

April 26, 1978

SECY-78-228

## COMMISSIONER ACTION

For: The Commissioners

From: Clifford V. Smith, Jr., Director  
Office of Nuclear Material Safety and Safeguards

Thru: Executive Director for Operations *JWS* *See EDO note,  
page 13.*

Subject: COMMISSION RESPONSE TO GAO FINAL LETTER REPORT ON  
NRC'S ROLE IN SELECTING FISSION TECHNOLOGIES \*

Purpose: To present the proposed NRC role in selecting fission technologies, in response to GAO's recommendations in the subject report, together with a draft response to the House Committee on Government Operations and Senate Committee on Government Affairs.

Category: This paper covers a policy matter requiring Commission consideration and action.

Issue: The nature and content of the response to the Congress. The subject GAO report (Enclosure 1) recommends that: NRC establish a program to monitor, systematically and independently, development of alternative fission technologies, and report to the President and cognizant Congressional committees on known or suspected licensing problems of these technologies, and NRC should rank, to the extent possible, technologies for desired development in the United States from a licensing point of view. (A written statement on actions taken on the GAO recommendations is required to be submitted to the House and Senate Committees named above not later than 60 days after March 7, 1978.)

Decision  
Criteria: 1. Does the alternative selected comply with the GAO recommendations?

\* Fission technologies - combinations of nuclear reactors and supporting fuel cycles.

2. Does the alternative chosen provide actions beneficial to the United State in regard to nuclear energy resource utilization and nonproliferation objectives?
3. Is the alternative chosen consonant with the independent regulatory function of NRC?

Alternatives:

1. A level of NRC participation in the selection of fission technologies that the NRC staff believes to be partially responsive to the GAO recommendations would provide for review of four reactor systems, together with appropriate fuel cycles, in response to requests from DOE. In the required response to Congress, NRC could characterize the reviews as independent, and state that NRC is requesting DOE to include the NRC's reviews in DOE proposals to the President and Congress on selection of alternative technologies. This alternative requires about 14 man-years\* of effort and about \$0.8 million to complete the four reviews described in alternative 4 of SECY-78-136 (Enclosure 2).
2. An intermediate level of NRC participation would provide for: review of the criteria, data, process and results used by DOE in its selection of its most promising alternative systems from a licensing viewpoint; review of the same four systems delineated in alternative 1; initiation of research programs in support of the four systems; and preparation of a staff report to the President and Congress.

In the required response to the GAO recommendations, NRC would state that it has set up a program to review alternative fission technologies and that the Commission will transmit a report of the staff's findings to the President and cognizant Congressional committees.

This alternative is estimated to require about 25 1/2 man-years of effort and about \$3.4 million. This alternative represents a more responsive position by NRC to the GAO recommendations than alternative 1.

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\* Only professional manpower is included in the manpower estimates.

3. The highest level of NRC participation considered in this paper would initiate an essentially independent review by NRC of the NASAP systems. Nonproliferation strategies available to the United States would be evaluated and the safety, safeguards and environmental characteristics of 7-8 reactor systems and appropriate fuel cycles would be reviewed. Research programs in support of the systems would be initiated. A report to the President and cognizant Congressional committees would be prepared.

In the required response to Congress on the GAO recommendations, NRC would state that it has set up a program to review alternative fission technologies and that the Commission will transmit a report of the staff's findings to the President and cognizant Congressional committees.

This alternative requires about 50 man-years of effort and about \$7.0 million dollars of funding.

Discussion:

President Carter's April 1977 Nuclear Power Policy Statement initiated the International Nuclear Fuel Cycle Evaluation (INFCE), which will receive major input from DOE's Nonproliferation Alternative Systems Assessment Program (NASAP). The staff considered NASAP to be an important program and proposed in early budget requests to undertake independent evaluations of alternative fission technologies in 1978 and 1979. Although the Commission specified that the agency was to maintain a general level of cognizance over DOE development work on alternative fuel cycles, the Commission eliminated most personnel and most funds requested for alternative fuel cycles in the FY 1978 budget. For FY 1979, the Commission directed that no major new commitments of resources or program dollars should be made to alternative fuel cycles until more definitive proposals were brought to the agency's attention.

Consistent with Commission policy, the staff has been attempting to follow the NASAP program on a minimum basis. For example: on an ad hoc basis the staff has reviewed reports as DOE has released them for comment; and an ad hoc staff task force responded to a request from the GAO for staff views on safety, safeguardability and environmental acceptability of alternative fission technologies. In addition, a standing NRC coordinating committee was appointed to handle NASAP-related matters on as-available and as-requested bases.

Recently (SECY-78-136), the staff has proposed to respond affirmatively to a DOE request that NRC review an HWR concept of the CANDU type. In addition, the various offices have underway or are planning to initiate several contractor studies pertaining to alternative fuel cycles.

The GAO has completed a survey for the Joint Economic Committee of the status, potential and problems of alternative fuel cycles, and, prior to publication of its final report, has recommended strengthening of NRC's role in Federal efforts to select alternative fission technologies for further development. GAO notes that:

- NRC has no responsibility for developing nuclear fission technologies and its principal function is to assess and regulate independently the safety, safeguards and environmental adequacy of civilian nuclear facilities and procedures proposed to NRC for licensing action by DOE and the nuclear industry.
- NRC is not a member of the inter-agency management group that will approve the screening of candidate alternative fission technology systems for government development.
- There is no ongoing systematic NRC effort to monitor and evaluate alternative fission technologies for the future.
- The failure to establish an organized effort within NRC to monitor and evaluate independently nuclear fission technologies for future development could result in
  - the Federal Government selecting and funding the development of nuclear reactor and fuel cycle technologies that are not among the most acceptable from the safety, safeguards and environmental point of view; and

--serious delays and cost overruns if NRC is not adequately prepared or unable to express timely views on the licensing aspects of the construction and operation of demonstration projects and/or if the licensing staff and the developers disagree on the design requirements for such projects, which has occurred in the past for the Clinch River Breeder Reactor.

GAO recommended to DOE that it: inform NRC of alternative technologies under serious consideration for future development as soon as they are selected; and, recognize NRC's report on known or potential licensing issues and problems as a major factor in formulating proposals on alternative technologies.

GAO recommended that the Chairman, NRC:

- Establish a program to monitor, systematically and independently, the development of alternative fission reactor and fuel cycle technologies.
- Identify and report to the President and cognizant Congressional committees known or suspected licensing issues and problems associated with the reactor and fuel cycle technologies under serious consideration by DOE before any are scheduled to be selected for future development. To the extent possible, the Chairman should rank the reactor and fuel cycle technologies for desired development in the United States from a licensing point of view, and clearly identify the relative safety, safeguards and environmental advantages and disadvantages of each.

Senator Bentsen, the recipient of the GAO letter report, has written to Chairman Hendrie encouraging positive actions on the GAO recommendations be initiated at once "without further Congressional direction."

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DOE is scheduled to complete its preliminary integrated assessment and selection of key system classes in April 1978, with selection of the most promising alternative systems scheduled for October 1978. The final draft report is scheduled for July 1979. It is clear that DOE is now winnowing candidate systems down to a smaller number than those enumerated in the NASAP plan of August 1977. The staff believes that a positive NRC response to the GAO recommendations is appropriate from a policy standpoint, but such response requires both staffing and financial funding for appropriate implementation. At the time the FY 1979 budget was developed, the Commission felt it was too early to commit substantial NRC resources to NASAP studies. The staff believes the strong recommendations by GAO, the letter from Senator Bentsen, the DOE NASAP schedule, the DOE request for NRC review, and the time required to develop a program for and to obtain supplemental authorization of resources and manpower for the independent evaluation of alternative systems makes a positive response to the GAO recommendations desirable. If NRC is to produce meaningful, integrated analyses of alternative fuel cycles on a time frame consistent with the DOE schedule, work must begin as soon as possible. Additional personnel and funds are required for any substantial level of NRC participation.

In developing alternatives for consideration by the Commission, the staff has relied heavily on the assumption that the September 30, 1977, request to NRC from then ERDA for review of an HWR of the CANDU type represents the type of request that might be forthcoming from DOE and that requests for four reviews will be received from DOE. If requests for more reviews are received from DOE, increased resources would be required for certain of the alternatives. The staff notes that the NASAP plan has never been published in final form, although a final version is scheduled for publication in April 1978. In addition, staff participation in INFCE has led to the knowledge that the INFCE Technical Coordinating Committee believes that a reorientation of NASAP is required if NASAP is to provide meaningful input to INFCE to meet the INFCE deadlines.

We note also that the GAO has recommended that NRC rank reactor and fuel cycle technologies from a licensing point of view. While the staff report may result in a ranking, the propriety of a ranking being made by an independent regulatory commission may be questioned by individuals and agencies outside of NRC.

With respect to the alternative responses to the GAO recommendations:

It is the staff plan that any work carried out on any of the alternative plans would be conducted by present line organizations of NRC. To the extent necessary to provide coordinated planning and inputs to DOE, cognizant Congressional committees and the President, the efforts of the various NRC offices would be coordinated by the NASAP coordinating committee or another appropriate organization designated by the Commission or the EDO.

Whatever advice or evaluations that NRC provides to DOE and the President and Congress on the licensability of concepts that have been reviewed represents preliminary conclusions based on preliminary information. This advice would not be intended to prejudice the development of reactor systems or fuel cycles, nor would it be intended to commit NRC in any future licensing actions.

Work on any of these alternatives would have to be carried out in FY 78 and FY 79; the report to the President and cognizant Congressional committees, a part of alternatives 2 and 3, would be published coincident with the final NASAP and INFCE reports. All alternatives require added resources of manpower and/or funding for FY 78 and FY 79.

Alternative 1: NRC would reply to requests from DOE for reviews of four alternative systems. The Commission would inform Congress that it was undertaking independent reviews of alternative reactor systems and fuel cycles in response to requests from DOE, but that NRC would not write a summary report. However, copies of individual reviews would be provided to the President and cognizant Congressional committees. NRC would inform Congress that NRC will request DOE to include NRC reviews in DOE proposals for the President and Congress on alternative technologies. The Commission could also inform the Congress that, in the opinion of NRC, DOE would be required to write a programmatic statement before embarking on any large program to demonstrate alternative technologies; and that NRC would provide comments on licensability at that time. (This alternative is essentially the same as alternative 4 of SECY-78-136.)

Alternative 1 is estimated to require the following resources:

NRR	10	man-years	\$0.8 million
NMSS			
FC	2	man-years	
SG	1	man-year	
RES	1	man-year	
Total	<u>14</u>	man-years	<u>\$0.8 million</u>

PRO (a) Minimum requirement for additional personnel and funds.

(b) Consistent with NRC policy of reacting to requests for licensing actions.

CON This response does not appear to meet the intent of the GAO recommendations and Senator Bentsen's letter.

Alternative 2: In alternative 2, NRC would:

- Review the same four alternative systems, defined in alternative 4 of SECY-78-136.
- Review the process, criteria, information and results used by DOE in its selection of concepts for further evaluation and review the DOE selection to determine whether NRC believes an appropriate selection has been made.
- Perform computations and simple tests to assist in defining problem magnitude and in planning any required follow-on work associated with NASAP.
- Provide inputs to DOE and write a summary report to the President and cognizant Congressional committees.



The Commission would inform Congress that NRC has established a program for independent monitoring of alternative reactor systems and fuel cycles and that NRC would submit a report of staff findings to the President and cognizant Congressional committees.

Alternative 2 requires the following resources:

NRR	12 1/2	man-years	\$0.8 million
NMSS			
FC	5	man-years	0.4 million
SG	4	man-years	0.2 million
RES	4	man-year	2.0 million
Total	25 1/2	man-years	\$3.4 million

- PRO (a) This response would be essentially consistent with NRC's position of being a reactive (rather than an initiating) organization.
- (b) An independent NRC review of the DOE process for selecting the most promising alternative systems would be made.
- (c) The reactor concepts to be reviewed would be well developed and NRC participation would not prejudice staff evaluation in later reviews.
- (d) Additional personnel and funding requirements would be smaller than those required for alternative 3.
- CON (a) May not be completely responsive to GAO recommendations that NRC independently and systematically review alternative technologies.
- (b) NRC agreement to review these concepts may be regarded as prejudice in favor of the concepts, and reluctance to comment on licensing issues of less well developed concepts could limit DOE's long term decision making perspectives.

Alternative 3: NRC would attempt to comply with the full intent of the GAO recommendations by initiating an independent and systematic monitoring of alternative fission technologies and preparing a report to the President and Congress. A response to Congress would indicate the Commission's affirmative response to the GAO recommendations.

The three offices, NMSS, NRR and RES, would begin immediately to develop coordinated program plans, schedules and resource requirements which would be submitted by the offices to the Commission. In alternative 3, the staff is proposing an essentially independent NRC program that exceeds the level of effort described in alternatives 1 and 2.

In alternative 3,

- The staff would review the criteria, data and process used by DOE in its selection of most promising alternative systems to determine whether NRC considers the appropriate selection of concepts for further development has been made.
- NMSS and NRR would review 7-8 alternative reactor concepts together with supporting fuel cycles from safety, safeguards and environmental standpoints.
- RES would perform computations and simple tests to assist in defining problem magnitude and in planning work associated with NASAP follow-on.
- The staff would evaluate nonproliferation strategies open to the United States and assess the interaction of selected strategies and NRC licensing functions.

In addition, the staff would provide the Commission with an evaluation of the full range of safeguards, safety and environmental concerns and their probable modes of resolution associated with the NASAP follow-on program. Output of this alternative would contain recommended actions to be factored into the Commission's 5-year plan to cope with the work load arising from the NASAP follow-on.

It should be noted that the lack of recent data from DOE makes a precise estimate of this alternative difficult. The staff believes, however, that the preliminary level of staffing and funding indicated below is necessary for an independent NRC program.

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A preliminary estimate of the resource requirements is:

NRR	30	man-years	\$2.9 million
NMSS			
FC	9	man-years	.4 million
SG	5	man-years	.2 million
RES	6	man-years	3.5 million
Total	50	man-years	\$7.0 million

PRO (a) Satisfies most GAO recommendations.

(b) DOE considers NRC staff views on licensability to be important in the overall choice of concepts to be emphasized for development into the commercial phase, and these views would be available for the DOE decision process.

(c) Provides early opportunity for staff to become familiar with concepts that may be pursued in the future.

(d) Provides the opportunity for NRC to review and comment on nonproliferation criteria.

(e) Provides specific response to GAO's concern over NRC long range plans.

CON (a) This alternative involves a large number of concepts, many of them in an early stage of design. Recommendations made on such designs could potentially bias future design and reviews.

(b) The present uncertainty about concepts and evaluation criteria may make the analyses premature. Manpower may be utilized reviewing concepts that may be discarded for various reasons as work progresses.

(c) Large additional resources are required.

While the resources shown in Alternative 3 would be needed for a broad ranging coverage of NASAP activities, the outcome of the DOE studies may likely be of more limited variety than the 7-8 concepts we have included in our projection for this alternative. Furthermore, this alternative requires very large additional resources that are specialized in nature and appear to be impractical to secure in the time frame involved.

Recommendation: That the Commission:

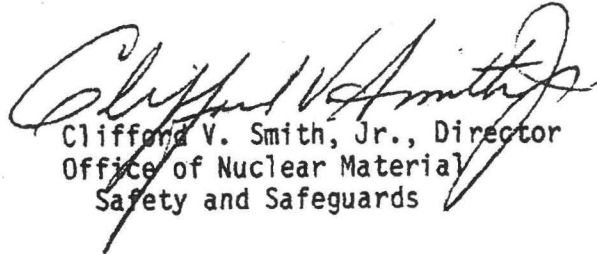
1. Approve alternative 2, authorizing NMSS, NRR and RES to develop a coordinated and more detailed schedule and budget for the effort and submit the schedule and budget to the Commission for approval.
2. Authorize the staff to begin preparation of a supplemental FY 79 appropriation, as necessary.
3. Approve the transmittal of the enclosed letter to Senator Abraham Ribicoff (Enclosure 3). Identical letters will be sent to the Chairman, House Committee on Government Operations; the Chairman, Senate Subcommittee on Nuclear Regulation; the Chairman, Committee on Interior and Insular Affairs; the Comptroller General of the United States; and the Chairman, House Subcommittee on Energy and Power. A similar letter will be sent to the Vice-Chairman, Joint Economic Committee.
4. Approve the transmittal of the enclosed letter to Secretary Schlesinger (Enclosure 4).

Coordination:

NMSS has acted as coordinator for preparing this paper; has attempted to develop a consensus position of the three offices on the recommended alternative; and has incorporated the resource requirements provided by individual offices for each alternative. ELD has no legal objections; RES and NRR concur.

Scheduling:

The Chairman is required to respond to Senator Ribicoff within 60 days following March 7, 1978.



Clifford V. Smith, Jr., Director  
Office of Nuclear Material  
Safety and Safeguards

Enclosures:

1. GAO Final Letter Report Regarding NRC's Role in Selecting Fission Technologies
2. SECY-78-136
3. Proposed letter to Senator Abraham Ribicoff
4. Proposed letter to Secretary Schlesinger

NOTE: Commissioner comments should be provided directly to the Office of the Secretary by close of business

EDO NOTE: The EDO supports the recommended staff response to the GAO. It should be emphasized, however, that resources to implement the recommendation are not currently in the FY 1978 program or in the pending FY 1979 budget request. The EDO has requested the BRG to review the program of the Commission and to recommend to him how resources can be reprogrammed to initiate the activities described in the proposed staff response.

ENCLOSURE 1

GAO FINAL LETTER REPORT REGARDING NRC'S  
ROLE IN SELECTING FISSION TECHNOLOGIES



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

March 8, 1978

*Tom Rehm*

*Screen Ticker  
NRCW NEWS  
suspr 30 days  
cc RES  
NRR  
SP  
Jereh*

*NOTE: Review Commission Action  
page of draft for Congress  
addressing council of rec.  
Include Rehm in drafts.  
TJR*

MEMORANDUM FOR: Chairman Hendrie  
Commissioner Gilinsky  
Commissioner Kennedy  
Commissioner Bradford

FROM: *fo* Thomas J. McTiernan, Director  
Office of Inspector and Auditor

SUBJECT: GAO FINAL LETTER REPORT REGARDING NRC'S ROLE IN  
SELECTING FISSION TECHNOLOGIES

In accordance with our August 25, 1975, memorandum concerning coordination of GAO activities within NRC, the subject report is being sent for your information.

It should be noted that recommendations directed to the Chairman, NRC, are contained on page 6 of this letter report. As you know, Section 236 of the Legislative Reorganization Act of 1970 requires the Chairman to submit a written statement on actions taken on GAO recommendations to the House and Senate Committees on Government Operations not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the NRC's first request for appropriations made more than 60 days after the date of the report. This response on NRC's actions will be coordinated and drafted by EDO.

Should you have any views or comments on the subject report, we will be happy to pass these on to GAO.

Enclosure:  
Cy subj rpt dtd 3/7/78

- cc: L. Gossick, w/encl
- S. Chilk, w/encl
- J. Nelson, w/encl
- K. Pedersen, w/encl
- C. Kammerer, w/encl
- J. Fouchard, w/encl
- H. Shapar, w/encl
- C. Smith, w/encl
- B. Burnett, w/encl
- E. Case, w/encl
- S. Levine, w/encl
- T. Rehm, w/encl

Contact: Fred Herr, OIA  
49-27051



COMPTROLLER GENERAL OF THE UNITED STATES  
WASHINGTON, D.C. 20548

B-164105

March 7, 1978

The Honorable Lloyd Bentsen  
Vice Chairman, Joint Economic  
Committee  
United States Congress

Dear Mr. Vice Chairman:

We are bringing to your attention the need to strengthen the Nuclear Regulatory Commission's (NRC's) role in Federal efforts to select nuclear fission technologies for future development. Our concern over NRC's role arises from work we have done in response to a May 12, 1977, request from the former Vice Chairman, Joint Economic Committee, that we review the status, potential, and problems of alternative nuclear fission technologies. Our report on the status, potential, and problems will be issued to the Congress in early spring. We are reporting on the need to strengthen NRC's role at this time because we believe prompt attention is required.

In April 1977 the President proposed to (1) defer indefinitely commercial reprocessing and recycling of plutonium, as well as the commercial introduction of the Liquid Metal Fast Breeder Reactor (LMFBR); (2) reduce funding for the LMFBR program and redirect it toward evaluation of alternative fission technologies; and (3) cancel construction of the Clinch River Breeder Reactor (CRBR)--the Nation's first LMFBR demonstration powerplant. These actions were taken in the hope they would help reduce the risk of nuclear weapons proliferation.

As a result of the President's proposal, the Department of Energy (DOE) is conducting a major assessment program to recommend nuclear fission technologies for future development. NRC, however, has no systematic ongoing effort to independently monitor and evaluate alternative technologies from a safety, safeguards, and environmental point of view to complement the DOE effort. Such an NRC effort is needed; in our view, to help ensure the selection of the most appropriate nuclear fission technologies for future development by the United States. Accordingly, we are making recommendations to the Chairman, NRC, and the Secretary, DOE, aimed at strengthening NRC's role in the selection process.

EMD-78-44  
(30369)



The matters presented here were discussed with NRC and DOE officials and their comments were considered during report preparation.

MAJOR DOE EFFORT TO SELECT  
NUCLEAR FISSION TECHNOLOGIES  
FOR FUTURE DEVELOPMENT

The Nonproliferation Alternative Systems Assessment Program (NASAP) is DOE's major effort to assess alternative nuclear fission technologies which might meet the energy needs of the Nation while enhancing the Nation's nonproliferation efforts. The overall program goal is to recommend to the Secretary of Energy by July 1979 U.S. development priorities for those systems which, when deployed in the United States and internationally, would offer improved proliferation resistance compared to systems that permit access to plutonium or to other materials directly usable in nuclear weapons.

Under initial consideration as candidate technologies for future development are more than 85 nuclear systems involving 21 reactor types and 12 fuel cycle combinations. The number of candidate systems will be reduced through a series of successive screening steps. Screening of systems will be based on an evaluation of their (1) proliferation resistance, (2) resource utilization, (3) technology status and development needs, (4) economics, (5) commercial feasibility, and (6) environmental and safety acceptability. The results of these screenings will be approved by an interagency management group from DOE, the State Department, and the Arms Control and Disarmament Agency--but not NRC.

The NASAP plan notes that considerable interaction with NRC is required to obtain a consensus on the licensability of candidate systems, and that NRC assistance will be needed to identify major generic environmental and safety problems which may lead to difficulty in meeting existing or proposed regulatory requirements. No agreements, however, exist between NRC and DOE on how or when this interaction and assistance will take place or in what form it will be.

NEED TO STRENGTHEN NRC'S ROLE

NRC has no responsibility for developing nuclear fission technologies; such efforts are the responsibility of DOE and industry. NRC's principal function is to independently assess and regulate the safety, safeguards, and environmental adequacy of civilian nuclear facilities and procedures proposed to them for licensing action by DOE and the nuclear industry. Accordingly, NRC is primarily a reactive organization.

NRC's primary efforts regarding alternative nuclear fission technologies for the future have been to provide a staff response to a request from us on the licensing issues associated with a number of nuclear fission technologies, and requests from DOE on preliminary planning documents relating to NASAP. In addition, NRC has recently become involved to a limited extent in an international study of nuclear fuel cycle issues. As noted above, NRC is not a member of the inter-agency management group that will approve the screening of candidate systems.

Since there is no systematic ongoing NRC effort to monitor and evaluate alternative fission technologies for the future, the NRC staff is not prepared to make extensive evaluations of such technologies. On August 17, 1977, we requested the written views of the NRC staff on the safety, safeguardability, and environmental acceptability of various reactor and fuel cycle concepts. We asked the staff to identify areas of known problems and the areas it anticipates would have to be emphasized in any future licensing review of each concept. Further, we asked the NRC staff to rank or categorize the concepts according to their probable licensability.

In order to respond to our request, NRC had to establish an internal coordinating committee to draw together the views of its various program groups. In its response to us, the NRC staff committee did not rank or categorize the probable licensability of the nuclear concepts. According to NRC officials, they did not have the resources, time, or necessary information to do so.

In commenting on our report, NRC officials stated that the Commissioners had earlier stressed that no major new commitment of resources or funds should be made in this area until more definitive proposals were brought to the agency's attention which could conceivably lead to licensing actions by NRC. We were told that although the Commissioners felt that it was too early to devote substantial levels of resources and manpower to the variety of study efforts being pursued by DOE, the NRC staff was expected to keep abreast of activities in the area. Without specifying the exact amount, it was noted that NRC's fiscal year 1979 budget request to the Congress provides limited funds among various program offices for this general monitoring effort.

POSSIBLE CONSEQUENCES OF NOT HAVING  
EARLY COMMISSION INVOLVEMENT

The failure to establish an organized effort within NRC to independently monitor and evaluate nuclear fission technologies for future development could result in

- the Federal Government selecting and funding the development of nuclear reactor and fuel cycle technologies that are not among the most acceptable from the safety, safeguards, and environmental point of view; and
- serious delays and cost overruns if NRC is not adequately prepared or unable to express timely views on the licensing aspects of the construction and operation of demonstration projects and/or if the licensing staff and the developers disagree on the design requirements for such projects.

Regarding the first possible consequence, a brief synopsis of the history of LMFBR development will illustrate our concern. In the 1960s the LMFBR was essentially selected as the next generation of nuclear fission power. Eventually, it became the highest priority energy research and development program in the United States and several other nations.

Unfortunately, the selection process in the 1960s did not give full consideration to how this technology could be used to supply the material for developing a nuclear weapons capability. This was changed by the President when he directed that proliferation of nuclear weapons capability become a major factor in assessing nuclear alternatives for the future. If a nuclear fission technology other than the LMFBR is ultimately selected for future development, the Federal Government would have spent hundreds of millions of dollars on a technology that yielded no direct tangible benefits as a commercial power source.

While the Nation could still select a technology that might not be the most acceptable, we believe that an independent evaluation of future technologies by NRC before the selection is made would help reduce this risk. The Nation would not have to rely only on DOE's technical opinion. Instead, it would have the benefit of the expert opinion of the agency which would ultimately be responsible for licensing the plant that would result from the program.

With respect to the second possible consequence, millions of dollars in cost overruns could result due to slipped licensing milestones unless NRC is able to license future

demonstration projects in a timely manner. Again, the LMFBR illustrates our concern.

The CRBR is a major project in the LMFBR program. One major objective of the CRBR is to demonstrate that LMFBRs are licensable. Therefore, NRC's licensing review--which has been indefinitely suspended as a result of the President's proposal to cancel the plant--was a critical step in the project's construction schedule. The licensing review of the CRBR was hampered during its entire history by disagreement between ERDA and NRC on the fundamental safety design of the plant to cope with low probability accidents. For example, the NRC staff stated in August 1975 that it was not likely that the proposed containment design for the CRBR would be adequate for the site, but it was not until December 1976 that the design was changed to comply with the NRC requirements.

In February 1976 an ERDA official testified before Congress that a 15-month delay in the overall project resulted in a \$214 million cost increase. This delay and cost overrun, according to the ERDA official, was due to both ERDA and NRC underestimating the time that would be needed to license a "first-of-a-kind" plant like the CRBR. Although a number of factors contributed to the licensing delays and cost overruns, the fundamental difference in perspective between NRC and the plant's developers about how the plant would be built to meet certain safety concerns was certainly a major, if not the biggest, factor. We previously discussed some of these licensing problems in three reports 1/.

### CONCLUSIONS

It is likely that the President and the Congress will use DOE proposals on which nuclear reactor and fuel cycle technologies should be selected for future research, development, and demonstration as a major source for policy decisions on the funding of future nuclear research and development programs. Both would be able to make better decisions if NRC were actively and independently involved in this process as soon as possible. However, NRC does not have any current

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1/"Problem Areas Which Could Affect the Development Schedule for the Clinch River Breeder," December 1974; "Cost and Schedule Estimates for the Nation's First Liquid Metal Fast Breeder Reactor Demonstration Powerplant," RED-75-358, May 22, 1975; and "Liquid Metal Fast Breeder Reactor: Promises and Uncertainties," OSP-76-1, July 31, 1975.

plans to become actively involved in this crucial evaluation and planning effort.

This lack of early involvement might eventually cause serious licensing delays for future nuclear technologies. Once before, when NRC and the then ERDA disagreed on fundamental safety design requirements for CRBR, the Federal Government experienced major licensing delays which resulted in large cost overruns. Early NRC involvement would help highlight any differences of opinions and would allow for a more focused debate on the relevant issues.

More important, the Nation needs NRC's early and informed perspective on the various nuclear technologies to preclude technologies from being selected that may not be among the most acceptable from a safety, safeguards, and environmental viewpoint. Further, developers need to be able to rely on the regulators to give them timely and reliable information on the potential licensability of future nuclear technologies.

#### RECOMMENDATIONS

We recommend that the Chairman, NRC:

- Establish a program to systematically and independently monitor the development of alternative fission reactor and fuel cycle technologies for the future.
- Identify and report to the President and cognizant congressional committees known or suspected licensing issues and problems associated with the reactor and fuel cycle technologies under serious consideration by DOE before any are scheduled to be selected for future development. To the extent possible, the Chairman should rank the reactor and fuel cycle technologies for desired development in the United States from a licensing point of view, and clearly identify the relative safety, safeguards, and environmental advantages and disadvantages of each.

We also recommend that the Secretary, Department of Energy:

- Inform NRC of the reactor and fuel cycle technologies which are under serious consideration for future development as soon as they are selected so the Commission can identify and report on associated licensing issues and problems.

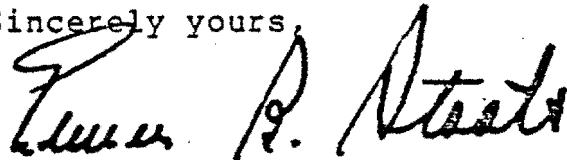
--Recognize NRC's report on known or potential licensing issues and problems as a major factor for consideration in formulating proposals to the President and the Congress on which reactor and fuel cycle technologies should be selected for future research, development, and demonstration.

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As you know, section 236 of the Legislative Reorganization Act of 1970 requires the head of a Federal agency to submit a written statement on actions taken on our recommendations to the House Committee on Government Operations and Senate Committee on Governmental Affairs not later than 60 days after the date of the report, and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

As arranged with the former Vice Chairman's office, we are sending copies of this report to DOE and NRC so that the requirements of section 236 can be set in motion. Copies will also be sent to other interested parties.

Sincerely yours,



Comptroller General  
of the United States

ENCLOSURE 2

SECY-78-136

March 6, 1978

SECY-78-136

## COMMISSIONER ACTION

For: The Commissioners

From: Edson G. Case, Acting Director, Office of Nuclear  
Reactor Regulation  
Clifford V. Smith, Director, Office of Nuclear Material Safety  
and Safeguards

Thru: Executive Director for Operations *[Signature]*

Subject: NRC REVIEWS OF ADVANCED NUCLEAR POWER PLANT CONCEPTS

Purpose: To determine the amount of effort that the NRC staff devotes to reviewing reactor concepts and associated fuel cycle concepts presented by DOE under the Nonproliferation Alternative Systems Assessment Program (NASAP).

Category: This paper covers a policy matter involving the NRC/DOE interactions.

Issue: The nature of the NRC response to requests from DOE for Preliminary Safety Evaluations (PSE) of reactor and fuel cycle concepts presented under NASAP, prior to DOE selection of those alternatives that it intends to pursue into the demonstration stage.

Decision  
Criteria:

1. Does the alternative chosen provide for actions beneficial to United States policy in regard to nuclear energy resource utilization and nonproliferation objectives?
2. Does the alternative chosen involve the NRC in the concept selection decision process in any inappropriate way?
3. Does the alternative chosen tend to commit, or appear to commit, the NRC to positions on concepts which may later be submitted for NRC licensing action?
4. Does the alternative chosen overtax our available manpower resources?

contact:  
Speis



- Alternatives:
1. Comply with the DOE requests for reactor reviews. Provide guidance on the preparation of DOE's Preliminary Safety Information Document (PSID) based on information needs, and licensing precedents and principles. Provide a full reactor evaluation (commensurate with the completeness of the material submitted) for each concept submitted by DOE, highlighting any licensing problem areas.
  2. Decline the DOE requests until non-proliferation standards have been adopted and final alternative reactor and fuel cycle choices have been made by DOE and endorsed by the Administration.
  3. Initially agree to review only those established reactor concepts for which a substantial background of applicable experience exists, e.g., Heavy Water Reactor (HWR) of the CANDU type, High Temperature Gas Cooled Reactor (HTGR), Spectral Shift Reactor (SSR), Light Water Breeder Reactor (LWBR), and a Liquid Metal Fast Breeder Reactor (LMFBR) variant. Other less developed concepts could be evaluated later as designs and characteristics become firmer.
  4. Consistent with DOE's broad program and the objectives of NASAP, participate in the review of complete nuclear systems, and include in the scope of the NRC staff review described in Alternative 3 the fuel resource requirements, alternative fuel cycles, and the safeguards and non-proliferation aspects of the reactor and the associated fuel cycle facilities.

Discussion: President Carter's message of April 7, 1977 proposed that the new emphasis being placed on non-proliferation aspects of the reactor fuel cycle be extended to cover advanced reactor concepts, including the LMFBR. The DOE responded by instituting the NASAP studies for the comprehensive evaluation of alternative reactor concepts and fuel cycles to meet the President's goals. The NASAP objective is a program that can satisfactorily match the US energy needs and fuel resources, while providing a means to assure that other nations can also meet their expanding energy needs, without aggravating the proliferation problem. The NASAP results will provide significant input to the International Fuel Cycle Evaluation (INFCE) program, which is reexamining fuel processing, breeding, and proliferation problems on an international

basis over the next two years. The reactor concepts within NASAP are not new, but are generally being reevaluated in the light of fuel cycle alternatives and optimizations with strengthened safeguards and non-proliferation characteristics. The standards by which proliferation resistance is to be judged are the subject of a separate NASAP study, which is expected to continue through 1978.

The DOE is preparing a Preliminary Safety Information Document (PSID) for the HWR concept of the CANDU type, which is to be submitted to NRC in initial form about May 1978. DOE has requested that we review the initial document, and provide comments and suggestions for use in the preparation of their final PSID, which is scheduled for release about September 1978. DOE also requested that we prepare a Preapplication Safety Evaluation (PSE) of the concept described in the PSID, including guidance on technical licensing matters, requirements for research and development, definition of design basis accidents, and additional information requirements. This HWR evaluation will set a pattern for other concepts to be submitted later, to the extent that the information available on these other concepts permits. Prior to the NASAP studies, the NRC staff completed a similar evaluation of the Gas Cooled Fast Reactor Concept (GCFR); the NRC staff evaluation was based on a PSID prepared by the General Atomic Company. The PSID and PSE for the GCFR will serve as partial models for documentation in the NASAP efforts.

It is estimated that the HWR evaluation will require up to four man-years of NRR effort plus one man-year of NMSS effort, if sufficient fuel cycle information is provided. The other concepts most likely to deserve significant review effort are the Spectral Shift Reactor (SSR), the advanced fuel HTGR, and a variant of the LMFBR. Because of prior staff reviews of HTGRs and PWRs (to which the SSR is very similar) it is expected that reviews of the advanced fuel HTGR and SSR would require slightly less effort, about two man-years each (NRR 1-1/2 man-years and NMSS 1/2 man-year). A variant of the LMFBR is estimated to require 4 man-years to review including 1 man-year of NMSS effort, based on the experience with and unresolved issues from the CRBR review. If all four reviews were undertaken, it is anticipated that the total of 13 man-years would be about evenly distributed between FY 78 and FY 79. Previous manpower projections have allotted two man-years to Alternate Cycles in FY 1978 and FY 1979 by NRR, but

no manpower was allocated by NMSS for such work, in either fiscal year. If the NRR Alternate Cycle time were used for the requested DOE effort, there would be a shortfall of about 3 manyears in NRR for FY 1978 and 79, and 1.5-2 manyears in NMSS for each fiscal year. If DOE were to submit PSIDs for additional concepts, the shortfall would be greater, and we would have extreme difficulty in meeting DOE's overall NASAP schedule of about two years. To this time, DOE has not mentioned the possibility of a request to review the Light Water Breeder Reactor (LWBR), or improvements in basic LWRs to improve fuel utilization, under the NASAP program. Depending on the nature of DOE's further efforts, particularly plans to pursue commercialization of a concept, there is a potential need for NRC confirmatory research to provide an acceptable basis for licensing decisions.

In defining the range of alternative responses open to us, we have eliminated those options that would tend to place the NRC staff in the position of evaluating a concept after having participated in the design definition of that concept. It would also be inappropriate for the NRC staff to rank the concepts in the order of licensability. Thus, it would seem that, at most, we should provide critical feedback and licensability opinion to DOE after reviews of their PSID and related fuel cycle and safeguards inputs. Prior to that time our comments would be limited to guidance on the practices and principles that the NRC staff uses in reaching its conclusions, suggestions for inclusion of information in the PSID and similar material. Light water reactor and uranium fuel cycle experience provides the bulk of these precedents.

Alternative 1 would comprise a review of all the reactor concepts submitted by DOE.

The minimum response would be a rejection of DOE's request until fully developed and screened concepts could be presented, Alternative 2.

An intermediate option is Alternative 3, whereby we limit our reviews to those concepts that are already rather well developed. In this way our participation should not be construed as significantly influencing the development of a design that is in a relatively preliminary stage.

A fourth option, which responds to DOE's request for our thoughts on the best way to carry out such reviews, is Alternative 4. This Alternative includes the entire nuclear system in the scope of the NRC staff reviews.

Alternative 1: Comply with the DOE requests for reactor reviews. Provide guidance on the preparation of DOE's PSID based on information needs, and licensing precedents and principles. Provide a full reactor evaluation (commensurate with the completeness of the material submitted in the PSID) for each concept submitted by DOE, highlighting any licensing problem areas.

- PRO
- (a) Provides a measure of cooperation with DOE for achievement of Presidential objectives.
  - (b) Provides early opportunity for staff to become familiar with the reactor concepts that may be pursued in the future.
  - (c) DOE considers the NRC staff views on reactor licensability to be important in the overall choice of concepts to be emphasized for development into the commercial phase, and these views would be available early in the DOE decision process.
- CON
- (a) This alternative could involve many concepts, many of them in an early and fluid stage of design. Recommendations made at this stage on such fluid designs could be interpreted as NRC support for early design features, and could potentially bias future design and reviews.
  - (b) The present uncertainty about non-proliferation criteria will make the evaluation incomplete and possibly premature. Manpower may be wasted reviewing concepts that do not fit the criteria that would ultimately apply.
  - (c) Because of the large number of concepts, the manpower requirements would be well beyond our available resources.
  - (d) Since only reactor reviews are involved, significant system considerations related to fuel cycle and safeguard aspects will remain unreviewed by NRC.

Alternative 2: Decline the DOE requests until non-proliferation standards have been adopted and final alternative reactor and fuel cycle choices have been made by DOE and endorsed by the Administration.

- PRO (a) NRC's review would not bias DOE's choices at the early design stages of the concepts.
- (b) The evaluations would be limited to the concepts meeting DOE's criteria and would have the benefit of well developed non-proliferation criteria.
- (c) There would be little requirement for NRC manpower in FY 78.
- CON (a) NRC input would come at a late stage, and could impact DOE's implementation schedules, particularly if our response is unfavorable, or heavily qualified because of unavailable information.
- (b) A PSE is a preapplication document and should not have to await the completion of all phases of design.
- (c) This alternative would delay evaluation that we would have to do eventually, and timing may be a greater constraint for later evaluation.
- (d) DOE considers the NRC staff views on licensability to be important in the overall choice of concepts to be emphasized for development into the commercial phase, and these views would not be available early in the DOE decision process.

Alternative 3: Initially agree to review only those established reactor concepts for which a substantial background of applicable experience exists, e.g., HWR (CANDU), HTGR, SSR, LWBR, and an LMFBR variant. Other less developed concepts could be evaluated later as designs become firmer, and evaluation is warranted.

- PRO (a) This approach would be consistent with our past actions in evaluating the GCFR concept.
- (b) It would be a suitable application of the PSE vehicle since NRC conclusions could be definitive.
- (c) These concepts are fairly well developed already. Basic design choices are, in many cases, already made. Our participation would not prejudice staff evaluation in later review of these design choices.

- (d) DOE schedules are unlikely to be impacted unfavorably, because these are the only alternatives that are far enough along to reach the licensing stage in the near future. The Decision Criterion 1 would be satisfied in regard to those alternative reactors in the immediate prospect. The less developed alternative reactors do not have an impact on Criterion 1 at this time.
- (e) DOE considers the NRC staff views on reactor licensability to be important in the overall choice of concepts to be emphasized for development into the commercial phase, and these views would be available early in the DOE decision process.

- CON
- (a) Non-proliferation criteria are not yet developed, and the design evaluations may be premature in the sense that non-proliferation criteria could prompt significant changes in the concepts, or discarding of some concepts.
  - (b) NRC agreement to review these concepts may be regarded as a prejudice in favor of these four concepts and against others.
  - (c) Reluctance of NRC to comment on potential licensing issues of less developed concepts could limit DOE's long term decision making perspective.
  - (d) Since only reactor reviews are involved, significant system considerations related to fuel cycle and safeguard aspects will remain unreviewed by NRC.
  - (e) Manpower requirements would be about 6 manyears over allocated resources if the reviews were spread over the next two years and a total of four concepts are reviewed. We estimate that NRR would require 3 additional manyears in both FY 1978 and FY 1979. Performance of the NASAP reviews without the allocation of additional NRR manpower would result in delays in completion of CP, OL, Systematic Evaluation Program and generic technical activity reviews. The estimated impact is a 2 month delay in several such cases or activities for each NASAP concept reviewed.

Alternative 4: Consistent with DOE's broad program and the objectives of NASAP, participate in the review of complete nuclear systems, and include in the scope of the NRC staff review described in Alternative 3 the fuel resource requirements, alternative fuel cycles, and the safeguards and non-proliferation aspects of the reactor and the associated fuel cycle facilities.

- PRO
- (a) This reactor evaluation approach would be consistent with our past actions in evaluating the GCFR concept.
  - (b) The reactor evaluation would be a suitable application of the PSE vehicle, since NRC conclusions could be definitive.
  - (c) The reactor concepts are fairly well developed already. Basic design choices are, in many cases, already made. Our participation would not prejudice staff evaluation in later review of these design choices.
  - (d) DOE schedules are unlikely to be impacted unfavorably, because these are the only alternatives that are far enough along to be likely to reach the licensing stage in the near future. The Decision Criterion 1 would be satisfied in regard to those alternative reactors and fuel cycles in the immediate prospect. The less developed alternative reactors do not have an impact on Criterion 1 at this time.
  - (e) DOE considers the NRC staff views on reactor licensability to be important in the overall choice of system concepts to be emphasized for development into the commercial phase. The reactor evaluation, plus the fuel system review performed by the NRC staff, will be comprehensive and complete. It will include the fuel cycle and associated facilities, and will provide DOE with needed information and input for the INFCE decision process.
  - (f) This scope of review involves NRC in the total spectrum of the nuclear option (i.e., reactor and fuel cycle) from the beginning, and should be beneficial to the long term programs of the nation.

- CON (a) Non-proliferation criteria for reactors or fuel cycles are not yet established, and the evaluations may be premature in the sense that non-proliferation criteria could prompt significant changes in the concepts, or discarding of some concepts.
- (b) NRC agreement to review these concepts may be regarded as a prejudice in favor of these four concepts and against others.
- (c) Reluctance of NRC to comment on potential licensing issues of less developed concepts could limit DOE's long term decision making perspective.
- (d) Manpower requirements would be about 9 manyears over allocated resources if the reviews were spread over the next two years and a total of four concepts are reviewed. We estimate that NRR would require 3 additional manyears in both FY 1978 and FY 1979 and NMSS would require 1.5-2 manyears for each fiscal year. Performance of the NASAP reviews without the allocation of additional NRR manpower would result in delays in completion of CP, OL, Systematic Evaluation Program and generic technical activity reviews. The estimated impact is a 2 month delay in several such cases or activities for each NASAP concept reviewed.

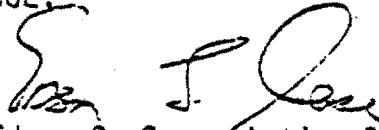
Recommendations: That the Commission:

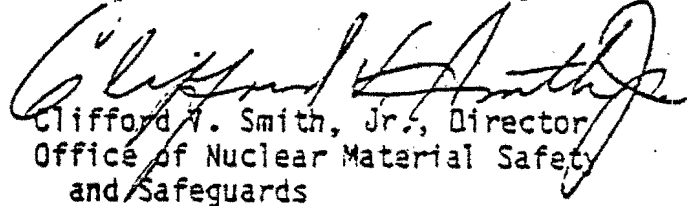
1. Approve Alternative 4 including the allocation of additional manpower. Note that the lack of non-proliferation criteria may limit the precision of staff conclusions. Direct the staff to work out the details of implementation of the reactor and fuel cycle evaluations.
2. Note that the ACRS will be requested to review.
3. Approve the transmittal of the enclosed letter from L. Gossick to G. Cunningham (Enclosure 2). This letter is a reply to the original request for review from Mr. Bauer (Enclosure 1), and has been prepared in accordance with Alternative 4.



Coordination:

The Office of Nuclear Reactor Research agrees that Alternative 4 should be adopted. The Office of the Executive Legal Director has no legal objection to the adoption of Alternative 4 or the proposed response to DOE.

  
Edson G. Case, Acting Director  
Office of Nuclear Reactor Regulation

  
Clifford V. Smith, Jr., Director  
Office of Nuclear Material Safety  
and Safeguards

Enclosures:

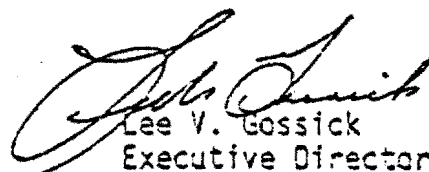
1. Proposed Letter to  
G. Cunningham
2. Letter from Mr. Bauer

DISTRIBUTION:

Commissioners  
Commission Staff Offices  
Exec Dir for Operations  
ACRS  
Secretariat

EDO NOTE:

I endorse the selection of Alternative 4 in the subject paper, but I recommend that the question of allocation of additional personnel to the offices be deferred until I have had the opportunity to review the schedule of DOE submissions to the Commission, the manpower resources required by these initiatives, as well as by other priority actions within the Commission and the availability of resources that can be made available through reallocation to meet these needs.

  
Lee V. Gossick  
Executive Director  
for Operations

NOTE: Commissioner comments should be provided directly to the Office of the Secretary by c.o.b. Friday, March 17, 1973.

Commission staff office comments, if any, should be submitted to the Commissioners NLT March 13, 1973, with an information copy to the Office of the Secretary. If the paper is of such a nature that it requires additional time for analytical review and comment, the Commissioners and the Secretariat should be apprised of when comments may be expected.

ENCLOSURE 1  
PROPOSED LTR TO G. CUNNINGHAM



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

Dr. George W. Cunningham  
Acting Program Director  
for Nuclear Energy  
Department of Energy  
Washington, D. C. 20545

Dear Dr. Cunningham:

The NRC has considered Mr. Bauer's request of September 30, 1977 for a Preapplication Safety Evaluation (PSE) of a low-enriched uranium heavy water reactor (HWR) of the CANDU type, and similar treatment of other alternative concepts, and is prepared to act affirmatively on it. Preliminary discussions have been held between the NRC staff and representatives of DOE and their contractors in regard to the HWR evaluation. These discussions have indicated some areas where more definite information will be required, including information on the desired scope, depth, and schedule of NRC staff review.

Consistent with the Department of Energy plans to evaluate the nonproliferation aspects of the various potential nuclear systems, including reactors and fuel cycles (the NASAP studies), we believe that it would be appropriate to include in the scope of the NRC staff review of the HWR the fuel resource requirements, alternative fuel cycles, generic and safeguards impacts of heavy water production, and the safeguards and nonproliferation aspects of the reactors and the associated fuel cycle facilities. Preliminary discussions with your staff indicate that this scope of review should be practicable and productive. We recognize that your proposed documentation relating to the licensability of a reactor facility may not be an appropriate vehicle for this additional information, and suggest that the DOE and NRC staffs reach agreement on the content and timing of additional documentation. At the present time, we believe that it is reasonable to expect completion of this fuel cycle review at about the same time as the licensability review of the reactor.

We believe that the NRC staff can be of assistance to you in evaluating the licensability of the various system concepts you are considering. In order to do this, the environmental impact, the safeguards and the public health and safety aspects of the system concepts, including the estimates of the probabilities and consequences of accidents, must be evaluated and shown to be acceptable when considered in the light of the criteria developed for the licensing of established systems of reactors (LWRs) and fuel cycles. This requires that reasonably firm designs be considered in order that meaningful judgments can be made on their acceptability. We would therefore not propose to review system concepts that are in a very preliminary stage of development, such as, for example, the gaseous core reactor.

In order to arrange for the commitment of the necessary personnel at the proper time we will need a firm estimate of the schedules on which you would expect to submit the Preliminary Safety Information Document (PSID) and related material and the other schedule milestones that you are able to identify. It would also be helpful to hold further discussions aimed at gauging the depth to which the system concept and its particular characteristics should be examined. In making these determinations, it will be necessary to take our limited manpower resources into account.

In regard to the HWR concept, which you are proposing for NRC's first consideration, the reactor review will follow the usual pattern of a licensing review, but with the abridgements appropriate for a concept-stage review rather than a well-defined reactor proposed for construction permit review. Other concepts will be considered in a similar fashion as permitted by the available information. We also note that where a need for a research and development program is identified in the course of your review, information outlining any such program should be furnished to the NRC for evaluation. Fuel cycle and safeguards assessments will likely be generic in nature making use of background and data previously developed in similar programmatic efforts.

We plan to set up the HWR review as a project within the Division of Project Management, Office of Nuclear Reactor Regulation, with the LMFBR Branch having the lead responsibility. Our review would omit specific site considerations, but where necessary typical siting would be assumed. The proposed review of fuel cycles, safeguards, and nonproliferation aspects would be managed by the Office of Nuclear Material Safety and Safeguards (NMSS).

We do not believe that the schedule your representatives proposed at the November 11, 1977 meeting with our staff is fully adequate. An initial six month period for the preparation of the Preliminary Safety Information Document (PSID) was proposed, and may be adequate. For preliminary planning you should allow about 12 months between the date of submittal of the PSID and the expected date on which the staff would complete its safety evaluation. Further discussions of DOE plans, schedules, and scope of review may prompt revision of this schedule.

In developing the PSID, you should follow the general format indicated in the "Standard Format and Content of Safety Analysis Reports for LWRs" insofar as it is applicable to this effort. Sections of the Standard Format not dealing with safety and licensing matters may be abbreviated or eliminated entirely from the reactor review; we understand from discussions with DOE staff that this is your intent. This will significantly facilitate our review. We would expect pertinent sections of your report to give clear information with respect to:

1. The design criteria, codes and standards upon which a detailed design would be developed.
2. The conceptual design of various systems and their interrelationships.
3. A description of the analysis methods, assumptions, and results obtained.
4. The analysis of a spectrum of accidents based on anticipated and less likely events such as process disturbances, equipment malfunctions and postulated component failures. The need for engineered safety features should be evaluated based on the probability and consequences of these events. The impact of various single failures on the course of the accidents should be evaluated.
5. Your assessment of the acceptability of the plant systems in relation to the design criteria and of the overall acceptability of the concept.
6. Identification of unique features or characteristics of the design compared to current technology and practice, and an evaluation of the safety significance of these departures.

You should identify those design criteria, codes, and standards applicable to LWRs which will be met, and provide justification for deviations from those which will not be met. Where criteria must be utilized that are different from or supplemental to those in current use, an explanation should be supplied. Similarly, we would expect you to supply a brief description of all the steps in the related fuel cycle, the related facilities and a review of the materials and facilities that require safeguarding.

In our review, we will provide a preliminary judgement as to whether or not the reactor concept could be developed into a design that could receive favorable staff assessment if a license application were to be submitted. Our judgment may be qualified in terms of resolution of safety questions, research and development results, or development of specific criteria. The fuel cycle review will provide preliminary evaluations of the environmental, safety, and safeguards aspects of the supporting fuel cycle.

We intend to request ACRS review of these concepts. We may therefore assume that the Committee will want occasional presentations from the NRC staff and DOE on this subject.

As Mr. Bauer requested, the staff will provide guidance on technical licensing matters, identification of requirements for research and development, definition of design basis accidents, and information requirements from AECL and others. We anticipate that this will be a continuing process to ensure that the PSID provides the information necessary to reach conclusions.

Mr. Bauer requested NRC guidance on safety and licensing implications for nuclear power plant alternatives sited outside the U.S. In this regard, we anticipate only being able to offer guidance based on parallels in the U.S.

As to the mode of our assessment, we expect that it will rely substantially on material submitted by you during the review process, augmented with some elements of our independent analysis as needed.

In our review we will make allowance for a period of questions and replies because we find this method productive in licensing reviews. In addition, however, we anticipate that these exchanges will be supplemented by topical meetings and less formal communications throughout the review in order to expedite the flow of information. The files of the project and the meetings themselves will be open to the public as required by law. Exceptions can be made to restrict access to proprietary material, but it is desirable that as little proprietary material as possible be used in this review.

I have appointed Mr. Homer Lowenberg Chairman of an NRC staff coordinating committee to handle NASAP related matters; please contact him on overall arrangements. Dr. T. P. Speis, Chief of the Liquid Metal Fast Breeder Reactors Branch, is our point of contact for the reactor licensability review, and Ms. Kathleen M. Black (NMSS) is the point of contact for the fuel cycle review. Please have your staff contact them for detailed arrangements and planning.

Sincerely,

Lee V. Gossick  
Executive Director for  
Operations

ENCLOSURE 2  
LETTER FROM MR. BAUER



UNITED STATES  
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION  
WASHINGTON, D.C. 20545

SEP 30 1977

Mr. Edson G. Case  
Acting Director  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Dear Mr. Case:

Under the President's leadership the country is intensely examining the various options for utilization of nuclear power, with particular attention to the nonproliferation aspects of the various potential fuel cycles and reactors. ERDA is a major participant in this undertaking, and as one of its efforts, has produced a Nonproliferation Alternative Systems Assessment Program (NASAP) plan. The draft of this plan has been reviewed by NRC, and we are in the process of incorporating the NRC suggestions into the plan. Because of the importance, high priority and urgency placed by the President on the NASAP and the International Nuclear Fuel Cycle Evaluation (INFCE) programs, it is important that the participation by NRC be expanded to include expert opinion on the licensability aspects of the alternative power sources. Licensability is a critical part of the determination of overall commercial feasibility and the projected timing and cost of the commercial introduction of these alternative concepts. These commercial aspects are an essential consideration of the overall nonproliferation potential of these plants.

In addition to the NASAP plan development work, ERDA is preparing to enter into plant design and evaluation contracts with industry for selected NASAP alternative power plant concepts. These will include the Heavy Water Reactor, Spectral Shift Control Reactor, Molten Salt Reactor, Gaseous Core Reactor, Accelerator Breeder Reactors, and other reactor concepts. The purpose of this letter is to request NRC assistance on the NASAP Heavy Water Reactor (HWR) study and to advise NRC of the probable nature and timing of similar requests for NRC assistance on selected other concepts.

On the HWR plant, the specific assistance being requested is for NRC to conduct a Preapplication Safety Evaluation (PSE) of the HWR based upon a Preliminary Safety Information Document (PSID) to be submitted



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within three months by the U.S. reactor manufacturer selected by ERDA to conduct the HWR design study, assisted by a U.S. architect-engineer and by the Argonne National Laboratory (ANL). Based upon exploratory discussions between NRC and ERDA staffs, it appears that the general form and content of the General Atomic (GA) PSID and the NRC PSE on the GA Gas-Cooled Fast Reactor (GCFR) plant would be appropriate vehicles for accomplishing this goal for the NASAP HWR. We recognize that in certain areas the detailed knowledge of the plant and its safety considerations may be initially less than that provided for the GCFR review by NRC.

Our aim is to develop the best information possible in the time available. In this regard, it would be helpful if the NRC staff could participate in a mid-October 1977 preliminary meeting on the NASAP HWR with ERDA, the reactor manufacturer, the architect-engineer and ANL technical staffs. By attending this meeting, the NRC staff could become familiar with the NASAP HWR design criteria, considerations and objectives. We, therefore, could receive appropriate NRC guidance on the information to be provided in the HWR PSID to be submitted to NRC by the ERDA funded project team.

ERDA has already developed a PSID for an HWR which can be provided to NRC, and has completed a plant layout and capital cost estimate for a 1140 MWe HWR at the hypothetical Middletown, U.S.A. site. We believe that meaningful discussions on the NASAP HWR between NRC and ERDA could begin immediately. Suggested items for discussion include:

1. Existing and needed information on the HWR plant description, key design criteria, safety analysis, site considerations, reactor and coolant system characteristics, engineered safety features, auxiliary and emergency systems, safety analysis, plant conformance with NRC General Design Criteria (GDC) and the development of proposed GDC and plant modifications. It is believed that these items should be discussed to assure that the PSID submitted to NRC by ERDA's contractors contains the information required by the NRC staff to perform a meaningful review and produce a PSE.
2. NRC guidance on probable content of the PSE on the NASAP HWR in the areas of principal safety considerations, the relationship of NRC concerns about the HWR conceptual design to the requirements for a research and development program, and the definition of design basis accidents.

SEP 10 1977

3. NRC guidance on the desirability and practicality of ACRS review subsequent to completion of the NRC PSE report.
4. NRC guidance on the schedule. A possible schedule could be:
  - . draft PSID to NRC for preliminary evaluation - within 3 months
  - . formal submittal of PSID to NRC - within 6 months
  - . NRC PSE report completed - within 9 months
  - . ACRS review (if appropriate) - between 10 and 13 months.

Additionally, close liaison would be maintained between the ERDA funded study team during the first 6 months to familiarize the NRC staff with the NASAP HWR design and ensure the adequacy of the PSID submittal to NRC, and the NRC PSE report.

5. NRC guidance on information and participation which should be requested from AECL and others, such as CANATOM, Ontario-Hydro, Electric Power Development Corporation (Japan), as appropriate.
6. NRC guidance on the approach to considering the safety and licensing implications for nuclear power plant alternatives sited outside the U.S., both by U.S. and non-U.S. reactor manufacturers.
7. Other items proposed by NRC and others, such as the NASAP HWR designer, architect-engineer, and ANL.

Completion of this effort should determine if the NASAP HWR concept potentially offers an acceptable degree of safety so as to allow future reviews to concentrate on details of the design rather than fundamental questions of concept adequacy. Additionally, it will assist ERDA and its contractors in estimating the probable effort and time in evolving required safety related research, engineering, and development data, and the related NRC and ACRS time to complete the formal site selection, construction permit, and operating license process.

If NRC can respond favorably to this request for specific assistance to the ERDA NASAP HWR project, we suggest that an NRC staff member be assigned as early as possible to work out the details of the program with the ERDA HWR technical manager, K. A. Trickett. We understand that NRC has established a coordinating committee for NRC work in the area of alternative fuel cycles and reactor technologies. We believe that contacts between ERDA and this committee could also be productive.

In addition to the above specific and immediate request for NRC assistance on the NASAP HWR project, we anticipate that other alternative reactor systems, such as the Spectral Shift Concept, will also be submitted for similar safety/licensing evaluation by NRC in the future.

We realize the difficulties and inherent limitations that may constrain the study. A large number of concepts are to be assessed. They are in varying stages of development. For some of the systems a great deal of information is available, and a very large backlog of safety assessments already exists. For some of the systems, however, no reference design or reasonable point of departure may exist at this time.

It is also our belief that it is crucially important that the various systems be evaluated against criteria appropriate to the system at hand. We, of course, are fully aware that a large array of criteria have already been established for the Light Water Reactor (LWR), on which the U.S. nuclear program has been based. However, we believe that an assessment which places excessive weight on criteria developed for the light water system may not, in itself, be an appropriate basis on which to assess other systems. This again obviously is a source of major difficulty; and judgments, as well as analyses, will have to be made relative to various recommended criteria.

We believe that it is inherent in the nature of the task that faces us that your analyses and reviews will necessarily have to be very selective. Similarly, our input would also be of a limited nature, at least in some cases.

We seek your opinion as to whether you would prefer your assessment of these other alternative reactor systems to be based solely on your own analysis of the system, or whether you would prefer your analysis to come in a responsive mode to material we present to you, as proposed above for the HWR. If you select a responsive mode for your assessments, we will arrange for our contractors to prepare appropriate material and request ANL to assist us in this safety and licensing activity.

The end product of the collective evaluation which we seek is an assessment of the safety and licensability of each of the concepts. We are fully aware of the difficulty of this task and also that it may depart significantly from precedent on NRC assessments. We must also emphasize that the effort which we hope to initiate between us must be consistent with the overall NASAP schedule since this is a major interagency commitment.

Among the assessments that we believe it would be useful for NRC to perform for each of the alternative NASAP concepts are the following:

- (a) Comments relative to the fundamental safety of the concept.
- (b) The criteria against which such licensability would be assessed and the possible difficulties on licensability.
- (c) The likely research and development requirements with respect to both timing and magnitude.

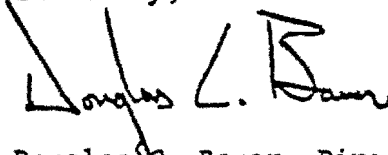
We would like to emphasize that the assessments made in this study should not be viewed by NRC as having any binding aspects on them.

These and any other assessments that you would care to make should be instrumental in allowing us to reach an assessment relative to the ultimate practicality of the concept being considered.

We are, of course, anxious to get your thoughts as to how we might best perform this task. As noted above, there are many issues to be resolved, and we would like to discuss the matter with you so that we can proceed with this task. In this regard, it would be helpful for NRC to work with the ERDA program manager, S. Strauch, and his staff, to determine how best to proceed on these additional efforts.

I would appreciate your advising me if we may look forward to your assistance. I would be pleased to discuss it further with you at your convenience.

Sincerely,



Douglas C. Bauer, Director  
Division of Nuclear Research  
and Applications

- cc: K. S. Pederson, Director, Office  
of Policy Evaluation, NRC  
H. Lowenberg, Asst. Dir. for  
Operations Technology, NRC  
L. V. Gossick, Exec. Dir. for  
Operations, NRC  
R. P. Denise, Asst. Dir. for  
Special Projects, NRC  
R. S. Boyd, Director, Div. of  
Project Management, NRC  
R. V. Avery, Director, Reactor  
Analysis & Safety, ANL  
G. W. Cunningham, O/ANE, ERDA

ENCLOSURE 3

PROPOSED LETTER TO SENATOR ABRAHAM RIBICOFF

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The Honorable Abraham Ribicoff  
Chairman, Committee on Government Affairs  
United States Senate  
Washington, D.C. 20510

Dear Senator Ribicoff:

Pursuant to Section 236 of the Legislative Reorganization Act of 1970, we are informing you of the actions that NRC is initiating in response to the General Accounting Office's recommendations on the NRC role in the assessment of nuclear fission technologies whose development should be accelerated. These recommendations were contained in a March 7, 1978, letter report to Senator Lloyd Bentsen from Comptroller General Staats (Enclosure 1). The Commission has determined that an affirmative response on the part of NRC to the GAO recommendations is desirable.

A statutory responsibility of NRC, as mandated under the Atomic Energy Act, the Energy Reorganization Act, and the National Environmental Policy Act, is to ensure that civilian nuclear activities are conducted in a manner consistent with the public health and safety, common defense and security, and environmental quality. Clearly, all of these factors could play an important role in the evaluation of alternative reactor-fuel cycle systems for potential domestic use. NRC's existing framework of rules and regulations provides some guidance in assessing candidate systems.

Although the NRC staff and the DOE staff have been maintaining contact in certain areas, in order for NRC's proposed program developed in response to the GAO recommendations to be successful, NRC will have to have increasingly close contact with DOE. I am writing to Secretary Schlesinger stating that NRC intends to be responsive to the GAO recommendations and noting the necessity for joint agency cooperation.

The Honorable Abraham Ribicoff - 2 -

I have directed the staff to begin development and implementation of a program for an essentially independent evaluation of the development of alternative fission technologies. NRC would: review the process, criteria, information and results used by DOE in its selection of concepts for further development to determine whether NRC considers an appropriate selection of concepts for further development has been made; review, in response to requests from DOE, reactor concepts and supporting fuel cycles from a safety, safeguards, environmental and licensing viewpoint; and initiate some research efforts to assist in defining problem areas associated with any follow-on effort.

The Commission will provide a staff report to the President and Congress of our preliminary findings of known or suspected licensing issues and problems associated with alternative technologies under serious consideration by DOE. Of course, these preliminary findings could not commit NRC to specific positions in future licensing actions. The report will include a comparative evaluation of the alternative technologies studied from a safety, safeguards, environmental and licensing point of view; to the extent possible, the alternative reactor and fuel cycles evaluated by NRC will be ranked from a licensing standpoint. The NRC objective will be to publish a report on a time scale compatible with the completion of the NASAP program and the INFCE studies.

The NRC budgetary allocation for alternative fuel cycle studies in FY 79 was extremely limited. The Commission decision to undertake an essentially independent evaluation of the development of alternative technologies and to prepare a report may entail a request for additional resources for the program. I will request such funds and personnel after DOE and NRC have established the necessary communication link, and NRC has developed its program.

The NRC appreciates the importance of minimizing the risks of nuclear proliferation and stands ready to work with DOE and the rest of the Legislative and Executive Branches to the fullest extent consistent with its statutory obligations and responsibilities.

Sincerely,

Enclosure:  
GAO Final Letter Report Regarding NRC'S  
Role in Selecting Fission Technologies

ENCLOSURE 4

PROPOSED LETTER TO SECRETARY SCHLESINGER

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The Honorable James R. Schlesinger  
Secretary of Energy  
Washington, D.C. 20545

Dear Mr. Secretary:

The Nuclear Regulatory Commission has reviewed recommendations from the General Accounting Office on the role of NRC in assessment of alternative fission technologies whose development should be accelerated (letter, Staats to Bentsen, March 7, 1978). The Commission has responded affirmatively to the GAO recommendations.

I have directed the staff to begin development and implementation of a program for an essentially independent evaluation of the development of alternative fission technologies. We are planning to: review the process, criteria, information and results used by DOE in its selection of concepts for further evaluation, and review the DOE selection to determine whether NRC believes an appropriate selection has been made; perform computations and simple tests to assist in defining problem magnitude and in planning any required follow-on work associated with NASAP; and publish a report to the President and cognizant Congressional committees of our findings of known or suspected licensing issues and problems associated with alternative technologies under serious consideration by DOE, including a comparative evaluation of the safety, safeguards, environmental and licensing aspects.

A statutory responsibility of NRC, as mandated under the Atomic Energy Act, the Energy Reorganization Act, and the National Environmental Policy Act, is to ensure that civilian nuclear activities are conducted in a manner consistent with the public health and safety, common defense and security, and environmental quality. Clearly, all of these factors could play an important role in the evaluation of alternative reactor-fuel cycle systems for potential domestic use. NRC's existing framework of rules and regulations should provide some guidance in assessing candidate systems.

In order that this assessment of alternative fission technologies by NRC be performed on a timely basis, it is essential that a communications link between NRC and DOE be established at an early date to permit NRC access to DOE NASAP studies and results.

The Honorable James R. Schlesinger

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I would appreciate your appointing a contact point as soon as possible so that NRC can begin its planning to carry out its independent review of alternative technologies.

The NRC appreciates the importance of minimizing the risks of nuclear proliferation and stands ready to work with DOE and the rest of the Executive and Legislative Branches to the fullest extent consistent with its statutory obligations and responsibilities.

Sincerely,