



OFFICE OF THE
CHAIRMAN

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

January 4, 1983

The Honorable Marilyn L. Bouquard
Chairman, Subcommittee on Energy
Research and Production
Committee on Science and Technology
United States House of Representatives
Washington, D.C. 20515

Dear Madam Chairman:

This responds to your November 19, 1982 letter requesting the Commission's views on implementing the recommendations in the Committee's report entitled "Research Programs Conducted By the Nuclear Regulatory Commission," House Report No. 97-795. Enclosure 1 is the Commission's views presented as responses to the numbered recommendations in the Committee's report.

Regarding your specific question on research concerning fission product release and transport, Enclosure 2 contains two schedules -- one for completing the research and a separate schedule for utilizing the research results in updating the Commission's regulations. The NRC staff has indicated to the Commission that an interim reassessment of the radioactive source term would be developed by February 1983 for selected regulatory analyses. A more comprehensive reassessment of the source term should be developed by the end of 1983 for broader regulatory use. Through 1983-85 research will be conducted to verify computer codes and to assess the effectiveness of various engineered safety systems for removal of high density aerosols.

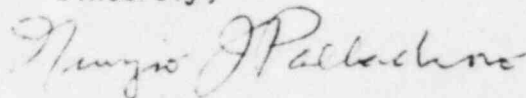
Regarding your specific questions on the incorporation of recent safeguards research into the regulations, on the bases of the results of two recently completed research programs on the potential health effects of sabotage on a spent fuel cask in an urban setting, the NRC staff has concluded that moderation of current regulations is justified. Proposed amendments to the current rules for protection of spent fuel shipments against sabotage are scheduled to be submitted soon for the Commission's consideration. It is our understanding that the types of changes that are being proposed have been discussed with the subcommittee staff. We will inform you of any proposed rule prior to publication in the Federal Register.

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PDR COMMS NRCC
CORRESPONDENCE PDR

The Honorable Marilyn L. Bouquard -2-

I trust that the information I have provided is responsive to your request.

Sincerely,



Nunzio J. Palladino
Chairman

Enclosures:

1. NRC Responses
2. Schedules

ENCLOSURE 1

NRC RESPONSES TO RECOMMENDATIONS CONTAINED IN

HOUSE REPORT NO. 97-795 DATED SEPTEMBER 8, 1982

"RESEARCH PROGRAMS CONDUCTED BY THE NUCLEAR REGULATORY COMMISSION"

Enclosure 1

Recommendation 1a: Expedite review of 10 CFR 50, Appendix K

NRC Response: Experimental research and analysis completed to date has resulted in sufficient information to allow NRC to draw up a partial proposed revision to 10 CFR 50.46 and Appendix K which would provide significant relief from some of the conservatisms that exist in this regulation. The staff is proceeding to write such a proposed revision. This will undergo NRC interoffice review, followed by reviews by the Committee to Review Generic Requirements (CRGR) and the Advisory Committee on Reactor Safeguards (ACRS), and finally Commission action before being published in the Federal Register for public comment. We are expediting this and hope to complete the entire process during the summer of 1983.

Meanwhile research continues on those Appendix K topics for which sufficient information does not now exist for a proposed revision. Some of these are: emergency core cooling (ECC) bypass, critical heat flux (CHF), post CHF heat transfer correlations, and boiling water reactor (BWR) heat transfer during the spray injection period. In some of these cases the experimental research is done but analysis must continue. In the case of ECC bypass, the joint U.S./Japanese/Federal Republic of Germany 2D/3D program is expected to provide final confirmation of conservatisms believed to exist in the ECC bypass models based on small scale test data. The 2D/3D information will not be completed until the fiscal year 1986 - 1987 period.

As the additional information becomes available during the next four years a decision will be reached as to the need for and timing of a second proposed revision to 10 CFR 50.46 and Appendix K.

Recommendation 1b: Review research programs and list major regulatory impacts.

NRC Response: The Office of Nuclear Regulatory Research is revising the format of its Long Range Research Plan as a vehicle to review research programs and list major regulatory impacts. The new plan is expected to show the relevance of research to the regulatory program or improved safety and key dates for integrating research results into regulatory guides and standards.

The new plan utilizes a management by objectives approach, first identifying regulatory needs and then designing a research program to meet those needs. The new plan is intended to include a description of the process used by the NRC in establishing research priorities.

Recommendation 2a: Reword the charter of the Office of Nuclear Regulatory Research to support more broadly the overall mission of NRC.

NRC Response: The Office of Nuclear Regulatory Research was established by the Energy Reorganization Act of 1974 (Public Law 93-438). This Act stated:

the Director of Nuclear Regulatory Research shall perform such functions as the Commission shall delegate including:

1. Developing recommendations for research deemed necessary for performance by the Commission of its licensing and related regulatory functions.
2. Engaging in or contracting for research which the Commission deems necessary for the performance of its licensing and related regulatory functions.

The Energy Reorganization Act of 1974 was amended by the Nuclear Regulatory Commission's Fiscal Year 1978 Authorization Act (Public Law 95-209) to include a new subsection which stated:

The Commission shall develop a long-term plan for projects for the development of new or improved safety systems for nuclear power plants.

The responsibilities of the Office of Nuclear Regulatory Research are outlined in NRC Manual Chapter 0125:

The Director is responsible for planning and conducting a comprehensive research program that is responsive to current and future NRC needs, and directs the development of regulations, criteria, standards and guides. Plans and implements programs of nuclear regulatory research and standards which the Commission deems necessary for the performance of its licensing and related regulatory functions...

We believe the current charter is sufficiently broad to allow the Office of Nuclear Regulatory Research to conduct whatever research is necessary to support the overall mission of the NRC. However, to assure that our research activities are supportive of the overall NRC mission, we have restated our research policy in the latest draft of our annual Policy and Program Guidance to the staff as:

The purpose of the research program is to provide the technical basis for rulemaking and regulatory decisions; to support licensing and inspection activities; to assess the feasibility and effectiveness of safety improvements; and to increase our understanding of phenomena for which analytical methods are needed in regulatory activities. There should be increased emphasis on using research results in the regulatory process and on getting research results that are useful. Staff should not engage in research merely to postpone tackling difficult regulatory issues.

Recommendation 2b: Expand research on the impact of regulatory formats and processes on assured and improved safety.

NRC Response: The Office of Nuclear Regulatory Research reorganized the Division of Risk Analysis on October 12, 1982 to strengthen the Regulatory Analysis Branch by the addition of personnel experienced in rulemaking and in systems engineering. The charter of the Regulatory Analysis Branch is attached.

REGULATORY ANALYSIS BRANCH

Carries out a systematic evaluation (which includes the use of probabilistic risk assessment) of relevant safety issues and the information needed to address those issues. Develops and manages the annual preparation of an integrated Long Range Research and Standards Development Plan for RES. Use of results of NRC and other research programs to identify regulation changes needed to correct deficiencies in safety significant areas or eliminate unnecessary regulatory constraints. Proposes or initiates rulemaking as appropriate. Manages complex rulemakings which span the technical or organizational responsibilities of several RES branches or which involve novel or complex questions of regulatory policy. Plans, organizes and manages a research program directed toward improving the effectiveness of the NRC regulatory process (i.e., the process used in reaching and implementing decisions on regulatory issues) through the use of value/impact analyses and PRA. Evaluates alternatives to the regulatory process and recommends changes as appropriate. Implements changes as directed. Monitors and analyzes administrative, judicial and legislative developments that could affect NRC regulatory and research programs. Develops, documents and implements policies and procedures needed for an effective, coherent, consistent and understandable regulation development process. This includes policies and procedures for such activities as preparation of a "regulatory analysis" on the impact of a proposed regulatory activity, periodic and systematic review of Commission regulations, handling of petitions for rulemaking and RES interactions with the CRGR. Advises the RES staff on the implementation of these policies and procedures. Develops and implements an agency-wide technology transfer program to (1) train a cadre of PRA practitioners capable of evaluating PRA submittals and applying PRA techniques to regulatory problems, (2) apprise NRC management and selected staff of PRA results having an impact on the regulatory process, and (3) expand the use of PRA technology to support the NRC safety goal.

Recommendation 3a: Restructure the long range research plan.

Recommendation 3b: Submit to Congress with the budget request for each fiscal year a description of deliverables, major intermediate milestones, total estimated resource requirements and potential impact on safety for each program.

NRC Response: This year's LRRP is being restructured into a program-specific framework with each chapter addressing a significant program area. The program area discussed in each chapter contains elements which address the relevant issues. The element contains a listing of the regulatory needs and justifications and research program descriptions which include:

1. the strategy planned to accomplish the research (including resources required);
2. the major research product expected; and
3. the fiscal year of delivery of the product.

The LRRP will also include a discussion of research in support of unresolved safety issues and TMI Action Plan, future areas of possible research, and a strategy for priorities.

All future budget requests will include the information requested.

Recommendation 3c: Develop a systems engineering organization to formulate an overview of factors affecting plant safety and to set research priorities and objectives accordingly.

NRC Response: The answer to 2b. also applies here. The reinforced Regulatory Analysis Branch is essentially a systems engineering organization that will formulate an overview of factors affecting plant safety and suggest research priorities and objectives accordingly. The principal vehicle for this process is the annual development of the NRC Long Range Research Plan. As presently conceived, three factors will be used in setting priorities -- risk significance, regulatory significance, and cost effectiveness.

Risk significance evaluates whether the work proposed reduces or eliminates important uncertainty in an area significant to risk. Regulatory significance evaluates whether the proposed work will be useful in providing a basis for current or expected licensing and enforcement decisions. Cost effectiveness considers the results expected per dollar spent, the timeliness of the research product and how it fits with existing research capabilities.

Recommendation 4a: Place increased emphasis on the licensee's safety responsibility by requiring more safety research of the industrial community.

NRC Response: We believe the nuclear industry and the Department of Energy have a major role and interest in performing safety research and reliability research related to safety questions to ensure that nuclear power plants and other nuclear facilities are designed and operated safely and reliably. In support of this belief, there is an increasing level of cooperation and coordination among NRC, DOE, the Electric Power Research Institute (EPRI), the nuclear industry, and other countries in research program planning to ensure that the appropriate level of effort is directed at resolving safety issues with efficient use of resources and to prevent unnecessary duplication of effort.

For high-level waste management and for CRBR, DOE is the applicant, and NRC is requiring the applicant to do the safety research necessary to support their license applications.

NRC has cooperative projects with industry groups. Examples of some program areas where nuclear safety research is being coordinated with EPRI are:

1. The release and combustion of hydrogen in containment buildings.
2. Fracture mechanics for reactor vessel and piping integrity.
3. Source term research dealing with the retention of fission products in reactor primary systems and representative model development.
4. Integral test programs on a wide range of thermal-hydraulic transients in reactor systems.

We will continue to place increased emphasis on the licensee's safety responsibility by encouraging more safety research of the industrial community.

Recommendation 5a: Continue to increase substantive cooperative programs with EPRI and INPO involvement.

NRC Response: We are continuing to pursue increases in cooperative programs with EPRI. A list of the active and proposed cooperative programs is attached along with a chronology of those programs.

Our cooperative efforts with INPO center on the exchange of operational information. A "Memorandum of Agreement Between the Institute of Nuclear Power Operations and the U.S. Nuclear Regulatory Commission," which was effective on April 1, 1982, covers the following areas:

- Collection of Operational Data
- Computerized Data Storage and Retrieval (industry operational and engineering data bases)
- Foreign Information
- Significant Event Screening
- Exchange of Analysis and Evaluation Results

NRC/EPRI COOPERATIVE PROGRAMS

Historical

- 1970 Atomic Energy Commission-Division of Reactor Development and Technology (AEC-RDT) requests more funding of safety research by industry. General Electric (GE) submits unsolicited proposal for what will become Two Loop Test Apparatus (TLTA) program.
- 1971 TLTA program funded 25 percent by GE and 75 percent by the Nuclear Regulatory Commission (NRC). GE funds less, on theory that GE will also supply facilities.
- 1971-1974 Full length emergency cooling heat transfer (FLECHT) program with Westinghouse (W) started similar to TLTA. Extensive discussion with Combustion Engineering (CE) concerning pump research but no program.
- 1975 Electric Power Research Institute (EPRI) formed. EPRI joins TLTA and FLECHT programs.
- Informal discussions between EPRI and Office of Nuclear Regulatory Research (RES) so as to not duplicate effort. EPRI funds CE pump program, NRC to fund emergency core cooling (ECC) bypass.
- 1978 NRC joins Japan and Germany in 2D/3D program to generate ECC bypass data.
- 1979 Strong interest from Office of Nuclear Reactor Regulation (NRR) to test Boiling Water Reactor (BWR) spray distribution and other multidimensional effects. Joint NRC/EPRI/GE BWR Refill/Reflood program started.
- 1980 NRC and EPRI see need to test BWR operational transients. Joint concern for GE to reorient TLTA to BWR full integral simulation test program.
- 1981-1982 Pressurized thermal shock issue - EPRI takes the lead in responding with CREARE program. NRC joins EPRI in expansion of existing CREARE program. NRC analyzes data from EPRI tests.
- EPRI asks NRC to join in a series of large aerosol transport and plateout tests to be conducted by the Marviken project and to join in a series of hydrogen tests to be conducted in a large dewar at the Nevada Test Site.
- 1982 Westinghouse proposal to EPRI for MB-2 steam generator work. EPRI solicits NRC support of program.
- 1980-present Strong NRR interest for Babcock & Wilcox (B&W) test. EPRI considering involvement.

TABLE 1
COOPERATIVE PROGRAMS

<u>Active</u>		
<u>Program</u>	<u>Partners</u>	<u>Financial Considerations</u>
Full length emergency core heat transfer-system effects and separate effects test	NRC	42%
	EPRI	33%
	<u>W</u>	25%
Full integral simulation test	NRC	41-2/3%
	GE	25%
	EPRI	33-1/3%
30° Sector Steam Test Facility	NRC	39.8%*
	EPRI	35%
	GE	25.2%
Hydrogen combustion and control program	EPRI	35%
	NRC	23%
	Six foreign countries	42%
<u>Proposed/Not Finalized</u>		
Steam generator tests	NRC	37.5%
	EPRI	37.5%
	<u>W</u>	25%
Semiscale MOD 5	NRC	40%
	B&W Owner's Group)	60%
	EPRI	
	B&W)	
Thermal fluid mixing program	NRC**	50%
	EPRI	50%
Fission product/aerosol transport experiments	NRC	10%
	EPRI	10%
	Consortium headed by Sweden	80%

*Cost growth could result in the contractor assuming as much as 50% of the additional costs.

**Because NRC was prevented from fully contracting with CREARE for sole-source legal reasons, we have committed in principle to providing 50% of the total combined NRC-EPRI program costs of the MB-2 + CREARE programs.

Recommendation 5b: Request EPRI or INPO review at the initiation or completion of any NRC research program involving operational procedures or reactions either as an input or as a deliverable product. _

NRC Response: INPO and EPRI are heavily involved in the review at the initiation and completion of NRC human factors research programs including those involving operational procedures or reactions. INPO and EPRI representatives attend as observers at NRC research review group meetings. INPO and EPRI comments are solicited on selected draft research reports. In the proposed NRC "Human Factors Program Plan," INPO and EPRI are expected to participate in the three program reviews that will be conducted each year. INPO and EPRI are supplying some key elements to the program plan such as job/task analyses, maintenance programs, accreditation of training and review of corporate management and organization practices.

Recommendation 5c: Formally invite EPRI comments on the NRC research budget and on the Long Range Research Plan when these documents are reviewed by the Advisory Committee on Reactor Safeguards (ACRS).

NRC Response: EPRI reviews and comments on the general program direction of NRC research when they receive the Long Range Research Plan upon publication. This occurs early enough to allow appraisal of EPRI comments by the NRC as part of the Research Budget development. EPRI also reviews more detailed NRC plans for specific program areas where they have an interest, such as human factors, piping and seismic design. We believe that the recommended EPRI review of the research budget would be redundant with the other EPRI reviews and therefore unnecessary.

Recommendation 6a: Establish with DOE a cooperative review committee to coordinate research of mutual interest and to recommend regulatory changes to reflect research results.

NRC Response: In 1980, Congress passed Public Law 96-567, "Nuclear Safety Research, Development, and Demonstration Act of 1980," to provide for an accelerated and coordinated program of light-water-reactor safety research, development, and demonstration to be carried out by the Department of Energy. The NRC has provided staff personnel to serve on the Department of Energy working groups that have been set up to assist the Department of Energy in formulating the plan and to review its progress and implementation. The approach being taken by the Department of Energy to draw up a comprehensive program management plan, if effectively implemented, should result in a program that will yield safety information and designs that could improve the safety of nuclear power plants. Due to the limited funding received by the Department of Energy to implement the agreement, we are unable to say how useful it could be in making day-to-day decisions; however, it appears to be an appropriate model on which to base future agreements with the Department of Energy.

We believe that the available vehicles for the Department of Energy to recommend regulatory changes are adequate and preserve the independence of NRC.

Recommendation 6b: Negotiate specific memoranda of understanding with the Department of Energy to cover LWR safety research, advanced reactor safety research, and research on safe management of nuclear waste.

NRC Response: There is currently in effect a Department of Energy (DOE)/NRC Interagency Programmatic Agreement in Support of Improved Reactor Safety. It became effective on December 28, 1979. This Agreement covers improved light-water-reactor (LWR) safety research, but does not cover advanced reactors.

Informal contacts with DOE to develop a Procedural Agreement on Fast Breeder Reactor Safety Research were initialed last year and extensive discussions have been held. A draft agreement is currently under negotiation. DOE and NRC staffs are proceeding to work out a similar agreement for the High Temperature Gas Reactor (HTGR).

In response to the Nuclear Safety Research, Development, and Demonstration Act of 1980 (Public Law 96-567), DOE and NRC are in the process of preparing a new Interagency Programmatic Agreement in Support of Improved Reactor Safety Under Public Law 96-567. This Agreement would replace the December 28, 1979 Agreement.

In the area of nuclear waste, NRC will reexamine the need for a specific memorandum of understanding on research in light of our present coordination and cooperation with DOE and our existing umbrella agreement entitled, "DOE-NRC Procedural Agreement for the Coordination of DOE and NRC High-Level Waste Programs," dated October 1980.

A fact that must be recognized in the Clinch River Breeder Reactor (CRBR) proceeding is the very formal relationship between NRC and DOE. As a license applicant before the NRC, DOE has the responsibility to completely support their application.

Recommendation 6c: Review all current research at NRC and DOE on advanced reactors and waste management. Coordinate the respective programs of the two organizations to eliminate any unnecessary duplication of effort.

NRC Response: We have coordinated our research programs on advanced reactors and waste management very carefully with the DOE to be sure there is no unnecessary duplication of efforts. For example, we provide DOE with descriptive summaries of all of our contracting actions. We have in some instances eliminated from our program plans research that could be more appropriately performed by the DOE and thus significantly reduced project budgets over the past several years.

In FY 1983 the entire LMFBR research program is directed at providing information needed by the NRC in support of the review of the CRBR license application. In developing this program, our licensing staff and our research staff have had numerous discussions with DOE to ensure that our programs are coordinated and that all the information necessary for licensing will be available. The NRC licensing staff and representatives of DOE and their contractors hold frequent meetings (four or five per month) for detailed discussion of issues in the CRBR license application. In this review process the need for additional research information is quickly identified and discussed by the NRC and DOE staffs.

In waste management, there are at least five or six meetings per year between DOE and NRC staffs and contractors relative to the National Waste Terminal Storage Program (NWTS) to (a) identify early potential licensing problems and (b) facilitate coordination of research and avoid unnecessary duplication and gaps.

Finally, the NRC RES staff and contractors are following the progress of research programs sponsored by DOE, EPA, EPRI, foreign governments, and international agencies in order to avoid unnecessary duplication and promote maximum utilization of existing information in conducting the NRC research program. The R&D program sponsored by DOE is the most extensive and serves as a primary source of information. It is assessed by the NRC and which is evaluated to help identify issues, potential problem areas, and priorities of the NRC research program.

Recommendation 6d: Continue cooperating with the Department of Energy as they define a comprehensive reactor safety research program pursuant to Public Law 96-567.

NRC Response: The Department of Energy has prepared a Program Management Plan for the Conduct of a Research, Development, and Demonstration Program for Improving the Safety of Nuclear Power Plants (DOE/NE-0032). NRC is cooperating with DOE by presenting comments on the DOE plan and by its membership in the various working groups specified in Sections 4 and 5 of Public Law 96-567.

These working groups consist of experienced senior technical personnel from NRC, the Electrical Power Research Institute (EPRI) and other nuclear industry users' groups and associations.

RES reviewed the draft documents prepared by the Department of Energy (DOE) in response to Public Law 96-567. Specifically, NRC agreed with DOE recommendations to forego the building of a National Reactor Engineering Simulation Facility and forego the creation of a Federal Nuclear Operations Corps.

NRC also provided input and comments to DOE's Program Management Plan for the conduct of a Research Development and Demonstration Program for Improving Safety of Nuclear Power Plants.

Recommendation 7a: Coordinate all technical assistance programs through the Office of Nuclear Regulatory Research.

NRC Response: Technical assistance is conducted primarily by the Licensing offices in support of technical capabilities on specific regulatory issues requiring rapid resolution. Technical assistance is not coordinated through the Office of Nuclear Regulatory Research because of the complications and delays inherent in involving two offices. All research, on the other hand, is coordinated with the other NRC "user offices," in particular the licensing offices, through the Research Endorsement Process where each statement of work (SOW) is circulated for technical review and approval. Thus, "research" is coordinated with "technical assistance."

We believe that research, because of its longer term nature, can better tolerate the delays inherent in the coordination process. Hence, we plan to continue the present process of coordinating research with the licensing offices rather than the recommended coordination of technical assistance programs through RES.

ENCLOSURE 2

SCHEDULES

I. Schedule for completing research on fission product release, transport and control (source terms):

A. Milestones by March 1983

1. Revised best estimate for source term analysis for PWR large dry containment plant:

Draft report	1/83
Peer review	1/83
2. Complete NUREG-0771, "Regulatory Impact of Nuclear Reactor Accident Source Term Assumptions," as a resource document for assessing the regulatory impact of source term research:

Report completed 2/83

B. Milestones by January 1984

1. Revised best estimate for source term analysis for:
 - BWR Mark I and III plants

Draft report	3/83
Peer review	4/83
 - PWR Ice Condenser plants

Draft report	5/83
Peer review	5/83
 - Source term uncertainty analysis (thermal hydraulic, fission product behavior mechanisms, containment failure) for all plants

Final report	6/83
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2. Complete NSPP tests: prototype aerosol transport in condensing steam at ORNL 4/83
3. Complete Phase I high temperature fission product release from irradiated fuel segments (annealing to 1700 - 2000°C) at ORNL 10/83
4. Complete aerosol release tests using 10 kg fuel bundles at ORNL 11/83
5. Complete core melt - concrete interaction aerosol/fission product release model 1/84

C. Milestones by the end of 1985 for confirmatory research.

1. Complete work on improved TRAP-MELT code including attenuation in reactor coolant system (This computer code assesses fission product transport and attenuation within LWR reactor coolant system during severe accidents.) 2/84
2. Complete small scale TRAP-MELT verification tests 9/84
3. Complete evaluation of engineered safety systems (ESF) effectiveness for removal of high density aerosols 9/85
4. Complete MARVIKEN V large scale tests of fission product/aerosol transport in reactor coolant system 10/85
5. Complete Phase II irradiated and simulated fuel tests (annealing to 2700°C) at ORNL 11/85

II. Schedule for updating the Commission regulations involving source terms: (As the research is completed, the staff will look at specific areas such as emergency planning for possible modifications to regulations or implementation of research results through loosening criteria.)

- A. Commission paper containing a staff recommendation on the question of distribution of potassium iodide (KI) to the general public as an emergency protective measure in the event of a severe reactor accident 1/1/83
- B. Commission paper containing an evaluation of the risk reductions for new source terms for four important severe accident sequences End of June 1983
- C. Commission paper containing an evaluation of source term impacts and recommendations for changes in emergency planning, safety goals and accident indemnification End of September 1983
- D. Commission paper containing an evaluation of all other important aspects of the regulatory program influenced by source terms End of December 1983
- E. Periodic progress reports in the form of Commission information papers Through 1984-85
- F. Final Commission paper/NUREG status report End of 1985