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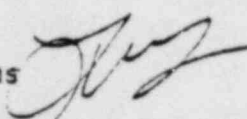
UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SECY-79-430

INFORMATION REPORT

For: The Commissioners

From: Saul Levine, Director
Office of Nuclear Regulatory Research

Thru: Lee V. Gossick, Executive Director for Operations 

Subject: ACRS REPORT TO CONGRESS, "1978 REVIEW AND EVALUATION OF THE NRC SAFETY RESEARCH PROGRAM," NUREG-0496

Purpose: To inform the Commission of RES comments and response to the ACRS recommendations contained in the subject report.

Discussion: On January 25, 1979, Commissioner Ahearne requested that RES prepare a comparison of the ACRS recommendations, contained in their second annual report to Congress on the NRC's safety research program, NUREG-0496, and the planned FY 1980 research programs, including, "for recommendations not in the budget, an explanation of why we did not include them." A partial response was transmitted to Commissioner Ahearne by memorandum on March 5, 1979, which discussed only those ACRS recommendations and findings that call for significant modifications in our present program plans.

The enclosure to this information paper includes a current discussion of all of the ACRS recommendations contained in NUREG-0496. The individual items are keyed in the enclosure to program areas and ACRS Report page numbers. As discussed in the March 5, 1979 memorandum to Commissioner Ahearne, our broad, overall comparison of the RES FY 1980 program and the ACRS recommendations shows that the two are highly congruent. Also, the RES Director and staff concur with the key findings, and with most of the detailed ACRS recommendations, found at the end of each chapter. In many cases, ACRS recommendations are either being implemented already, or are planned as a part of our FY 1980 or FY 1981 program.

In addition to the specific comments which are discussed in detail in the enclosure, the following discussion is provided to summarize the major findings of the ACRS report.

1. The RES FY 1980 program reviewed by the ACRS in NUREG-0496 was prepared by RES prior to the TMI-2 accident. The TMI accident has indicated a number of areas requiring additional safety research information. While some of these requirements can be accommodated by reprogramming and reorientation of ongoing efforts, we believe there will be a significant amount of new work that will require resources over and above those contained

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in the FY 1980 budget request to the Congress. Therefore, we are currently preparing a proposed FY 1980 supplemental budget request for review by the Commission.

RES has already had one meeting with ACRS members (TMI-2 Subcommittee on May 31, 1979) to discuss such research needs as part of the development of the supplemental budget request. We expect to continue this useful dialogue with the ACRS during the development and review phases of the FY 1980 supplemental budget process. RES comments included in the enclosure address the impact of the TMI accident on the research area being discussed, where appropriate, and update the comments previously provided in our March 5, 1979 memorandum to Commissioner Ahearne.

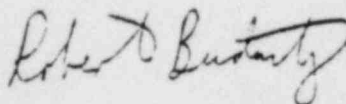
2. The ACRS recommended that a more systematic review and evaluation of operational experiences and incidents be undertaken. Subsequent to this recommendation by the ACRS, NRC staff has developed recommendations for Commission consideration regarding implementation of a dedicated Operations Evaluation function, including identification of the additional resources which must be devoted by the agency to address this need. It is RES' intent to participate fully in the proposed agencywide, reorganized effort in this area.
3. The ACRS comments reflect general agreement with the content and direction of the RES LOCA/ECCS research program. The impact of the TMI accident, especially with respect to investigations of transients and small LOCA events, may result in a delay in implementing previously planned decreased levels of funding in this area by FY 1981. This area is under active reconsideration at the present time, and RES will keep the ACRS informed of our developing plans.
4. As in their previous report to Congress on the safety research program, the ACRS recommends that the NRC's advanced reactor safety research program be more aggressively pursued in order that the necessary safety research to resolve safety issues be carried out concurrently with development. RES agrees with this recommendation and believes that it is important that the administration and Congress perceive the necessity of doing advanced reactor safety research so as not to compromise future decisions on this issue.
5. With regard to some other important safety research program areas, the ACRS believes 1) that the major emphasis being given to earthquake-related research, especially the Seismic Safety Margins Research Program, is appropriate; and 2) that risk assessment activities should continue to emphasize collection and analysis of component and systems performance data, development of methods to evaluate more quantitatively the contribution of human error to risk, and the recommendations of the Risk

Assessment Review Group Report. RES' current plans and recommendations are consistent with the ACRS comments in these areas.

6. RES agrees with the ACRS that the NRC program on research to improve reactor safety should be funded at the level needed to permit effective pursuit of all of the research projects and scoping studies recommended in the NRC's Plan for Research to Improve Reactor Safety, NUREG-0438. The proposed FY 1980 supplemental budget request will request funds to support most of these activities with special emphasis being given to research to improve plant operator accident response capability.

The comments and recommendations made by the ACRS in NUREG-0496 have been most useful to RES as important input in the continual planning and implementation of the NRC's safety research program. Furthermore, the many meetings held by the ACRS with RES staff as part of the process of preparing their annual report to Congress, offer excellent opportunities for continued dialogue between the ACRS and staff which is useful to both parties. The NRC's safety research program can only benefit from this process.

Coordination: None.



for Saul Levine, Director
Office of Nuclear Regulatory Research

Enclosure: RES Comments on ACRS
Recommendations (NUREG-0496)

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RES COMMENTS ON ACRS RECOMMENDATIONS
(arranged by chapter in NUREG-0496)

(begins with Chapter 2 because Chapter 1 is introductory)

CHAPTER 2: RESEARCH ON LOCA/ECCS

1. ACRS Recommendation (page 2-8)

"The ACRS recommends that the bounds now being placed upon the experimental program be followed so that an orderly reduction in the projects and costs can be achieved in the 1980s. Specifically, the ACRS concurs that the following costly items are not necessary: the ECC Bypass Test Facility, a new major multipurpose test facility, and a full-scale integral test facility."

RES Comment: ACRS concurrence that the major new programs mentioned are not necessary is based on RES recommendations provided in August 1978, and, therefore, ACRS and RES are in agreement in this area. It had been RES's stated intent to implement decreased levels of funding of overall LOCA-related experiments beginning in FY 1980, and no new LOCA/ECCS test facilities are contemplated. However, because of the TMI accident, the issue is under active reconsideration at the present time.

2. ACRS Recommendation (page 2-8)

"The LOFT program is being managed competently and effectively, and the ACRS recommends that it be continued. The limits to be placed upon LOFT tests should be reviewed so that the scheduled decommissioning by the late 1980s need not be deferred."

RES Comment: A review of the LOFT experimental program was completed in January 1979. The resulting plan calls for one test from each test series beyond the current power-ascension series to be done sequentially. The results will then be used to evaluate the merits of deleting or proceeding with the remaining tests. If deletions are identified, and if no additional tests are found necessary, the program could be phased out earlier. If no deletions or other changes are identified, decommissioning would still be scheduled for the late 1980s as recommended by the ACRS. However, it is possible that users' requirements, operational transient studies, or test results may identify other tests which are not currently planned and that this could extend the program in a way not now foreseen. In particular, the Three Mile Island accident emphasizes the need for high priority for small-LOCA research, and the impact on the LOFT program is being evaluated now in that light.

3. ACRS Recommendation (page 2-8)

"The ACRS considers the independent assessment program for best estimate codes to be essential. The ACRS recommends that more effort be placed on defining the requirements for such independent assessments, that the results be widely discussed in the technical community, and that detailed plans be made for assuring that sufficient virgin tests be reserved for the independent code assessments."

RES Comment: RES agrees that the independent assessment program for best estimate codes is essential and, accordingly, has planned to increase the effort in independent assessment substantially. The independent assessment of RELAP 4/MOD 6 is already well underway and work is underway on independent assessment of the fuel code FRAP. The overall plan for independent assessment of TRAC is being formulated by RES, and it will require the code assessment expertise in four laboratories (LASL, INEL, BNL, and SANDIA), as well as a broader review in the technical community.

As RES continues to define the detailed plans for independent assessment of best estimate codes, these plans and ultimately the results of the assessment will be thoroughly discussed with the technical community in Research Review Group meetings and ACRS meetings.

4. ACRS Recommendation (page S-6)

"Considering the progress being made and the status of the conservative licensing processes, the ACRS believes that the LOCA/ECCS research should not continue to dominate the NRC research programs. Nevertheless, the ACRS recommends that the large-scale tests of the international program and those planned for the next few years in LOFT be carried out."

RES Comment: While the current trend of NRC research programs is away from LOCA/ECCS research, the large-scale tests of the international program (2D/3D, for example) and those planned for the next few years in LOFT are proceeding vigorously. Further, as a result of the Three Mile Island accident and as indicated in item 2., above, experiments and code development related to small LOCA's and transients are planned to be expedited.

5. ACRS Recommendation (page S-7)

"A clear-cut schedule for termination of the LOFT tests should be established."

RES Comment: A full plan of LOFT experiments has been in existence for the past 3 years. As the program has entered the nuclear phase it has become possible to prepare better estimates of turnaround times and hence to estimate the actual test schedule. This in turn has led to efforts to minimize the total number of tests in the program. Initially this resulted in dropping three experiments. The next step was to order the tests so that following the first power ascension series, one test from each remaining series would be done sequentially. The resulting test program and schedule is shown in Table I. While this schedule indicates that the final experiment should take place in August 1986, the result of the test plan described above could very easily lead to the deletion of a number of these tests. It is also likely that examination of the results obtained from various tests or NRR requirements could modify the currently planned tests or result in rearrangement of planned tests. In fact, the recent events at Three Mile Island will likely lead to the advancement of the first small break experiment L3-1 noted in the Table.

TABLE I
LOFT LOCE TEST SEQUENCE

Test	Date	Power (kW/M)	Break	Comment
L2-2	Dec. 1978	26.3	DECL	
L2-3	May 1979	39.4	DECL	Standard "best estimate" test
L2-5	Sept. 1979	39.4	DECL	"Evaluation Model" test (loss of offsite power and loss of one ECC system)
L2-4	April 1980	52.5	DECL	
L2-6	Oct. 1980	39.4	DECL	Pressurized fuel
*L3-1	April 1981	39.4	CL	A_{crit} = small break area just causing core flow stagnation
L4-1	Oct. 1981	39.4	DECL	Lower plenum injection
L5-1	March 1982	39.4	DEHL	Best estimate conditions
L7-1	Sept. 1982	39.4	DECL	Best estimate SGTR = 16 tubes/ refill HL injection
L3-3	Feb. 1983	39.4	CL	$A < A_{crit}$
L4-5	Sept. 1983	39.4	DECL	B&W vent valve test
L4-3	March 1984	39.4	DECL	Hot leg/cold leg injection
L4-2	Sept. 1984	39.4	DECL	Hot leg injection
L7-2	Feb. 1985	39.4	DECL	Evaluation model SGTR = 16 tubes/ refill HL injection
L4-4	Oct. 1985	39.4	DECL	Direct downcomer injection
L3-2	March 1986	39.4	CL	$A < A_{crit}$
L5-2	Aug. 1986	39.4	DEHL	Evaluation model conditions

NOTE: Preliminary planning has the first ATWS Test (L6-1) scheduled following Test L3-1 (April 1981).

DECL - Simulates double-ended cold leg break.

DEHL - Simulates double-ended hot leg break.

CL - Simulates cold leg break.

*Events at Three Mile Island may lead to the advancement of this experiment such that it may precede the L2-5 experiment.

6. ACRS Recommendation (page 2-1)

"A significant increase in funding will be required in FY 1980 to cover the planned operation of the Loss of Fluid Test (LOFT) Reactor."

RES Comment: The increased funding needed for LOFT has been included in NRC's budget submission to Congress. Currently the program support funding estimates are as follows, which include for FY 1981 and beyond, estimates for research related to the TMI-2 accident.

<u>Fiscal Year</u>	<u>\$ Thousands</u>	
1979	23,000	(1979 dollars)
1980*	42,900	(1980 dollars)
1981	48,300	(1981 dollars)
1982	48,300	(1981 dollars)
1983	48,300	(1981 dollars)

*NRC responsible for full year funding of facility operating and maintenance costs in FY 1980. These costs were shared by DOE and NRC in FY 1979 and fully funded by DOE in FY 1978.

CHAPTER 3: FUEL BEHAVIOR RESEARCH

1. ACRS Recommendation (page 3-4)

"The high priority now assigned by the NRC staff to experiments relating to reactivity-insertion accidents should be reassessed in view of the very low probability of such accidents."

RES Comment: NRC has designated reactivity-insertion accidents as their highest priority among PBF programs because of suspected lack of conservatism in the licensing requirements. RES will review with NRR the results of recent RIA tests in PBF and will reassess priorities in the test program if warranted by this review. We will then discuss our conclusions with the ACRS.

2. ACRS Recommendation (page 3-3)

"Release and Transport of Molten Fuel and Fission products: ...The NRC is currently planning a reduced level of effort in this program. The ACRS believes this area of work is important and is concerned that the NRC effort in this area not be phased out."

RES Comment: The primary use of information from this research has been in the risk assessment program. Additional research needs, as a result of the TMI-2 accident, are currently being defined. We would now expect that the level of effort in this program area will probably increase. We will continue to maintain close coordination with the fuel melt program

in Germany and with the U.S. program on fuel melt in breeder reactors, and will continue to consult with the ACRS on this program area.

3. ACRS Recommendation (page S-3, 3-3)

"In general, the PBF program is producing valuable, timely results, and should be continued. The establishment of priorities within this program is a matter that merits continuing NRC management attention."

"The program of tests in PBF should continue to be closely monitored to assure that it meets clearly defined and justified regulatory needs."

RES Comment: The PBF program is reviewed in the review group meetings at least twice a year and more often when significant results are reportable. These meetings include detailed discussions with NRR participants and often result in updating of program priorities. There is also very frequent communication between the RES Fuel Behavior Branch and NRR Core Performance Branch to discuss program results and licensing needs. The RES budgeting process also requires NRR comment on PBF priorities and these also cause reorientation of the program. RES believes that these efforts to monitor priorities will assure that the PBF experimental program will be consistent with regulatory needs.

4. ACRS Recommendation (page 3-2)

"The NRC program on fuel behavior codes is adequate and essential for NRC needs, and provides useful guidance to the overall fuel behavior research program."

RES Comment: RES concurs with the ACRS comment on the adequacy of the fuel code development and assessment work.

CHAPTER 4: RESEARCH ON PRIMARY SYSTEM INTEGRITY

1. ACRS Recommendation (page 4-5)

"The HSST program should be completed as planned."

RES Comment: RES concurs with this recommendation; we have pursued the original goals of the HSST (Heavy Section Steel Technology) program established at its outset and have completed most of them. As the program has matured, some new questions have been raised by the staff, including pressurized thermal shock, toughness properties of irradiated material, and crack arrest damping, and the program has been modified and augmented to undertake the appropriate research.

2. ACRS Recommendation (page 4-5)

"The portion of the program devoted to piping reliability deserves a high priority because it may, in the end, enhance the safety of nuclear power plants by simplifying the engineering requirements."

RES Comment: RES concurs with this recommendation; to this end, we have initiated a significant new effort to quantify the reliability of piping

systems through both deterministic evaluations (material properties, realistic stresses, realistic flaw sizes and distributions) and through stochastic evaluations (initial flaw size, material properties and loads).

3. ACRS Recommendation (page 4-5)

"The research on the effects of coolant chemistry on crack growth in piping and pressure vessels is inadequate. A significantly expanded effort is warranted to better define the safety margins."

RES Comment: Research on the effect of coolant chemistry on crack growth rate in vessel and piping steel is well underway with an international effort being led by NRC. In our judgment this effort should meet the ACRS objective; however, we will discuss the matter further with the ACRS to get a closer meeting of minds, as well as evaluating further the need to investigate the effect of coolant chemistry changes resulting from an accident (i.e., TMI-2) on vessel integrity.

4. ACRS Recommendation (page 4-5)

"The NRC should initiate a project to evaluate the findings from operating experience regarding possible saturation effects of radiation embrittlement."

RES Comment: EPRI has an active program consisting of a number of surveillance capsules. RES is cooperating with EPRI and will evaluate relevant data as it becomes available from the EPRI program. This coordinated effort will also allow us to evaluate the validity of their data.

5. ACRS Recommendation (page 4-5)

"The project associated with steam generator tube integrity should be reviewed further to make certain that the planned expenditures are for research that complements that performed by the nuclear industry or, if intended to duplicate industry effort, pursues research avenues that would enhance the NRC's understanding of the problem."

RES Comment: RES has just recently received from our contractor a planning study of what program could be pursued on the retired steam generator and will shortly meet the NRR to decide on the overall program desired. EPRI work on steam generators does not overlap NRC's intended work. Discussions are planned to determine if a cooperative NRC/EPRI program in this area would be desirable.

6. ACRS Recommendation (page 4-2)

"Reactor water chemistry can induce cracks and affect the rate at which cracks grow in the primary system. This effect is of particular concern in boiling water reactors (BWR) where intergranular stress corrosion cracking has appeared repeatedly in sensitized stainless steel piping of generally small diameter pipes. The NRC is planning little or no research in this area; instead, it is depending almost entirely on the work of EPRI and of the General Electric Co., the BWR vendor. The ACRS questions whether the NRC can maintain the expertise needed to properly carry out

its regulatory function if all research is carried out by the reactor vendor."

RES Comment: The ACRS recommendation notes that NRC does not have an independent capability to assess research in stress corrosion cracking for BWR piping. RES acknowledges this, the reason being that funding has not been available, nor has there been a request from licensing or elsewhere to support such a request. RES will consider reprogramming of FY 1980 funds to start work in this area.

CHAPTER 5: RESEARCH ON OPERATIONAL SAFETY

1. ACRS Recommendation (page 5-3)

"The man-machine interface effort should be given high priority, with examination of the potential for and consequences of human errors as well as the mitigating aspects of man's intervention... The advantages and disadvantages of a greater degree of computer-controlled automation should be explored."

RES Comment: This area of research was given high priority in the NRC's "Plan for Research to Improve the Safety of Light-Water Nuclear Power Plants" (NUREG-0438). The accident at Three Mile Island has also demonstrated the urgent need for system improvements to enhance in-plant accident responses and man-machine interfaces. This work, which needs additional funds to be accelerated, includes improved data display and diagnostic systems to assist the plant operator under accident conditions, additional in-vessel and plant instrumentation which will operate reliably under such conditions, enhanced data transmission capabilities to obtain outside assistance during emergencies, system interlocks or equivalent to better help preclude plant operation unless all safety systems are in an operable conditions, and development of improved requirements for operator training simulators.

2. ACRS Recommendation (page 5-3)

"A more systematic review and evaluation of operational experiences and operational incidents in U.S. plants and in similar plants in other countries should be undertaken."

RES Comment: The Probabilistic Analysis Staff is performing a statistical analysis of LERs. Also, after the ACRS recommendations were written, the Commission asked the ACRS to review (on a trial basis for 3 years) LERs to identify those events which have adverse implications on reactor safety. In addition, RES believes that a dedicated Operations Evaluation function is needed within the agency to review and evaluate the operational data system to identify promptly potential safety concerns. NRC staff has developed recommendations for Commission consideration regarding implementation of such a function, including identification of the additional resources which must be devoted by the agency to address this need. It is RES's intent to participate fully in the proposed agencywide, reorganized effort in this area.

3. ACRS Comment (page 5-2)

"There is some question concerning whether an accelerated aging test that truly represents the deterioration in actual service and whether sequential exposure to radiation and the corrosive medium will have the same effect as simultaneous exposure. The radiation environment used in testing also needs to be correlated more precisely with LOCA conditions. A testing project on electrical cables, coatings, connector assemblies, cable splices, and lubricants has been completed at Sandia Laboratories, and additional projects have been initiated at Sandia and elsewhere. At present, there does not appear to be any significant synergistic effect of simultaneous testing, and the much simpler current sequential testing procedure therefore appears to be satisfactory."

RES Response: We agree that there are some questions concerning whether accelerated aging tests truly represent deterioration in actual service. We are conducting studies at Sandia in which we are attempting to find field aged material samples so that we can develop appropriate acceleration factors that will realistically predict aging phenomena in test materials. Although we have found no synergistic effects in materials tested to date, we plan to perform some limited testing with additional materials and equipment not yet tested, to assure that no such synergistic effects do exist.

4. ACRS Comment (page 5-2)

"There have been numerous instances of loose parts in reactor systems, and it is possible to detect such incidents and sometimes to locate the part by monitoring for impact on the system boundary. A Regulatory Guide has been issued concerning requirements for loose parts monitoring systems. However, the state-of-the-art needs to be improved, and commercially available systems need further development. The research program includes construction of a test loop and development of criteria. Equipment manufacturers are actively developing loose parts monitoring systems."

RES Response: Although RES is assessing the state-of-the-art and the need for improvements thereto, no developmental work is currently underway or planned. If our assessment shows that work is needed and is not being done by the industry, we will consider this area for support in our program to improve reactor safety.

CHAPTER 6: RESEARCH ON ADVANCED REACTOR SAFETY

1. ACRS Recommendation (page 6-3)

"The NRC should undertake a comprehensive study of the safety questions that are likely to arise for commercial LMFBRs.... The ACRS believes that there is a high-priority need to review all possible sources of serious accidents (e.g., loss of shutdown-heat removal capability), their probabilities, and their level of seriousness in plants of commercial size. Considerable use of probabilistic analysis techniques should be made. Preliminary conceptual designs should be utilized in the studies as a means for focusing on an integrated approach to the solution of problems such as post-accident heat removal."

RES Comment: Pending a decision on the future commercialization plans of LMFBRs in the U.S., we are carrying out an event tree analysis of CRBR potential core disruptive accidents to develop the framework and a cadre of skilled people for the recommended approach. We are testing fuels other than oxide which potentially have commercial value (carbide in FY 1978, FY 1979; metal in FY 1980) and we are carrying on studies with the UK under the NRC/UKAEA arrangement aimed at large plants.

2. ACRS Recommendation (page 6-4)

"The NRC should initiate scoping studies on GCRs, similar to those described for LMFBRs."

RES Comment: Plans were being made to start a limited scoping study of GCR safety issues under the NASAP program. However, the funding for such studies may be deferred because of more pressing needs associated with the TMI-2 accident.

3. ACRS Recommendation (page 6-4)

"It is recommended that the NRC initiate studies which place emphasis on prevention of the CDA."

RES Comment: This is a planned follow-on to the accident delineation (event tree) work. Early results indicate that attention needs to be given to the potential for over-cooling following a rapid scram event.

4. ACRS Recommendation (page 6-4)

"It is recommended that the program study the advantages and disadvantages of alternate containment designs for the LMFBR, incorporating such features as filtered and vented containment."

RES Comment: This is planned as a follow-on to the event tree work, the CONTAIN code and structural integrity tests that define the loads on containment. Work should start in FY 1980 or FY 1981 depending on availability of funds.

5. ACRS Recommendation (page 6-4)

"It is recommended that the NRC carry out a study to determine whether new experimental facilities or programs will be needed to demonstrate the validity of natural convection cooling on commercial-sized LMFBRs for both pool- and loop-type reactors."

RES Comment: Although some conclusions may come from the SSC validation studies, including prediction of FFTF tests, the safety test facility studies that we had planned were cancelled when the budget was cut in FY 1979; no formal activity is planned in FY 1979 or FY 1980.

6. ACRS Recommendation (page 6-5)

"It is recommended that the NRC evaluate on a continuing basis the need for new large-scale experimental apparatus, particularly as a result of

any new initiatives which may result from the studies recommended . . . above."

RES Comment: As above, this activity was terminated as a result of budget cuts in FY 1979. No activity is planned in FY 1979 or FY 1980.

7. ACRS Recommendation (page 6-5)

"The ACRS recommends continued study of the CDA and the resolution of problems associated with it, such as those related to post-accident heat removal."

RES Comment: A significant part of the advanced reactor safety budget is devoted to support of work in this area. The SIMMER code and the ACRR experimental program make major contributions in this area.

8. ACRS Recommendation (page 6-5)

"It is recommended that greater emphasis be placed on developing a planned, methodical program to keep abreast of and profit from safety research performed in other nations."

RES Comment: Completion of an exchange agreement with France (likely by late FY 1979) will permit a full exchange with the leaders in FBR technology. NRC already has exchange agreements in the LMFBR area with the UK, Germany and Japan.

9. ACRS Recommendation (page 6-2)

"The ACRS recommends that the Congress continue to regard advanced reactor safety research as a high national priority because of the time required to resolve important safety questions. Many of the current safety problems associated with light-water reactors have resulted from the fact that safety research lagged behind reactor development. If an advanced reactor program is pursued in the U.S., related safety research should be carried out concurrently with development. This will permit licensing to proceed in an orderly fashion when specific projects for advanced reactors are submitted. Since the LMFBR and the HTGR appear to be most likely advanced reactor candidates, those concepts are emphasized below."

"The ACRS believes that an increase in ARSR funding is important at this time to permit continuation of present programs and to provide funding to implement recommendations for the new work outlined below. It is recommended that ARSR funds be identified in the NRC budget separately from those for research on current reactor concepts."

"The ACRS believes that the NRC should be encouraged to follow foreign research programs closely and to participate in cooperative ventures when practical."

RES Comment: We agree with the ACRS' comments on the need for the advanced reactor safety research program and for maintaining it at a higher than current level. The program is currently funded at a level about 25 percent below its in-place capabilities. That is, a 25 percent increase in

budget would be devoted entirely to completing work now in progress rather than new starts. Key contractor staff have started to leave the program and it is doubtful that continued progress can be maintained at the current level of funding.

The major impediment to a significantly larger program is the need to spend large funds on important experiments and analyses in the absence of a national program for breeder reactor development. We agree with the ACRS that the future probably portends breeder reactor use in the U.S. and now is the time to commit the resources needed to resolve the safety issues.

10. ACRS Comment (page 6-4)

"Current NRC research efforts on the CDA place primary emphasis on understanding the event and its consequences. Industry and DOE place the greatest emphasis on prevention in their safety research. The ACRS believes the NRC should be in a position to evaluate critically the results of the industry and DOE approach."

RES Comment: NRC's current research program is balanced as follows: about 20 percent related to accident initiation including a wide range of transients; about 30 percent related to mitigation and loads on containment; and about 50 percent related to understanding accident consequences. In view of the very significant DOE work in accident prevention, we believe this balance represents a wise use of funds. In the near future, small efforts will begin to study the effect of various means proposed by DOE for increased plant reliability. For example, the recent DOE study of auxiliary heat removal systems will be used as a basis for comparing response to transients requiring plant shutdown with long term loss of offsite and onsite power. This work will go slowly until adequate funding is restored.

11. ACRS Comment (page 6-4)

"The research program on aerosol release and transport can provide important input to the design of (alternate) containment systems. The ACRS urges that a suitable program in this area be continued with this objective in mind. If successful, it could provide data over the next few years that will be extremely useful not only in the design of containment systems but also in assessing the full range of potential radionuclide release from accidents both in LMFBRs and LWRs."

RES Comment: We agree with the ACRS comment and are continuing the aerosol release and transport program. The test matrix has been reduced to remove a number of tests at unlikely extremes, and the work has been stretched out. Work on the CRI-II facility (used for instrument development and calibration) will have to be abandoned, and work on the magnitude of the source term continues to be deferred.

12. ACRS Comment (page 6-5)

"The ACRS anticipates that the ultimate approach to LMFBR safety will involve both a high degree of prevention and some degree of mitigation,

and it is desirable that the NRC be knowledgeable in the various phases of the accident as well as its mitigation. This will require continued development of the SIMMER code. However, it is doubtful that the code can ever be validated in the sense of precise calculations of such parameters as pressure, temperature, energy release, etc. Rather, the ACRS believes that the primary value of the code will lead to increased understanding of the event. The ACRS expects that reduction of the code development goals will lead to more modest experimental needs and lower costs than previously anticipated."

RES Comment: It is premature to place limits on the degree to which SIMMER can be validated since many experimental techniques and proposed test plans remain to be examined critically. Validation is a step-by-step process in which credibility is increased by comparison to experiment, and sensitivity calculations provide better insight into the importance of various modeling details on key variables in the accident analysis such as sodium slug kinetic energy. We agree with the ACRS that a primary value of the code is the increased understanding of the CDA being developed with its use. Already we know that sodium slug kinetic energy is relatively insensitive to many modeling details and we believe we are able to ask the more pertinent questions with greater precision than we did before. We also believe, however, that it is possible that proof tests, large enough to include all pertinent phenomena, could validate crucial parts of SIMMER predictions and that such tests require a new Safety Test Facility. We believe that validation through large scale proof testing is a desirable long range goal. In the interim we are doing the best we can to increase credibility based upon experimental evidence with the resources currently available.

CHAPTER 7: RESEARCH ON EXTREME EXTERNAL PHENOMENA

1. ACRS Recommendation (page 7-4)

"Because research on extreme external phenomena addresses questions relating to the siting of all types of reactors and fuel cycle facilities, it should be assigned a high priority in the NRC safety research program, and should be funded at appropriately increasing levels over the next few years.... The ACRS believes that the major emphasis given to earthquake-related research is appropriate and undoubtedly will constitute the most substantial demand for additional funding in future years."

RES Comment: An orderly growth is being planned in cooperation with User Offices, and increasing funding levels are anticipated as programs are identified and defined. This work is underway. In particular we agree with the ACRS that earthquake related research will continue to demand a greater portion of additional funding in future years.

2. ACRS Recommendation (page 7-4)

"The recently initiated Seismic Safety Margins Research Program (SSMRP) is highly desirable and should become the keystone of the earthquake research program."

RES Comment: The SSMRP is the keystone of the earthquake research program, and it will be reviewed frequently with the technical community and the ACRS.

3. ACRS Recommendation (page 7-4)

"The other earthquake-related programs, including the scientifically oriented studies of regional seismicity, continue to be important but should be reviewed periodically to determine their relation to the SSMRP."

RES Comment: Research in other seismic areas to reduce potentially large uncertainties in elements of the SSMRP and to be responsive to current licensing needs will be conducted in parallel; this includes the regional seismicity program, fragility studies, failure mode determination and evaluation of load combination requirements. Periodic review will assure coordination between these programs and the SSMRP.

4. ACRS Comment (page 7-4)

"Research on the effects of aircraft crashes on the equipment housed inside structures and research on various effects of turbine missiles is proposed for FY 1980. The latter is complementary to the extensive work being done by industrial organizations such as the Electric Power Research Institute. These projects are considered worthy of support at an intermediate priority level."

RES Comment: These items have been included at a relatively low funding level (\$100,000). We agree with the ACRS comment that these programs are complementary to extensive work being done in Germany and by the Electric Power Research Institute.

CHAPTER 8: RADIOLOGICAL EFFECTS RESEARCH

1. ACRS Recommendation (page 8-5)

"Gather better data on the identification and importance of the various operational tasks that contribute to occupational exposures so that better guidance for control measures can be developed and applied. Specific attention should be directed to a determination of the basic factors that govern radionuclide buildup in reactor cooling systems, including the influence of operating practices such as rapid temperature variations, load following, end-of-cycle operation, and variations in coolant chemistry."

The Committee noted further (page 8.3, paragraph 8.3.1.b) that research should be conducted to promote the evaluation and application of advanced effluent control systems where these can be shown to be cost effective.

RES Comment: With respect to the sources and control of occupational exposures, NRC is presently conducting studies on sources of neutron exposure and dosimetry in operating power plants. We have not yet initiated research programs to correlate worker exposures with specific tasks or operations such as inservice inspections, nor have we attempted to measure the effectiveness of routine decontamination operations on

worker exposures. Our FY 1980-FY 1981 programs do, however, provide funding for such projects. Specifically, we intend to identify sources of residual contamination and exposure in plant operating areas and we will examine more fully the relationship between routine maintenance and worker exposures. The effectiveness of routine, frequent plant decontamination in reducing occupational exposures will be documented. We believe that these planned programs, coupled with our current understanding of radionuclide buildup and deposition in reactor cooling systems will provide an adequate base for the application of ALARA principles to regulations on occupational exposure.

In addition, both the SAFER Division and the NRR and SD staff maintain an awareness of developments in effluent control, air cleaning and waste treatment technology with a view toward their future application in operating plants. SAFER has recently completed an assessment of the applicability of reverse osmosis in treating low level liquid wastes generated in nuclear power plants and is continuing studies on the filtration of aerosols under high velocity transients. Programs designed to define more precisely the chemical and physical characteristics of effluents from nuclear facilities are also being carried out.

2. ACRS Recommendation (page 8-5)

"Arrange to have the NRC data banks on occupational radiation exposures examined by qualified epidemiologists specifically with the view towards developing data that can be more effectively utilized in determining relationships between radiation exposures and various health effects."

RES Comment: At present, the NRC maintains individual exposure data only on persons whose employment in radiation areas has terminated. In addition, the NRC receives reports on exposure by occupational category or by exposure range. The feasibility of conducting epidemiological research to define better the relationship between health effects and low levels of ionizing radiation is being examined in a joint study conducted by the Office of Standards Development in concert with the Environmental Protection Agency. The results of this study will provide guidance concerning the required improvements on the occupational exposure data being collected.

3. ACRS Recommendation (page 8-5)

"Initiate research studies to define better the variables in the data yielded by various methods used for testing the efficiency of absorber and filter systems within nuclear power plants."

RES Comment: RES is maintaining its current research program to develop better data on the effect of aging, loading and other variables on the absorption of radioiodine by charcoal filters and is testing the performance of high efficiency filters under high velocity flow transients.

We believe, however, that the variability of the data yielded by various standard filter test methods is sufficiently well understood to permit regulatory decisions and evaluations to be made. Therefore, refinement of the definition of the variables, while desirable, has a low priority in our present situation with limited funding.

4. ACRS Recommendation (page 8-5)

"Continue to develop improved methods for, and the data base supporting, the calculation of radiation doses to population groups residing in the vicinity of nuclear facilities."

The Committee amplified on this recommendation by suggesting (page 8.3, paragraph 8.3.2) that the improved data base should include data on effluent characteristics, the transport of radioactive material through the environment and the internal deposition of radionuclides in the human body.

RES Comment: We agree with this overall assessment by the Committee. RES has recently initiated a comprehensive study to characterize aerosols produced in fires, explosions or other events related to the processing and handling of radioactive materials. In this study, particle size distribution, chemical form, deposition and reentrainment characteristics of such aerosols will be measured. Such data will be used to provide a well characterized source term for dose assessment studies.

Additionally, studies being carried out to validate and improve models which predict the transport of radionuclides in water and on sediments in rivers. Another line of research is investigating food chain pathways to man through agroecosystems. An improved internal dosimetry methodology is being developed in pace with improvements in models for predicting cross-irradiation due to internal radionuclide deposition in various body organs as a function of age, size and metabolic models.

Increased interest in the various naturally occurring radionuclides associated with uranium mining and milling biological effects has prompted investigation of the biological half-lives of such radionuclides in various chemical forms. Related studies are being conducted on the internal deposition of these radionuclides in residents in the mine/mill areas.

5. ACRS Recommendation (page 8-5)

"Expand... research to develop instrumentation and methods for the rapid interpretation and estimation of radionuclides releases in the event of a serious accident, and initiate research studies on methods for decontaminating and reclaiming land, buildings, and equipment, and for establishing dose limits for population groups desiring to return to areas that have been evacuated following a nuclear accident."

RES Comment: RES has recently completed the development of a portable, sensitive instrument capable of detecting low levels of airborne radioiodine. This instrument was designed principally for use by State emergency response teams and was recently used at TMI.

Although no research has yet been proposed on methods on the post accident reclamation of severely contaminated land, buildings or equipment, RES recognizes the need for such information to support regulatory decisions. Accordingly, we intend to review, in detail, the requirements for such

information and will develop and propose appropriate research projects for future funding.

Furthermore, we expect that as a result of the TMI incident, we will identify and initiate research directed at providing additional insights into emergency response requirements, capabilities and effectiveness. In addition, the experience obtained in decontaminating the Three Mile Island facility will be documented, analyzed, and the results applied to the development of criteria for decontamination/decommissioning as well as post-accident recovery.

6. ACRS Recommendation (page 8-6)

"Allocate a modest portion (perhaps 10 percent) of its total research funding on radiological effects to efforts designed to address problems on a longer range basis, before they become major issues."

RES Comment: RES will establish a group to consider the long range regulatory issues associated with radiological affects and identify research topics at an appropriate level of effort.

CHAPTER 9: WASTE MANAGEMENT RESEARCH

1. ACRS Recommendation (page 9-5)

"Identification of the dominant contributors to risk in radioactive waste management operations and quantification of the uncertainties in the risk estimates."

The Committee also observed (page 9-2-3) that this effort would include the research required to make population dose estimates and suggested that particular attention should be given to the establishment of appropriate numerical values for those parameters where data are lacking. This would include the areas of physical transport through the biosphere, the uptake, retention, and transport of radionuclides by biota and the definition of relevant characteristics of the receptor population (diet, age, life style, etc.).

RES Comments: At present RES is conducting programs to improve and validate models which predict the release of radionuclides to the environment, their transport through the environment, and uptake by biota and their ultimate impact on man.

Field data are being obtained in the vicinity of the West Valley Facility, NY, to test hydrologic and sediment transport models. The release of radionuclides from solidified wastes, the migration of radionuclides in soils and geologic media are being studied in the laboratory and at other existing low-level commercial waste disposal facilities in a cooperative program that includes the Los Alamos Scientific Laboratory, the Brookhaven National Laboratory, and the University of California Laboratory of Nuclear Medicine and Radiation Biology. The retention of radionuclides in soils and the uptake in radionuclides from selected agricultural soils and crops are also being studied in the laboratory to determine the range of sorption and transfer coefficients observed under

a variety of conditions. Studies of the possible significance of bioenvironment pathways in the long term movement of radionuclides at these burial grounds are scheduled to begin in 1980. However, no work has been planned yet in the areas of diet, age distribution, food distribution patterns, or other characteristics of the recipient population. Atmospheric transport models are being reevaluated and compared under a technical assistance program related to reactor accident evaluation. The applicability of the atmospheric transport models to fuel cycle and waste management facilities is planned as a follow-on study. (See also item 3., below.)

2. ACRS Recommendation (page 9-5)

"Continued development of criteria for the design and operation of radioactive waste disposal and storage facilities. This applies to low-level as well as high-level wastes."

RES Comment: RES agrees that these criteria are important items to be addressed, and a research program plan is being formulated to provide the technical bases for developing such criteria or issuing implementing guides.

3. ACRS Recommendation (page 9-5)

"Development of quantitative data for the more significant parameters involved in the calculation of the physical and biological transport of radionuclides within the environment."

The ACRS Report stated further (page 9-3) that "Special attention should be given to the long-term transport of the transuranics and long-lived fission products in geologic structures and to the uptake and retention of such radionuclides by plants and animals."

RES Comment: We agree with the ACRS recommendation. The hydrogeological processes provide the principal mechanisms that could transport radioactive wastes away from a repository in deep geologic structures.

As noted in the preceding section, studies are in progress to test the hydrogeological procedures and theory for assessing the subsurface transport of radionuclides from nuclear repositories, and to test and improve methods for dating groundwater and resolve problems of interpretation of divergent results. We are budgeting for measuring and improving the understanding of the migration of specific long-lived radionuclides through geologic media and pathways to plants and animals.

4. ACRS Recommendation (page 9-5)

"Continued development and implementation of licensing criteria to facilitate the decontamination and decommissioning of nuclear facilities."

RES Comment: Our response to the Committee's recommendations regarding research directed toward decontamination and decommissioning nuclear facilities has been addressed in our Comments on Chapter 8, Recommendation 5.

5. ACRS Recommendation (page 9-5)

"Evaluation of research needs on waste disposal problems associated with alternate fuel cycles."

RES Comment: The present RES program plan for nuclear waste management research takes into account waste forms from either spent fuel or processed fuel from the current LWR designs.

While we agree with the need to conduct research on the disposal of waste from other fuel cycles, we feel that it would be preferable to wait until the NASAP and INFCE studies on nonproliferation alternatives are completed before initiating this work. The NASAP and INFCE reports should identify the most promising technologies thereby permitting us to focus our limited resources.

CHAPTER 10: SAFEGUARDS RESEARCH

1. ACRS Recommendation (page 10-5)

"Plans for the research on safeguards and security should provide for a program at about the present level of effort for at least the next several years, with some allowance for the possibility that it may be necessary to increase the level should the national policy call for early adoption of new fuel cycles or new reactor types."

RES Comment: The program through FY 1978 was sufficiently comprehensive to provide a basis for addressing any specific problems arising from alternative fuel cycles or new reactor types should such a national policy decision be made. However, there has been a reduction of the scope and level of effort on the FY 1979 research on material control and physical protection safeguards effectiveness evaluation methods. If this trend continues in FY 1980, a 2-year lead time will be necessary to reestablish the research competence in these areas.

2. ACRS Recommendation (page 10-5)

"Studies should be made to determine whether the use of alternative fuel cycles would change significantly the nature or importance of the types of safeguards measures now being studied. These studies should include also an estimate of how soon new questions might arise and how long would be required to solve them."

RES Comment: See the RES comment on ACRS Recommendation 1, above.

3. ACRS Recommendation (page 10-6)

"The matter of determining the minimum number of essential components which, if fully protected, could enable a plant to withstand sabotage of other components deserves the maximum emphasis which can usefully be put on it."

RES Comment: Two research projects at Sandia have addressed the problem of identifying those essential components which, if fully protected,

would enable a plant to withstand sabotage. The project to develop means for evaluation of physical protection has used the SETS code to identify type I and type II vital areas. This method has been applied, in cooperation with Los Alamos, to about a dozen operating power reactors. Some improvements to the code to reduce analyst time have been made, but a significant revision to the SETS code to further reduce analyst time has been deferred due to the heavy diversion of contractor staff to support field application of the current method. The other project, a design study to reduce reactor vulnerability to sabotage, has characterized the vital areas of the SNUPPS design. These two programs are closely coordinated, and the results of both have had high acceptance and credibility with NRR and affected licensees.

4. ACRS Recommendation (page 10-6)

"It is recommended that, in connection with the development of computer codes directed at security problems, the NRC Staff give careful prior attention to the type of question for which the code might provide answers, the use to which some answers would be put, and the amount of effort likely to be needed to obtain them."

RES Comment: RES, user office, and contractor personnel have given this matter considerable attention. Typical of the kinds of questions for which the computer software should help in providing answers are the following three questions. One question is, "What are the sabotage/theft targets within the facility?" This question is concerned primarily with the identification of material access points in fuel facilities and vital components in reactors. Another question is, "What are the threats that represent the safeguards system vulnerabilities?" This question is directed towards the determination of those adversaries and adversary actions which, if not further protected against, would permit theft of special nuclear material from material access points or sabotage of vital components at the facility. A third question is "What factors represent the principal sensitivities of the safeguards system?" This question is directed toward the identification of those safeguards equipments and procedures whose modification, inclusion, or deletion would result in noticeable changes in the answers to the first and second questions.

CHAPTER 11: RISK ASSESSMENT

1. ACRS Recommendation (page 11-4)

"As the PAS and others have observed, and as the Risk Assessment Review Group (RARG) Report emphasizes, accurate risk assessment requires a data bank of performance histories of components and systems. The PAS is working within the NRC and with others to collect and evaluate data. It should continue to emphasize this activity and also should provide guidelines to ensure that appropriate information is reported to those responsible for collecting reactor system performance information."

RES Comment: RES agrees with the ACRS fully and plans to continue its emphasis on the collection and evaluation of data. The data bank of performance histories of component and systems is being significantly supplemented by ongoing programs for plant data analysis, LER statistical

trend evaluation and LER failure rate determination. These programs will be continued into FY 1980. A program of component failure data applications for operating reactors will be implemented to assimilate this data for risk assessments. Other ongoing major efforts in the Data Analysis Program include developing statistical techniques for analyzing reported common cause failures, determining failure rate uncertainties based on formal statistical techniques, and extracting time trends (e.g., wear-outs) from detailed plant maintenance logs. All these programs will evaluate existing reporting techniques and are expected to result in improved data reporting requirements from operating reactors.

2. ACRS Recommendation (page 11-4)

"A point of continuing concern in connection with accident consequence prediction is the appropriate description of biological effects of radiation. The BEIR Committee is scheduled to release a report within a few months. The ACRS recommends that the consequence calculations be reexamined in light of the recommendations of that report when it is released."

RES Comment: Arrangements are being made to establish a Health Effects Modeling Work Group, involving the technical staff members, contractors, and consultants most appropriate for developing a consensus use of BEIR III results. The BEIR III report, like its predecessor, will most likely give several dose response models and a range of risk factors. Subsequently, different health effects models might be needed for different purposes: a more conservative one for design, planning and standards setting and a different model or models for estimating the consequences of a given situation or event. RES also believes that in the development of health effect models, the analyses in other authoritative reports besides BEIR III, such as UNSCEAR 77, ICRP 26, the forthcoming NCRP 40 and EPA's Federal Radiation Protection Guides Update should be incorporated as appropriate.

3. ACRS Recommendation (page 11-4)

"Many of the PAS research projects results in sophisticated computer codes applied to specific systems with assumptions about such items as failure modes and uncertainties on data. The ACRS believes that there is a need for quality assurance in the methodology and application of probabilistic analyses. The ACRS recommends that a systematic method of evaluation be developed which includes the necessary documentation of assumptions needed to enable peer review."

RES Comment: PAS is aware of the need for extensive review of its research projects and quality assurance checks on the results of these projects. Such review and quality assurance is particularly important on projects which might significantly impact the regulatory process.

NRC contractors, however, retain ultimate responsibility for the peer review of their work. Typically this review is carried out within the contractor's own organization, by selected comments from co-workers in the relevant disciplines, by presentation of preliminary and final results at conferences and symposia, and in many cases, in the independent refereeing that precedes publication of research in scholarly journals. Throughout the course of the research, NRC research managers conduct

periodic reviews to assure that a projects direction, schedule, and goals fulfill the contracts scope of work. The Office of Research maintains Research Review Groups (RRGs) in over 75 special areas, 11 of which are responsible for risk assessment issues. Each RRG is comprised of from three to seven NRC staff members and includes consultants from outside NRC chosen for their technical expertise. The RRGs review all outside contract research in their assigned areas, and perform continuing peer review for each contract. In one case an independent outside quality assurance check has been performed on an extensive utilized computer code. However, the final responsibility for the quality of contractor's research rests with the contractor, in risk assessment as it does with all NRC research.

Over and above this, PAS is aware of the need to develop detailed formalized quality assurance steps in methodology development and application, and we will give more attention to this during the coming year.

4. ACRS Recommendation (page 11-5)

"Many comments, including those in the RARG Report, have stressed the importance of further development of methods to evaluate more quantitatively the contribution of human error to risk. It is equally important that the contribution of operator adaptability be evaluated, because it may be a significant contributor in decreasing risk. An accurate evaluation may well provide insights into improvements in operator selection and training which could be implemented to further enhance safety of reactors."

RES Comment: We agree with the ACRS. In addition to continuing the research on Human Error Rate Analysis and the development of a Human Error Rate Handbook, plans have been formulated to structure the data analysis program to improve the data base for determining the contribution of human error to risk. Efforts are underway to examine potential adverse operator/maintenance actions from a systems viewpoint. Human factors analysis techniques are being codified for use in risk evaluations and plans are being made to use nuclear reactor simulators to collect human error data. Data analysis techniques are being used to analyze human errors, component failures, and system failures which have occurred and which are reported through the NPRDS or LER systems. In the light of the Three Mile Island accident, we are actively developing additional research tasks in this area.

5. ACRS Recommendation (page 11-5)

"After exchanges of correspondence with the EPA, the NRC agreed to undertake a study to determine acceptable levels of risk. This subject is of significance not only to the NRC but to virtually every organization making decisions that could affect the health and safety of the public. The ACRS believes that such studies are very important and there is a need for consideration of acceptable risk by each such organization. However, the ACRS believes that there is need for a comprehensive research program with the goal of defining potential criteria for societal risk acceptance, conducted with broad support from the many Federal departments and agencies involved in such decisions, and conducted under the auspices

of an organization not tied directly to the problems of any specific activity or regulatory decision."

RES Comment: PAS initiated a program in FY 1978 on Acceptable Risk. Although desirable, this program does not constitute the program desired by the ACRS, which would be a comprehensive research program conducted with broad support from many Federal departments and agencies. RES has made contact with the NFS which has expressed interest in sponsoring such work. Initial joint efforts by RES and NFS will involve a workshop early next year to gain a clearer definition of the criteria to be followed.

6. ACRS Recommendation (page 11-5)

"Finally, the ACRS recommends that careful consideration be given to the recommendations of the RARG Report."

RES Comment: RES agrees with the ACRS and has already presented a plan to the Commission to implement those Lewis Group recommendations in information paper SECY-79-94, dated February 2, 1979. RES is now preparing a FY 1980 budget amendment request which will include, among other things, recommendations to the Commission for implementing the Lewis Report recommendations.

Probabilistic Analysis Staff members appeared before the Risk Assessment Review Group during the past year and identified many of the deficiencies in the Reactor Safety Study which, along with others, were noted in the Review Group Report. Work has already been initiated directed toward correcting these deficiencies. PAS is implementing many of the recommendations made in the report and has developed plans to modify existing programs and add new programs to respond to concerns raised by the Review Group Report. Major efforts are underway to improve the data base by accelerating efforts to collect and evaluate data on the effects of floods, earthquakes, fires and common cause failures. Analysis of human errors is being updated to incorporate more realistic dispersion characteristics and biological effects. Value impact techniques are also being developed to help place priorities on other research programs.

CHAPTER 12: IMPROVED REACTOR SAFETY

1. ACRS Recommendation (page 12-5)

"The ACRS recommends that the proposed NRC program (on research to improve safety) receive substantial funding (\$1.5 million) in FY 1979, by reprogramming of other NRC 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. The ACRS recommends further that emphasis be given to the work on alternate concepts, on bunkered dedicated shutdown heat removal systems, on improved in-plant response to accidents or potential accidents, on improved methodology for evaluating research topics; and to scoping studies on the topics relating to prevention or mitigation of the offsite consequences resulting from postulated core melt accidents via liquid pathways, and to possible design measures for protection against sabotage."

RES Comment: NUREG-0438 recommended that the following five research topics be pursued: (a) alternate containment concepts, (b) alternate decay heat removal concepts, (c) alternate emergency core cooling concepts, (d) improved human interaction, and (e) advanced seismic designs.

In response to the Congressional initiative, the Commission has expressed its belief that extension of its charter into research on the development of new or improved safety systems is very useful. It will permit the exploration and evaluation of the many suggestions that have been made for improving safety of nuclear power plants and should indeed lead to improvements in their safety.

The FY 1979 Budget Authorization Act for NRC authorized \$1,500,000 to implement the plan. Matching appropriations were not provided. A total of \$800,000 was requested by reprogramming funds from FY 1978 unobligated carryover and FY 1979 appropriations. To date, reprogramming of \$400,000 has been approved by the Congress. These funds are being used to initiate research on alternate containment concepts, alternate decay heat removal concepts, and improved human interaction.

Within the limitations of current budget requests, RES would not be able to implement all of the research projects and scoping studies described in NUREG-0438, in a timely way, because the Office of Management and Budget has assigned part of the program to the Department of Energy. NRC is coordinating its effort with the DOE program to avoid unnecessary duplication. The remaining (NRC) program of \$1.0M in the current FY 1980 budget request is itself too limited in scope, in our view, to accomplish the needed work in a timely fashion.

In view of the TMI accident, RES is planning a FY 1980 budget supplemental request which would restore the funds previously requested in this important area. Emphasis will be given in this request to research related to improving operator accident response capability.