend that priority be given to running short-term or "scoping" experiments, to determine whether any inadequacies exist in engineered safeguards systems of the type being proposed for current plants. The results of these tests should be used to determine the need for any further tests or R&D. The Forum would be glad to assist in formulating the details of such a program.

The above remarks and recommendations should not be construed as any opposition to the achievement of reactor safety or to any efforts which will further that goal. We believe the cause of safety is best served by directing management concern and technical effort toward central and realistic matters.

If the Task Force can be of assistance in clarifying any of the above comments or in implementing any of the above recommendations, please let us know. Please be assured of our continued interest and cooperation.

Sincerely,

Theodore Rockwell III Chairman - Task Force on Safety R&D