The original documents are located in Box 60, folder "1976/08/06 - Bob Fri" of the James M. Cannon Files at the Gerald R. Ford Presidential Library.

MEET WITH BOB FRI
Friday. August 6, 1976
4:30 p.m.

Fri

THE WHITE HOUSE

WASHINGTON

August 4, 1976

MEMORANDUM

TO : BRENT SCOWCROFT
JIM CANNON
JIM CONNOR

FROM: BOB FRI

SUBJECT: Dealing with the Joint Committee

Schleede, Markham, Mitchell and I have been over the attached options paper and concur in Option 4. The paper is provided for your information and, if you want, discussion at our meeting this afternoon. Unless you object, I will proceed with Option 4.

cc: J. Mitchell

Issue:

How, if at all, should we work with the JCAE to develop a non-proliferation policy statue that: (1) could be passed by October 2; and (2) could be supported by the President.

Background:

The JCAE (and the Foreign Relations Committee) received S.1439, the Export Reorganization Act, on referral from the Government Operations Committee. The JCAE must report on S. 1439 by August 31. Both the Administration and the JCAE oppose the bill strongly. However, Chairman Pastore of the JCAE feels S. 1439 will pass if it gets to the floor.

To prevent this, Chairman Pastore intends to propose a substitute bill, the Nuclear Weapons Non-Proliferation Act of 1976. His strategy is based on two arguments to Government Operations.

1. The Administration is more likely to support the JCAE bill, because it sets up a policy framework within which reorganization can be properly done. (We have consistently agreed that policy should precede reorganization. Thus, the JCAE hopes to cooperate with us.)

2. Government Operations can get a bill only by going along with JCAE because: (a) Administration support is more likely, and (b) the JCAE can expedite passage by reporting a bill simultaneously to the House and the Senate.

A number of agencies (State, ERDA, Commerce, NRC and possibly others) have been asked to join a drafting session on Thursday. The JCAE staff objective seems to be to have a clean bill by August 23 or 24 (when Congress returns from recess) so the JCAE can report by August 30.

The JCAE bill has been quickly reviewed by my task force, using comments from State, ERDA, and NRC. OMB, NSC and Domestic Council participated in the review.

Our first assessment reveals three classes of problems with the JCAE draft.

1. Major policy issues. The JCAE bill establishes policy directions which may or may not be satisfactory to the President, and which are the subject of the nuclear policy review now being conducted. They are:

   a. Should the U.S. adopt an assured supply policy for nuclear fuel or fuel services and, if so, under what terms and conditions.

   b. Should the U.S. agree now to supply reprocessing services, if and when they become available.

   c. Should the U.S. commit publicly to an international regime for plutonium storage.

   The bill also raises substantive questions on grandfathering current customers, the role of private enrichment, and export licensing criteria. At this time, it is difficult to tell whether these questions arise from sloppy drafting or policy decisions. For example, the bill may suggest heavier reliance on government enrichment than we want, but the drafting on this point may just be awkward and not imply a policy position.

2. Major procedural issues. The JCAE bill:

   a. Mandates consultation in many matters by the NRC, which may be an unwarranted intrusion into the Executive Branch role.

   b. Raises the possibility, if we pursue it, of correcting the role of NRC in the licensing process. For example, a CAB-like procedure could be pushed in return for mandating more NRC consultation than we would like.

3. Other issues. There are a number of more minor questions with which we might work with the JCAE. Of course, some could grow to major issues as we examine them further. Importantly, the broad findings at the start of the bill seem fairly safe on first reading.

Factors Bearing on the Issue:

1. Our actions prior to August 30, and after that date, need to be considered somewhat separately. Because we have an interest in thwarting S. 1439, there may be value in working with the JCAE through August 30 (to consume as much time as possible), even if we oppose the bill thereafter.

2. There are downside risks of passage of the JCAE bill.

   a. A good bill could upstage the President.

   b. Even a good JCAE bill runs a risk of attracting bad amendments on the floor.

   c. The JCAE bill could be bad.

3. There is a possibility that, whatever we do, Chairman Pastore could get a bill through Congress and for the President a difficult decision on a sensitive issue in early October. However, there appear to be ways of stalling the bill without opposing it outright.

4. There is a downside risk in not working with the JCAE through August 30. The appearance of cooperation should delay S. 1439 to the point that passage is not likely. Perhaps more important, our cooperation could be an effective argument for stalling the ad hoc non-proliferation amendments being attached to other bills (e.g. Zablocki, Symington, Anderson).

5. Our ability to work with the JCAE is inversely proportional to the importance of the issues. That is:

   a. The major policy issues are best treated after the President has seen the results of the nuclear policy review.

   b. The major procedural issues should be treated as in a., above, but could be accelerated somewhat.

c. We can always discuss platitudes and details.

6. Neither we nor the JCAE may be best served by appearing to cooperate too closely at the outset. Indeed, such cooperation could be viewed as a collusive attempt by the bad guys to save face.

Options:

1. Cooperate fully with the JCAE.

Pro

- Appropriate bipartisan treatment of this important subject

- Gives us more control of the result.

Con

- Very difficult situation if the bill, or subsequent floor amendments, are unsatisfactory

- Difficult to do well without results of the nuclear policy review.

2. Ignore, or even oppose, the JCAE action.

Pro

- Relies on Presidential initiative as the force behind nuclear policy.

- Makes it easier to obstruct, or even veto, the result.

Con

- Probably will not stop the JCAE.

- If it did, would leave the field to S. 1439 and the ad hoc amendments.

- Would be exploited as Presidential opposition to non-proliferation policy upgrading.

3. Work at staff level (drafting services*) with the JCAE through August 30, but maintain policy flexibility until nuclear policy review is complete. At that time, try to shape policy of JCAE bill or, failing that, oppose it.

Pro

- A logical approach, for which we could probably get some JCAE support (Baker, Anderson).

- Does a great deal to suppress S. 1439 and ad hoc amendments through August 30.

- Preserves flexibility for opposing the result after August 30.

Con

- Reduces our control of policy in the JCAE bill.

- May result in opposing a non-proliferation bill, although with a better basis for doing so than in Option 2.

4. Same as Option 3, but: (a) maintain informal contact with JCAE members and staff on policy issues; (b) accelerate nuclear policy group examination of the major procedural issues, looking to possibility of taking advantage of the JCAE bill to clear up the NRC role; and (c) directing agency staff to cooperate in cleaning up unimportant details.

Pro

- Could set the stage for agreement on policy issues, if the timing is right.

---

* There is agreement that drafting services should be provided by each agency separately.

- Could help resolve the NRC problem.

- Is about as forthcoming as JCAE staff expects us to be, and therefore supports their strategy for heading off S. 1439.

Con

- Requires careful management, and could result in diversion of review group's time on premature consideration of the NRC issues.

- Otherwise, same as Option 3.

Recommendaton:

Option 4. If approved:

- I will maintain informal contact with George Murphy.

- We will advise agency representatives to provide drafting services only.

- I will organize a group to examine the NRC role issue.

- We will determine after the August 5 drafting session what additional advice we can give JCAE staff on minor issues.

- We will reassess our situation shortly before August 23, when Congress reconvenes.

- If asked by the press, we should indicate that the JCAE (in contrast to Government Operations) is going about the problem in the right way by putting policy before procedure. However, we reserve judgment on whether the JCAE is coming up with good policy until we have completed our review.

August 4, 1976

OUTLINE OF PRESIDENTIAL MESSAGE

The following outline is designed to: (1) give an indication of my own thinking on the results of the nuclear policy review, and (2) determine whether it is the kind of product we should have in mind.

In addition to the policy decisions I have assumed in the outline, four other assumptions are behind it:

1. It is given at a major international forum,
2. It must contain policy directions, but, to be credible, must also contain reasonably dramatic initiatives; to stress this, the outline contains some fairly tough stances.
3. In view of the JCAE exercise, presenting a common front with Congress would be helpful.
4. Some initiative to clear up current, highly publicized problems is also desirable.

Obviously, the outline is not rhetorical, but thematic.

Following this message, a separate domestic message (to the Congress or the public) would propose more specific

implementing actions. For example, a domestic message would probably,

1. Call on the Congress to conform the JCAE bill to the President's position.
2. Lay out the waste management program
3. Outline the specifics of a reprocessing program
4. Propose how to handle domestic spent fuel
5. Seek to reestablish public and investor confidence in the domestic nuclear option.

A generation ago, President Eisenhower saw the promise of nuclear power and offered to share its benefits with the world.

The promise remains, but we know now that we cannot enjoy the benefits of the atom without dealing forthrightly and effectively with its costs.

We know what we want to do--to use nuclear power peacefully while sharply limiting the risks that weapons material will fall into the wrong hands.

- No policy will succeed unless we strive to meet each nation's legitimate interest in power production.
- But we are all endangered unless we can:
  - renounce explosive uses of the atom,
  - place adequate controls over the generation and storage of plutonium
  - secure dangerous material against terrorist threat

All responsible nations can agree on these principles. Yet we have not moved nearly fast enough toward their realization.

Sadly, one of the most formidable obstacles to the control of plutonium is of our own creation. We have believed that the recycling of plutonium as a nuclear fuel is a necessary and desirable part of nuclear power. This belief is not clearly

valid, and banishing it from our thinking will cost no one very much.

The U.S. believes that the use of plutonium as nuclear fuel can and should be deferred unless and until facilities and techniques for control of plutonium can be decisively demonstrated to the world community. The U.S. intends to defer the use of plutonium recycle domestically while we work out the detailed operation and safeguards of the necessary facilities. In this spirit, the U.S. reasserts its views that the development of new national fuel cycle facilities is unnecessary, and I call on all supplier nations to defer any action to transfer such facilities or their technology for at least two years.

Although the need for plutonium as a fuel is not clearly established, the need for peaceful nuclear power cannot be disputed. Accordingly, the U.S. proposes to shoulder the responsibility of assuring a supply of nuclear fuel to nations that share with us a strong committment to the control of plutonium.

1. Recognizing our mutual interests extend to providing each nation a secure and reliable supply of energy, the U.S. is prepared to discuss, as part of our assurances on nuclear

fuel, related undertakings to share with our customers, U.S. technology and resources for alternate forms of energy.

2. The U.S. is embarked on a program of major expansion in its enrichment capacity. Contracts for this purpose are before the Congress now, and I urge the Congress to approve them swiftly. This expansion will take place in the private sector, but the government will earmark parts of this capacity for non-U.S. sales to ensure that the U.S. can deliver on its assured supply commitments.

3. I have directed _____to draw up terms and conditions of assured supply contracts, and to offer such contracts to all future and existing customers.

4. The U.S. believes it must be regarded as a reliable supplier--that while our policies must change as circumstances require, changes must be recognized as judicious and carried out by well-understood procedures. To this end, I am asking the Congress to provide that differences

between the Executive Branch and the regulatory authority licensing individual exports be referred to the President for decision.

I stress, however, that the U.S. offers these assurances to those who share our committment to the deferral of plutonium recycle and to the rigorous control of this dangerous material. We will therefore seek agreements that bind nations to the non-explosive uses of nuclear power, full fuel cycle safeguards, reasonable physical security efforts, and U.S. consent to future reprocessing of spent fuel. I urge other supplier nations to adopt the same policy.

In seeking these committments, our goal is to ensure that plutonium is protected from diversion or theft. The U.S. is absolutely committed to this goal, and will refuse to supply fuel when the goal cannot be met. We will, however, carefully consider any responsible arrangement that conforms to this policy. International reprocessing, return of spent fuel to the U.S., and storage of fuel under international control may, under carefully controlled circumstances, be feasible roads to our goal.

I am directing _____immediately to bring our current actions in line with this policy, that the U.S. will refuse to supply nuclear materials or technology to any

nation that does not provide adequate assurances of control.

But we must do more than state our intentions in matters so important to the world community. All nations must act to make our hopes real. In this spirit, the U.S. will take several decisive steps to implement domestic actions to support our policies.

- The U.S. believes that assured supply carries with it the obligation to receive spent nuclear fuel. I am directing _____ to establish the necessary spent fuel storage at our Savannah River site, and to develop the necessary financial arrangement protecting each nation's economic interest in the fuel.

- The U.S. believes uranium recycle is sensible, if economics dictate. I am directing _____ to accelerate the start up of the Barnwell facility for this purpose. We will learn how to do the job, and we will offer the service to our customers.

- The U.S. believes we need to know much more about the safeguarding, physical security, and economics of plutonium recycle. I am therefore directing _____ to construct conversion and

fabrication facilities on the Savannah River site for this purpose. In them, plutonium will be stored under strict control, and the fabrication facility will be designed to produce mixed oxide fuel only to demand. I believe this definitive step is needed to determine if a facility can be safeguarded, and if future facilities should be constructed with private funds on government property to enhance accountability and security. I invite participation by other countries in this venture.

- The U.S. believes international control of plutonium inventories is a desireable goal. Subject to satisfactory arrangements with the IAEA, the U.S. will place its own plutonium separated at Barnwell under such controls, and invites other countries to do likewise.

- The U.S. believes that all nations should submit to IAEA safeguards. I am therefore prepared to sign the fuel cycle safeguards agreement just concluded with the IAEA.

- The U.S. believes that assured supply extends to the final disposition of waste products. I am therefore directing an acceleration of our waste

disposal program, and calling for an international conference to address the responsibilities of supplier nations under this principle.

Finally, I recognize U.S. policy in the nuclear arena has been undergoing change and, with change, the vigorous debate that characterizes our political process. I believe that Congress, with the leadership of Senator John Pastore and others, is prepared to consider legislation that seeks the same ends, and endorses the same means, that I have urged here today. I shall continue to work with them so that the President, the Congress and the American people stand united--concluding debate without rancor, seeking wisdom without partisanship, and together forging solutions to a problem common to all peoples.

AGENCY POINTS OF CONTACT

Adm. Thomas D. Davies
Mr. Steven Jellinek
Mr. Richard Darmon
Mr. Frank Hodsoll
Dr. James P. Wade, Jr.
Mr. Roger Strelow
Dr. Richard Roberts
Mr. Edmond F. O'Connor
Mr. William Rosenberg
Mr. Robert Hanfling
Mr. Bruce A. Pasternack
Mr. Harry C. McKittrick
Mr. Benjamin Huberman
Mr. Winston Lord
Mr. Reginald Bartholomew

OFFICIAL USE ONLY

THE WHITE HOUSE

WASHINGTON

August 6, 1976

MEMORANDUM

TO : AGENCY POINTS OF CONTACT

FROM : ROBERT W. FRI

SUBJECT : Nuclear Policy Review Analytic Outline

Attached is an outline of the analysis we are conducting. In this or modified form, the outline will serve as the basis of our final product and the decision paper to the President.

Of special importance, the outline enumerates the criteria, issues, and options we are considering at this time. I would appreciate your careful review of these elements of the outline to determine if other criteria, issues, and options should be added to our analysis, or if existing ones should be deleted. The outline has been crosschecked against all the information we have so far received, and we believe it is reasonably comprehensive.

Also attached is a revised schedule showing when draft products on topics covered in the outline will be available to you.

Please furnish us your comments no later than Tuesday, August 10.

Attachments

cc: B. Scowcroft
J. Cannon
J. Lynn
J. Connor

OFFICIAL USE ONLY

NUCLEAR POLICY REVIEW

SCHEDULE FOR INTERAGENCY REVIEW OF MATERIALS

The following schedule lists materials corresponding to topics of the analytic outline (attached). In all cases, we will ask for agency comments within two working days of receipt. We expect to circulate a Presidential decision paper for agency review on August 23.

Analytic Outline Topics	Issue Paper to Agencies: First Draft	Final Draft
Introduction		
- International Dimension	August 6	August 16
- Domestic Dimension	August 11	August 16
Nuclear Policy Objectives		
- International criteria	August 6	August 13
- Domestic Criteria	August 10	August 13
Major Policy Issues		
- Issue One: Plutonium use	August 11	August 16
- Issue Two: Constraints	August 13	August 18
- Issue Three: Incentives	August 13	August 18
Other Major Questions		
- Waste Disposal	August 6, 11	August 16
- Federal role in domestic reprocessing, waste, and transportation programs	August 13	August 18
- IAEA Initiatives	August 13	August 18
- Technology initiatives	August 10	August 16

NUCLEAR POLICY REVIEW
ANALYTIC OUTLINE

INTRODUCTION AND BACKGROUND

I. Origin and Purpose of the Review

II. The International Dimension*

- A. Historical perspective
- B. Recent developments
- C. Major current problems
- D. Prospects
  1. Availability of plutonium
  2. Views of nonnuclear weapons states

III. The Domestic Dimension**

- A. Historical perspective
  1. Enrichment
  2. Reactors
  3. Reprocessing
  4. Waste
- B. Recent developments
  1. Enrichment
  2. Reactors
  3. Reprocessing
  4. Waste

---

* Full text draft of this section is attached. (A)

** To be prepared by ERC Nuclear Subcommittee.

C. Major current problems affecting the nuclear option domestically

1. Public confidence

2. Investor and industry confidence

D. Role of reprocessing, waste disposal, and nonproliferation issues affecting public and investor confidence

1. Generally

2. Specifically

a. Licensing problems

b. Court decisions

c. California statutes

d. Initiatives in other states

NUCLEAR POLICY OBJECTIVES

I. Overall Goal

A. Our overall goal is to meet legitimate needs for peaceful nuclear power, while eliminating the risk of plutonium (or other weapons grade material) being diverted for a national weapons capability, falling into the hands of terrorist or sub-national groups, or damaging public health.

B. The fundamental objective importantly contains an affirmative goal - to meet legitimate needs for peaceful nuclear power. Meeting this goal is prerequisite to attaining agreement on

controls that minimize or eliminate the risks associated with plutonium.

C. To control the risks of plutonium, our goals are to:

- secure commitments from all countries to non-explosive use of nuclear power
- retard the growth of nationally held stocks of plutonium, including limitation of new national reprocessing plants
- safeguard against diversion of weapons material through:
  - making plutonium stocks inaccessible except for nonexplosive uses
  - providing timely warning of diversion
- provide adequate physical security of dangerous materials

II. Overall Criteria for Gauging the Effectiveness of Policy Options Internationally

A. Will the option meet our overall objectives in controlling the risks of plutonium (see I.C., above)?

B. Is the course of action technically and economically feasible and otherwise compatible with our other foreign policy goals, bearing in mind that our nonproliferation efforts must be

viewed in a broader foreign policy context? This policy context includes our desire to achieve greater energy independence for ourselves and others.

C. Does the constraint or effort provide added credible assurances to the world at large that no diversions are occurring, that none are imminent, and that diligent efforts are being made to abate the spread of nuclear weapons?

D. Does the proposal or effort serve to enhance U.S. influence in this area?

E. Is the effort one that the U.S. could or should undertake unilaterally or does its efficacy depend on a wide degree of nuclear supplier and consumer support?

III. Overall Criteria for Gauging the Effectiveness of Policy Options Domestically*

MAJOR POLICY ISSUES

I. Introduction - three major issues appear to drive U.S. nuclear policy; these issues are considered first, followed by an analysis of important subsidiary questions.

---

* To be prepared by ERC Nuclear Subcommittee

II. Issue One: Harmonizing International Position on Domestic Programs on Plutonium Use

A. Assumption - the U.S. position on use of plutonium as a fuel internationally and the U.S. program for advancing plutonium recycle domestically should be mutually reinforcing; this consistency does not now exist, or at least has been blurred by recent U.S. action.

B. Statement of the Issue - assuming that the U.S. should conform international policy and domestic programs to a consistent view of plutonium as a fuel, then should:

1. international nonproliferation considerations drive our domestic program, or
2. are domestic benefits of reprocessing sufficiently attractive to allow domestic interest to drive our stand on plutonium internationally?

C. Specific Criteria for Evaluating the Policy Options

1. International criteria

a. The effect of our actions on decisions by other states (particularly those of proliferation concern or in sensitive regions) to acquire national reprocessing capabilities, and on their ability to do so

b. Other effects on the amount of plutonium which will be in national hands around the world, and potentially vulnerable to terrorist or national diversion

c. The effect on the probability that such plutonium would be used for nuclear weapon programs

2. Domestic criteria

a. Impact on consumer cost of electricity

b. Effect on the economics of near-term utility decisions on whether to choose nuclear or other power plants

c. Constraints (particularly related to resources) on attaining national energy goals

d. Effectiveness in defining government position sufficient to provide a better industry planning base

e. Impact on solving problems related to safety, environmental issues, adequacy of safeguards and physical protection, and meeting public concerns in these areas.

f. Effect on required spent fuel storage capacity

3. Subcriteria

   a. If we want to be able to offer to other countries services concerning the back end of the fuel cycle, does the option permit this?

   b. Is the option supportive to multinational or international regimes for the back end of the fuel cycle, and how much does this help?

   c. Does the option enhance our involvement with, and therefore leverage on, foreign countries of interest?

D. Option One

1. International Position - Plutonium is an important fuel: given proper constraints and safeguards, its use is indicated, at least for power programs above some threshold size.

2. Domestic Position - Benefits of plutonium recycle are quite attractive domestically. Therefore, the U.S. will pursue vigorous programs, including governmental assistance, aimed at installation of several reprocessing plants, starting in the late 1970's, sufficient to at least handle all U.S. LWR fuel. We would also more vigorously implement plutonium recycle. This could be combined with offering reprocessing services to other countries and establishing an international custody regime in the U.S. for separated plutonium.

E. Option Two

1. International Position - Plutonium is an acceptable, albeit potentially dangerous fuel: given proper constraints and safeguards its use is acceptable. The U.S. intends to take steps toward domestic buildup of domestic capacity. We might ask other countries

to delay their efforts pending further safeguards development, or we might simply press for a go-slow approach for smaller programs. We could invite foreign participation in our domestic demonstration program.

2. Domestic Position - Plutonium recycle is attractive domestically, and we must move toward it. The first step is to resolve existing uncertainties. Therefore, we adopt a demonstration program, involving one or two plants, government owned or government assisted private enterprises, to establish that reprocessing, waste handling, and recycle operations are technically demonstrated and licensable. This could lead to operation of further plants in the early 1990's.

F. Option Three

1. International Position - Plutonium recycle is of questionable value economically and of clear concern from the nonproliferation standpoint. Great care is required before the world commits to it. Other nations, but particularly those with small programs, should defer,for a time certain,steps leading to commercial reprocessing services. Suppliers should refrain from further exports of reprocessing technology

for at least a year or two.

2. Domestic Position - The U.S. sees no certain or sizeable domestic benefit from recycle in the near term. We therefore will defer a decision on recycle and large scale reprocessing. We would conduct a limited demonstration (probably AGNS) aimed at (1) establishing a viable program if needed later for recycle or a breeder option, and (2) possibly demonstration of alternatives. This would be combined with domestic and international initiatives to provide adequate spent fuel storage capacity, probably under international auspices, and examine other technical alternatives to recycle. Uranium recycle (e.g. at AGNS) might be operated at full scale. An mixed oxide demonstration project might or might not be included.

G. Option Four

1. International Position - Plutonium recycle is of highly questionable value and is extremely dangerous internationally. All nations should refrain at least for several years from reprocessing.

2. Domestic Position - The domestic benefit of plutonium recycle is marginal at best. We would announce a

U.S. government decision, based on nonproliferation safeguards, and economic/timing considerations, not to move ahead on reprocessing and recycle, at least for some period (5 to 10 years). This would be combined with an international effort to provide spent fuel storage (including the U.S. as a site) to discourage reprocessing, particularly in sensitive areas, and to establish a suitable international safeguards and custody framework, under which to move forward if use of breeders and/or recycle is indicated after that period.

H. Evaluation of the Options

1. Against general and specific international criteria

2. Against general and specific domestic criteria

3. Against costs of alternative domestic programs

III. Issue Two - Consistent U.S. Policy on Constraints

A. Assumption - A stated policy from which we are perceived to deviate frequently (e.g., for other foreign policy reasons) unnecessarily undermines public and international confidence in the U.S. position on nonproliferation. To minimize deviations, U.S. policy on constraints applied to nuclear exports should be broad enough to apply to all countries to which we wish to export.

B. Statement of the Issue - recognizing the need for a consistently applicable policy on constraints and for meeting our nonproliferation goals, should we:

1. Revert back to mode that full cooperation and reprocessing is fine if IAEA safeguards apply or state is NPT party?

2. Primarily stay where we are, possibly with more vigorous diplomatic activity?
3. Further raise the ante? How adequate do we find IAEA safeguards?

C. Constraint Options to be Considered

1. Limit our cooperation to NPT parties and/or states under full safeguards
2. Cooperate with states that are non-NPT as well as NPT parties,but under tougher controls
3. No cooperation with, or quaranteed benefits for states that reprocess nationally
4. No cooperation with non-nuclear weapon states that hereafter detonate nuclear devices
5. No, or limited, cooperation with sensitive regions (LDC's)
6. Insistence on better handles on the produced plutonium through such options as buy-back, barter, lease
7. Insistence on tougher U.S. veto rights concerning where reprocessing or plutonium fabrication and storage can occur.
8. Insistence that others participate in an international storage regime covering "excess" plutonium

b. Calling on all suppliers to seek controls over storage as a supply condition

c. Pledging new resources to IAEA for this purpose

2. Further efforts to strengthen the IAEA safeguards regime

3. More actively foster a physical security convention (including discussion of bilateral options including more intensive cooperation with EURATOM)

4. Narrow the gap in constraints with the other suppliers, including ways to assure that competitive commercial pressures among suppliers do not distort or temper non-proliferation conditions

a. Ribicoff's market sharing concept

b. Strengthened opportunities

F. Evaluation of the Options (against major international criteria, above)

IV. Issue Three - Creating Incentive to Accept U.S. Constraints

A. Assumption - the U.S. role as a credible nuclear supplier is critical, has eroded and needs to be restored to foster our nonproliferation

9. Strengthening real and perceived effectiveness and credibility of IAEA safeguards (Should we rely more on bilateral safeguards in all or selected instances for reprocessing?)
10. Possible other measures.

D. Optional Positions to Ensure Consistency
   1. Conditions cover all cooperating states, without exception
   2. Distinguish between NPT and non-NPT parties, possibly restoring an NPT preference
   3. Consider special arrangements to control plutonium (e.g., return of spent fuel) if all desired conditions are not met, especially in sensitive regions

E. Options to Secure Multinational Reinforcement of U.S. Bilateral Constraints
   1. More vigorous pursuit of U.S. proposal favoring an IAEA storage regime for excess plutonium by:
      a. Offering to place our own excess civil plutonium under an acceptable regime

interests. Since a policy of denial alone would be seriously deficient, we need to develop a better mix of incentives as well as controls to achieve our objectives.

B. Statement of the Issue - recognizing the need for an affirmative supply policy, then:

1. What can we do to enhance the attractiveness of the U.S. as a supplier of enrichment services?
2. Are we willing and able to offer cooperating states a credible alternative to reprocessing and retaining their own plutonium?
3. To what extent should initiatives under 1. and 2. above, be internationalized?
4. How can we assure cooperating states of our reliability, given the existing NRC role in export licensing?

C. Options to Enhance U.S. Enrichment Services

1. If the Nuclear Fuel Assurance Act is passed, what are the opportunities, if any, to underscore our commitment to meet needs of states complying with our ground rules? Are convincing new commitments of future capacity feasible? Can we say something new and positive concerning terms and conditions?

2. What should and can we do on short notice if NFAA fails or is deferred?
3. Is the Pastore Bill promising conceptually, subject to the necessary amendments?

D. Options to Offer Alternative to National Reprocessing

1. Should we inaugurate a major program to acquire foreign spent fuel elements in return, at our option, for cash or UF_6 and possibly the return of fabricated MOX fuel?
   a. What would be the benefits and costs?
   b. Should we accept the wastes and provide the feed?
   c. Should such an opportunity extend to all or just some cooperative countries?
   d. What are the probable domestic implications for U.S. utilities?
   e. Is there useful precedents in the earlier AEC conceptual reprocessing service proposal? Any legal constraints?
2. Should we offer to perform reprocessing services for foreign customers under terms where we would retain the wastes and have the opportunity to determine whether the customer receives UF_6, cash, or fully fabricated fuel rods

rods for immediate end use?

a. Is there a meaningful distinction between options a & b?

b. Should such an offer be constrained to a fraction of available capacity (AGNS) or should it be conceptual as per the earlier AEC "program?"

c. To whom would the benefits/conditions apply?

d. Can we proceed to a concrete offer or only express an interest in exploring such an idea with other users and suppliers?

3. Should we express a willingness, in principle, to have foreign spent fuels stored in this country for a protracted period with title residing with the customer?

4. Should we offer U.S. territory as a possible site for an international storage regime that might be a forerunner for a regional fuel cycle center?

5. Should we offer more concrete assistance to the establishment of spent fuel centers overseas?

6. What obligations would any of these actions impose on us concerning our relations with other suppliers?

E. Options for nonnuclear energy technology incentives

1. Can the U.S. offer convincing incremental assurances that nations adopting our nonproliferation criteria will enjoy additive benefits in nonnuclear energy development?

   a. What would be added beyond concepts we already support in the IEA, CIEC, etc.?

2. Can and should the U. S. adopt a more intensive program designed to encourage sensitive countries (for proliferation purposes) to develop nonnuclear energy alternatives?

F. Options for Internationalizing U.S. Initiative

1. Should we develop a sharing or guarantee arrangement for fuel supply and services with the other principal enrichment or reprocessing suppliers, pooling capabilities of the U.S., FRG, and UK and France in uranium feed, access, enrichment, and reprocessing capacities, to permit reactor competition to continue without this factor serving as an element favoring one supplier?

2. Should we attempt to draw the USSR, Canada, and Australia into this systems, to contribute

in the areas of national uranium (Canada, Australia), enrichment services (USSR), and utilization of acquired spent fuel (Canada)?

3. Is it in our interest to first consult closely with our prospective customers on any major U.S. initiatives or to involve them in the process of more detailed elaboration?

4. What are the likely implications of our proposed activities on various multinational efforts to which we already are committed?
5. Are there ways we ultimately might wish to use our sensitive technologies through cooperation to foster our nonproliferation objectives?
   a. Are we prepared to consider ultimate, active U.S. assistance to a regional/multinational reprocessing center that is supportive to our interests?
   b. Is an ultimate cooperatve arrangement with Australia of possible interest?
   c. Should we consider sharing technology with the other oil consumers?

G. Options for Clarifying Export Licensing Procedure*

H. Evaluation of Options

OTHER MAJOR QUESTIONS

I. Waste Disposal

A. Assumption - the waste disposal program has two important deadlines:

---

* To be furnished separately.

1. 1985, by which date a first plant should be ready to operate to receive waste
2. 1978, by which date enough results must be available to make a credible case that disposal technology is available; this date is important because:
   a. It is likely to be the earliest date for complete site evaluation,
   b. California must determine if technology is available during 1979.
   c. The sooner the program produces results, the better for public confidence.

B. Are the 1985 Program Goals Adequate?*

C. Should the First Plant be Licensed?
   1. Is licensing important for credibility?
   2. What are the timing implications?
      a. Could delays in the licensing process be tolerated, and what is their likelihood?

---

* See separate draft paper on this topic. (B)

b. Alternatively, would intervenors challenge a decision not to license, and what delay could result?

3. What is the appropriate licensing approach, recongizing the first-of-a-kind nature of the initial site?

a. Facility license

b Materials License

c. Modified approach

D. What Must Be Done to Meet the 1978 Goal:

1. For both reprocessing and throwaway cycle, what will be available by 1978 under the existing program?

a. Full site analysis

b. Terminal design

c. Canister

d. Solidification technology

2. Can and should any of these results be accelerated?

3. Will NRC criteria be available by 1978

a. What is the role of ERDA's GEIS?

b. How will EPA set general environmental criteria by 1977?

c. Can NRC act by 1978?

d. Will the necessary data be available?

4. If criteria and program results are available by 1978, can affirmative demonstration of disposal technology be produced?

a. According to California criteria

b. Other criteria

II. Federal Role In Domestic Reprocessing, Waste and Transportation Programs

A. Given a decision on the direction of the U.S. reprocessing program (see major issue one, above) what implementing actions must the Federal government take?

1. Support to AGNS

2. Support for first conversion and MOX fabrication facilities

3. Support to subsequent facilities

4. Impact on NRC licensing and GESMO actions

B. Does the waste disposal program need to be modified in view of major policy decisions above (e.g., to accept foreign waste)?

C. How can the commercial transport of commercial materials in the back end of the fuel cycle be fostered?

III. IAEA Initiatives

A. Given major policy decisions, above, what initiatives should the U.S. consider to demonstrate adequacy of IAEA safeguards, particularly for plutonium?

1. Joint demonstration of "safeguardable" facilities (in the U.S.)
2. Multinational safeguards demonstration projects (abroad)
3. Accelerated U.S. R&D program, including domestic and international safeguards

B. How, and to what extent, can the U.S. assure that IAEA receives adequate resources?

1. Increased contributions (financial, technical personnel) of members
2. Reimbursement for implementation of U.S. voluntary safeguards

IV Technology Initiatives

A. What technologies exist that, if successfully developed, remove the need to separate plutonium for recycle in converter reactors?

1. Tandem cycle
2. Others

B. Are these technologies promising?

C. How should promising technologies be pursued?

1. Defer plutonium separation until they are developed
2. Used as options for special cases
3. Be made part of a formal R&D program
4. Deemphasize

OVERALL CONCLUSIONS

I. Structure the Major Alternative Strategies

A. Weed out options of little merit or dubious feasibility

B. Construct alternative strategies from mutually consistent, viable options

II. Evaluate Alternative Strategies

A. On their own merits

B. In light of major international and domestic criteria

III. Present Conclusions and Recommendations

Attachment A

THE INTERNATIONAL DIMENSION

A. THE HISTORICAL PERSPECTIVE

For over twenty years the United States has been actively cooperating with other nations in the peaceful nuclear field under terms designed to prevent the spread of nuclear weapons.

From the very inception, this program has rested on the key assumptions that the U.S. has no monopoly on technical creativity in this area, that other nations are capable of ultimately proceeding with their own indigenous nuclear programs, and that our non-proliferation and other interests thus are better served by a program of active but controlled cooperation at least in direct power-producing technologies than by a policy of general secrecy or embargo. We also have regarded this effort to be important to the preservation of our technical and economic leadership in the nuclear and energy field, have judged the program to be important in fostering close political and economic associations with other countries, and have valued collaboration in the nuclear power field as supportive to our efforts to encourage greater independence for the oil consumers. Relatedly, the program has proven of considerable value in promoting a favorable balance of trade with estimated returns to the United States through 2000 valued at between $120 and $140 billion or roughly between 3.2% to 4.0% of projected total U.S. exports.

Fundamentally we have felt a responsibility under the mandate in the Atomic Energy Act to share our peaceful advances with other countries to the extent this is compatible with the national security. As a primary element in our cooperation, we have demanded that peaceful assurances and safeguards be applied to our assistance to help assure that it only is put to peaceful and nonexplosive use.

In general, we have moved to ever tighter constraints on our cooperation. The program has included the following major features:

- Strong adherence to the proposition, through long-term uranium enrichment contracts, that it is in our non-proliferation and related interests to be viewed as an attractive, stable and credible supplier of low enriched uranium fuel. This has been accompanied by the sales either directly or under license of U.S. nuclear power reactors of the light water type which have proved to be the preferred choice of most foreign nations.
- Strong U.S. support of the IAEA, in general, and its inspection and related safeguards responsibilities, in particular.
- Promotion of the concept that international safeguards should be applied not only to U.S. exports, but as widely as possible to all foreign programs. (We view such safeguards as basically a device that will detect and hopefully deter diversions on a timely basis. However, we have never

argued that they, per se, can prevent diversions by searching out clandestine facilities or physically recouping lost or diverted materials.)

- Sustained U.S. efforts, intensified as of late, to achieve a common approach among the principal nuclear suppliers in their nuclear export and safeguard policies so that non-proliferation constraints are isolated from competitive commercial considerations.
- Support of the NPT which has been ratified by 99 states with Japan and the EURATOM states notable recent adherents.
- Case-by-case cooperation in areas of research and development and in programs related to the safe use and regulation of nuclear energy.
- And the application of special constraints to the export of sensitive technology such as chemical reprocessing, uranium enrichment and heavy water production. These constraints have amounted to nearly complete abstention from export of these technologies.

B. RECENT DEVELOPMENTS

Over the past two or three years, there have been some significant advances in our nonproliferation policies. However, the Indian "peaceful" nuclear explosion was regarded as a major set back: following its occurrence, the Executive Branch

framed, through consideration of NSSM 202, an updated non-proliferation strategy which has been pursued with great intensity. This strategy has included:

- The inauguration of more intensive consultations with the other principal nuclear suppliers, including France (the so-called London Group), that has led to the adoption of commonly agreed guidelines to govern the respective nuclear export policies of the participants. These guidelines extend the traditional NPT/IAEA regime by providing for such measures as safeguards on replicated sensitive facilities, tighter retransfer conditions, and physical security standards. A major result, in addition to specific common safeguards policies, has been more systematic consultative procedures between ourselves and the other suppliers, with increased attention to the diplomatic and security dimensions of nonproliferation. As a consequence, there has been an obvious movement toward a greater commonality of approach toward sensitive export cases.

- The adoption of a generally more selective policy in our nuclear relations with other countries. For example, we have judged that we cannot regard NPT adherence to be the exclusive test as to a state's reliability as a nuclear partner or as the criterion for determining whether certain activities are permissible. In general, we have sought to impose a new set of stringent controls over the use and disposition of plutonium derived from US reactor and fuel supply , as illustrated by the case of the Egypt/Israel agreements.
- Intensification of international concern about the need to achieve better physical protection of sensitive nuclear materials by making compliance with U.S. standards a precondition for the supply of sensitive nuclear materials and exploring the feasibility of an international convention.
- Adherence to a new overall approach towards constraining reprocessing. We have argued more forcefully than ever before that the chemical reprocessing of irradiated fuel and the prospective accumulation of separated plutonium represents the

most sensitive aspect of the nuclear fuel cycle, that the further spread of reprocessing facilities (even to some NPT parties) is not desirable and that alternatives to further national facilities should be considered. This is predicated partly on the grounds that safeguards are less effective for these facilities than other types, that plutonium access on a national basis could be directly exploited for weapons if safeguards are breached, and that perceptions of countries acquiring small reprocessing plants could cause instabilities. This has represented a marked shift from a posture of many years standing that reprocessing is a legitimate, peaceful nuclear activity so long as adequate safeguards apply. It also has represented a material tightening over the views we expressed during negotiation of the NPT to the effect that NPT parties were not barred from acquiring their own reprocessing or enrichment capabilities, albeit not necessarily with our support.

For example, during supplier discussions and in proposals made by Secretary Kissinger before the UNGA, we have been exploring the concept that as an alternative to many national reprocessing plants, such facilities should be established on a multinational/binational basis. More recently, we have suggested that the industrialized states should service the reprocessing needs of other nations. Also, we successfully

pressured Korea to cancel a pilot reprocessing venture and are endeavoring to get Pakistan to do the same. Further, we have refrained for several years from exporting reprocessing technology and have bilaterally urged the other suppliers to adhere to similar restraint. We confidentially requested the major "reprocessing" states (including the FRG, France, the United Kingdom and the USSR) to join with us in an eighteen month moratorium on sensitive export commitments (such as commitment to export reprocessing or enrichment technology) during which time more secure and equitable alternatives would be pursued.

- Lastly, and most recently, we have been endeavoring to get the other principal suppliers to agree to an even more aggressive international approach to the potential plutonium accumulation and management problem, and we are exploring the concept that excess plutonium (in irradiated or separated form) should be placed under IAEA custody for storage pending bona fide civil use.

C. MAJOR CURRENT PROBLEMS

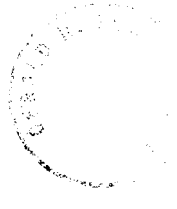
Notwithstanding all these efforts and some real accomplishments, which were comprehensively summarized by Secretary Kissinger on March 9 before the Government Operations Committee, we have run into

serious and unprecedented difficulties in our nuclear export program due to a confluence of different factors:

- Since the Indian nuclear explosion and our announcement of potential reactor sales to Egypt and Israel, there has been a massive increase in public concern over the proliferation issue and a perception by many critics and observers that more intensive efforts must be brought to bear on the problem to keep pace with the prospective growth of the industry and global spread of nuclear capabilities and weapons usable materials.

  Some critics have argued that we were intemperate during the "Atoms for Peace" Era, and they are pressuring for continuously more rigorous controls. Some also argue that we have oversold nuclear power to the LDC's or to states in sensitive regions.

- The subject also has become more politicized domestically and has entered the overall nuclear power debate with elements in the Congress and media arguing that the Executive Branch is not bringing sufficient vigor to bear on the problem or that it is acting imprudently in some export cases (India, Spain and South Africa). Most seriously there has been some drift away from



the bipartisan spirit that long distinguished this area and we have witnessed legislative proposals that would further hobble the Executive Branch either through over specific mandates or procedural amendments that would subject additional exports to Congressional review or veto. On the other hand, several responsible leaders, and most notably Senator Pastore, are endeavoring to work with the Administration in a constructive fashion in order to reduce the uncertainties as to where the U.S. is going in this field.

Concurrently,our image as a credible and reliable nuclear supplier has eroded to the lowest point in history of the program, and this, in turn, has reduced our relative influence in the non-proliferation theater and has occasioned a shift of nuclear commerce to the FRG, France and, to a lesser extent, Canada and the USSR. This situation has grave implications for long-term ability of the U.S. to influence the course of world nuclear developments. The factors leading to this last development are difficult to quantify but undoubtedly include foreign anxieties about our reliability due to:

a. Delays in passage of the Nuclear Fuel Assurance Act;

b. Concerns that our nuclear export policies may be in an open-ended state of flux;

c. New procedural complexities in our export policies due to the shifting of the nuclear export licensing responsibilities to the independent Nuclear Regulatory Commission. (At present a cooperating nation has less assurance than ever before that

fuel it has contracted and even paid for, pursuant to an Agreement for Cooperation, will actually be delivered on a timely basis).

- One particular source of concern has related to a perception by some foreign countries that we have deviated from positions that were either stated or inferred during the NPT negotiations. Some NPT parties (and notably Iran) have argued that our new policies represent a departure from the spirit if not letter of the Treaty since we have materially increased the ante for U.S. cooperation even with NPT parties and no longer accept the premise that NPT parties (and particularly those in sensitive regions) necessarily should be able to proceed with their own indigenous nuclear reprocessing and enrichment plants. Further, this has impacted adversely, to some extent, on North-South and alliance relationships since some of the candidates for U.S. nuclear assistance, like Iran, are latter day arrivals who are now being asked to submit to more rigorous controls than we favored in the past.
- Also while we have made marked strides in forging common minimum export policies with other suppliers, and while Paris and Bonn show signs of softening their positions on future transactions to exercise restraint and require some economic justification, our export conditions and controls over reprocessing are

more rigorous than those of France and FRG. Both countries see the inherent proliferation dangers of sensitive technologies, but still contemplate such transfers, partly on the grounds that such transfers are permitted by the London Guidelines if tightly controlled and that denial can catalyze the acquisition of unsafeguarded indigenous facilities. Some also believe they have promoted such transfers so as to enhance their competitive position with U.S. reactor companies who have been unable to export such technologies. We, however, are pressing at political levels for a moratorium on all such transfers, view the London Guidelines to be the minimum standards to be adhered to, and are seeking rigorous veto rights in our agreements as to where the fuels from our supplied reactors can be reprocessed. This continued disparity in supplier practice has led to some intense Congressional criticisms that we are not bringing sufficient pressures to bear on the other suppliers. U.S. industry, on the other hand, has expressed grave concern that our comparatively more rigorous export conditions, coupled with the general erosion of our credibility as a supplier, are serving to shift the nuclear business elsewhere. U.S. industry advises that, through 1972, U.S. suppliers received 25% of orders placed in the nuclear export markets. However, in the last three years, the U.S. share of such orders fell to 47%. In part, this dramatic decrease is due to uncertainties in U.S. export policy, as well as our comparatively more rigorous controls.

- Additionally, the IAEA safeguards system has been subjected to more intensive Congressional and public scrutiny than ever before. Some have argued that we are not receiving sufficient timely information to gauge the system's effectiveness, that the Agency lacks sufficient resources to do a credible job, or that the growing availability of weapons grade materials worldwide will make it infeasible to detect diversions in the relatively short time required to make a weapon. Others fail to see that the IAEA system is more than an accountability effort but also involves deterrence through containment and surveillance. Still others believe there are no inherent deficiencies in the IAEA safeguard system but that it needs to be materially strengthened and reinforced by additive bilateral and multinational constraints.

D. PROSPECTS

1. Availability of Plutonium

It is to be noted that 45 countries outside the U.S. are committed to some degree to nuclear power. In addition to 112 operating reactors outside the U.S., 117 reactors are under construction; 60 reactors are on order; and 18 reactors are currently planned. This sizeable effort was undoubtedly stimulated by the oil embargo and growing anxieties about shortages in fossil fuels. Not only is the consumption of nuclear power increasing but the number of suppliers and consumers is also. By the year 2000 the estimated nuclear capacity around the world may range from a low figure of _____ to a high figure of ____. In very rough terms, this should result in a gross cumulative production of roughly _____ tons of plutonium by the year 2000. The challenge that this will pose from a proliferation standpoint will, of course, very much depend on such factors as the degree to which this material is contained in the form of irradiated fuel elements, or the degree to which it is separated through reprocessing

(for recycling in thermal reactors, use in experimental facilities, or use in breeder reactors) and the degree to which there are national accumulations of excess quantities of separated plutonium available in forms suitable for prompt weapons use. Annex ____ to this paper attempts to project the current and prospective nature of the plutonium accumulation problem throughout the world under different assumptions concerning the prospective growth of the industry (i.e. whether or not we will decide to recycle).

Since chemical reprocessing is crucial to the acquisition of separated plutonium, it is important to characterize the current availability of reprocessing facilities throughout the world and their prospective increase under various assumptions.

First, it must be stressed that several nations, including the U.S., the United Kingdom, France, the USSR, Japan, Germany and India, already have acquired national reprocessing facilities and additional facilities of this character including the troublesome Pakistan plant are under construction or in the planning stage. A list of all known or firmly

planned reprocessing projects is attached as Annex _____. It is, of course, difficult to come up with a definitive picture of the likely increase and dispersion of such facilities far in the future since this often depends on the assumptions that one makes about the prospective future directions of the industry and often the attitudes of the evaluators. At one end of the continuum, many believe that a further expansion of reprocessing capabilities is inevitable in at least some or several countries as they move towards recycling and prepare for the breeder economy. The West Europeans for example appear firmly committed to the acquisition of further facilities. Proponents of reprocessing argue that it is essential to the healthy growth of the nuclear industry to assure the most effective use of uranium resources and an orderly transition to the breeder. Others, including elements in the arms control community, challenge the inherent need for the technology and argue that the economic and resource/ conservation benefits are not worth the proliferation risks that are attendant with a major move in this direction.

Most would agree that future global developments may be heavily shaped by the nature of the decisions that the U.S., as a leader, takes in its own domestic program. A key issue of this study is to examine whether, when, where and how domestic reprocessing might occur. However, the actions that we take domestically, or even internationally, cannot be viewed as decisive in preventing a state that is determined to reprocess from doing so. This would require diplomatic and security efforts which can help but may not be successful. In this regard the basic technology of reprocessing has been unclassified since 1958 and many believe it is within the capability of any determined state (as witnessed the Indian experience) to ultimately acquire a modest-scale reprocessing capability for weapons purposes, even though such a plant may not be optimal or even practicable from a commercial standpoint, and putting aside the political or security implications and disincentives involved.

In our last intergovernmental review of the nonproliferation issue (NSSM 202) we emphasized that the achievement of large scale commercial reprocessing is still a very formidable challenge for several countries and we have noted that we still have a brief, but meaningful leadtime to either head-off or shape prospective reprocessing developments in several countries of nonproliferation concern. In the field of uranium enrichment, major foreign efforts have been launched to sell enrichment services on a competitive basis.

- With the help of financial contributions from others, France is proceeding to construct a 10 million SWU/year gaseous diffusion plant designed to meet domestic and foreign needs and is organizing a follow-on 9 million SWU plant of a similar character
- The FRG, the United Kingdom and the Netherlands also are jointly collaborating rhrough the URENCO Group in acquiring

significant capacity through the centrifuge process and the USSR has made an important number of spot enrichment sales to the FRG, Japan, Sweden and others. Several other countries including South Africa, Japan, Australia, either have enrichment projects under construction, development or consideration. Notwithstanding the entry of additional states into the markets (as evidenced by the graph attached as Annex ____), it is still hoped that the U.S. will supply a good fraction of the foreign market although this will depend on our emerging nuclear export policies.

With respect to the spread of enrichment technology, the danger of proliferation through the route of highly enriched uranium (thus bypassing reactors and reprocessing) is real but not imminent. The gaseous diffusion process poses little problem in this regard, due to its size, cost and technological complexity, but the small centrifuge process could present a risk. Centrifuge technology could be used to further enrich low enriched uranium obtained on the open market or from UF_6 stock held for fuel fabrication. The URENCO group has expressed an interest in marketing centrifuges, under carefully controlled conditions but has not as yet concluded any definitive transactions. It would be governed in its exports by the London Supplier Guidelines which apply (a) particular constraints to the export of

sensitive technologies, as well as (b) the associated consultative procedures and policy constraints.

In 1974, the FRG agreed to export an enrichment plant to Brazil based on the jet nozzle process and, in principle, the FRG has expressed an amenability to cooperating with Iran in the enrichment field at a later point in time. Japan has an indigenous centrifuge program on a small scale.

Thus, there is an evident spread occurring of enrichment technology and over the long term we can anticipate the establishment of additional facilities in several countries particularly if some of the more advanced technologies, such as the laser isotope separation process prove practicable. For the near term, however, technological difficulties suggest that we must contain the plutonium problem while guarding against proliferation through the route of highly enriched uranium over the longer term.

All of the above factors, of course, also suggest that the relative U.S. monopolist role as a nuclear supplier, while important, is diminishing and that we must predicate our planning on this reality.

Finally, in assessing the nature of nuclear export problem, it also must be stressed that we are dealing with a wide variety of differing foreign situations where some tailoring of our nonproliferation strategies to particular situations undoubtedly will be required. Our current strategy contemplates that we will exercise greater discrimination in framing our arrangements to differing situations. One of the key considerations analyzed in this study is whether we are availing ourselves of a sufficient variety of differing constraints and arrangements to deal with evolving challenges and situations. By way of illustration, some of our agreements are with stable countries who are parties to the NPT and with whom we have close mutual associations (Japan, Canada and the EURATOM countries being good examples). Others are with states (like Libya or Korea) that adhere to NPT but nonetheless present potential proliferation problems. We also have cordial nuclear associations and agreements for cooperation, with _____ non-NPT countries, including South Africa, Israel, India, Argentina and Brazil. Also, as witness the cases of Israel and Egypt, we are seeking very rigorous controls in the case of our nuclear associations with particularly sensitive regions.

2. Views of Nonnuclear Weapons States

Also since many of the options discussed in this paper need to be assessed in terms of their probable impact on the nonnuclear weapon states, it may be useful to make the following general points to help establish our overall frame of reference.

First, as noted, several of the nonnuclear weapon states have committed themselves in various degrees to building nuclear facilities as part of their economic development and with an acute sensitivity to their oil dependence. Several do not have alternate energy sources readily available.

Many nonnuclear states also aspire to a greater security of supply of their energy resources in light of the oil crisis, and this has proved relevant to the claims by some that they need to chemically reprocess in order to derive the full value of the nuclear fuels that they acquire. Several nonnuclear weapon states also are in the throes of a nationalistic phase and are anxious to close the gap with the industrialized world or to show the trappings of modern technology. Some aspire to regional leadership, which they link to technological prowess. Hence they are highly suspicious of initiatives favoring nuclear restraint that emanate from the industrialized powers on the grounds that these tend to foster economic discrimination.

It cannot be overemphasized that a U.S. policy largely based on denial or one that is perceived as being highly discriminatory in nature is not likely to be very successful and in the final analysis may engender increased tension and hostility. Energy and development are inextricably limited. Access to adequate quantities of energy resources, on economically acceptable terms is perceived as essential and nonnegotiable to the populations of the Southern Hemisphere. Neither is a policy that is perceived as highly discriminatory in nature. Hence, success of our effort might well depend on perceptions by the nonnuclear weapon states that we are offering credible rewards to accompany any new constraints and that the alternatives we are proposing will not place them at any economic or political disadvantage.

It also must be noted, however, that some states seek civil nuclear facilities not only for peaceful power but also to give them a nuclear explosives option. In these cases, we need to be particularly rigorous in nonproliferation. Also we might deal with the situation through a wide range of policy techniques not necessarily limited to questions of nuclear supply or constraint.

ASSESSMENT OF ERDA's HIGH LEVEL WASTE MANAGEMENT PLAN AND PROGRAM

A. Background

Government policy since the 1970's has been for the Federal government to take responsibility for long-term storage of high level wastes. Private industry is responsible (subject to regulation) for packaging the wastes and delivering them in a prescribed form to a Federal repository for long-term storage.

The most pressing question in both the public's and nuclear critic's mind concerning nuclear waste is the Federal government's ability to assure that methods for terminal storage of high level, long-lived wastes will be available in a timely, safe, and environmentally sound manner.

The Federal record in this area is not outstanding:

-- permanent storage in the Lyons, Kansas Salt Mines was considered and rejected due to technical problems and local opposition.

-- temporary (50-200 years) near surface storage plans were dropped in 1973 due largely to environmental opposition.

-- programs to develop permanent repositories heretofore have had relatively low priority.

The President's 1977 Budget signaled a dramatic increase in the priority and pace of development of the high-level waste management program, with outlays increasing from $12 million in FY76 to over $65 million. The thrust of the program is to undertake exploratory drilling of various geologic formations around the country to find a suitable location for a pilot and operational repository(ies).

The ERDA program is taking enough shape that it can be asked "do we have the right program"--that is, can a preliminary assessment be made to determine if the program is adequate or should it be reshaped? There are two parts to the question: a) do ERDA's engineering, development and construction plans constitute a sound program, b) is the interplay of ERDA's program and the regulatory framework that will accompany it appropriate? This paper examines the first part of the question.

B. Criteria

High level waste management is somewhat unique in the nuclear fuel cycle:

-- it has no commercial value but could easily block the orderly development of civilian nuclear power.

-- the wastes will be around, hot and toxic, for thousands of years and must be isolated from the biosphere.

-- we will never know whether the program was an ultimate success--we cannot perform the 1000 year experiment.

It is therefore necessary to adopt several different criteria to judge the ERDA program. These include:

-- general waste management concepts
-- R&D strategy
-- status of technology
-- flexibility
-- public acceptance

General waste management concepts

An NRC Task Force has suggested at least five concepts to consider when examining the acceptability of a long-term waste management program.

They are:

1. Development of repository to handle both present and projected needs.

2. An isolation technique that does not rely on developing future technology to select, construct, or operate the proposed repository.

3. No reliance on institutional arrangements or future societies for perpetual management of wastes.

4. Decision should not result in irreversible consequences without removing major uncertainties and receiving society's approval.

5. Program should be cost-effective.

R&D strategy

The R&D strategy should be appropriate for the problem and satisfy the general waste management concepts. The cost of solving the problem are relatively minor compared to the monetary, health, and public credibility costs of failure. This suggests the program should utilize and examine several approaches simultaneously to solve a single technical problem rather than using a sequential approach and that engineering and safety should be considered as primary objectives rather than cost-minimization.

Status of technology

The baseline technology for development must be examined to insure that currently available technology can be used to isolate the waste within the relevant time period. This would include examining whether such technology is generally available and what the remaining major steps needed to develop and test its viability are.

Flexibility of program

While the program must develop to handle current projected wastes, it must also be flexible, including having the ability to accommodate program changes in other parts of the fuel cycle e.g., decisions on reprocessing, and expand to accommodate potential international initiatives.

Public acceptance

Does the technology stand a reasonable chance of a) proving acceptable to the public and b) passing the regulatory and institutional barriers to using the new technology?

C. Description of ERDA engineering program

The Reorganization Act of 1974 requires the Federal government to accept all High Level Waste. ERDA has been assigned the responsibility of selecting, developing, operating, and maintaining the integrity of the facility. ERDA has examined the various types of engineering options and concluded that deep geological burial represents the only technology that is currently available and that can be used to isolate the waste with a known degree of certainty. ERDA's criteria for development includes the following:

1. feasibility of being able to operate a terminal storage facility by the time the facilities are needed.

2. a retrievability concept for storage of waste in the early period of operation of the repository.

3. development of more than one site to serve the country as a terminal storage facility so that no one location need bear the burden for the entire United States. It is felt that multiple sites also:

   -- reduce waste transportation costs and risks if more than one facility is used since they will be dispersed around the country,

   -- help eliminate concern regarding possible Federal government reluctance to abandon possible sites after significant expenditure since other facilities will be available.

   -- provide a safety device in case any one site fails.

Although the sequence for developing a terminal storage facility may differ slightly from one geologic formation to another, the general sequence can be characterized as having distinct steps as follows:

1. identification of geologic formations of interest
2. reconnaissance surveys
3. in-situ tests
4. area studies
5. detailed confirmation studies
6. pilot plant operations

These steps imply both a scientific, R&D, and construction program and a decision process. With respect to the latter, it is the intent of ERDA to have an extensive series of review procedures by Federal, State and local organizations at appropriate decision points in the development sequence for each formation. Exactly what form those reviews will assume and an assessment of their likelihood of success has not been determined.

The last step in the program will be to convert the operation into a permanent Federal repository. It is currently envisioned that conversion of the facility to a Federal Repository will occur when sufficient data has been gathered to obtain the required licenses from NRC. Intentions are to do this at the earliest opportunity after actually receiving wastes (ERDA is planning on a 10-year pilot plant operation, altough the decision to license will be up to NRC). When the facility is converted to a Federal Repository, the main change would be to drop the retrievability option, to backfill, and seal the storage rooms.

The screening processes leading to the selection of the first plant sites is as follows:

> Starting with an initial list of multiple geologic formations, the first step is to identify a number of geologic study areas in each of the formations. The actual number of study areas will vary in each case and the total number will be in the neighborhood of eighteen. Within each study area a few detailed confirmation study locations are to be identified. From these detailed study areas six pilot plant sites will be selected. It is then planned to develop the pilot plants in pairs and sequentially.
>
> The development sequence for geologic disposal has already been completed for salt formations. Still remaining are further reconnaissance surveys, area studies and the subsequent steps leading to an operating repository. The first two pilot plants are expected to be on time in 1985. It should be noted that land purchase will not start until the entire review process for site selection has been completed for salt formations.

As previously indicated, the first two pilot plants will be constructed in salt formations, with start-up for receiving waste scheduled for the middle of 1985. The remaining pilot plants are expected to be constructed in other geological formations with start-up operations to be initiated two years later.

D. Assessment of ERDA's program

This assessment compares the ERDA program against criteria to indicate the general direction of the program and the rate of progress.

Concept

The currently planned ERDA program, if successful, appears to satisfy the broad conceptual requirements of a sound long-term waste management program:

--In terms of ability to handle both present and projected levels of waste, ERDA estimates that the first repository scheduled to be on line in 1985 would be filled to only about 60% of its capacity by the year 2000. Although the repository would fill up quite rapidly after that date (in about 5 years at 500 GWE) a second repository could extend that date to about 16 years. In fact, if ERDA were successful in developing 3 repositories or half of the currently planned number, storage capacity would be ample to the year 2027.

--The isolation technique underlying the program basically relies upon known and workable drilling, handling, excavation, etc. technologies, as opposed to unproven methods such as transmutation.

--ERDA's program employs a multi-barrier approach consisting of solidifying, packaging and storage in a stable geologic media. As opposed to other approaches to waste management which were suggested in the past such as dumping liquids into the granite, the current approach is designed to allow retrievability of the waste during the early years of operation, when the critical on-site tests will be performed.

--The key element in the ERDA program is to locate geologic formations that are predicted to remain stable for thousands of years, allowing the wastes to be permanently isolated and requiring no perpetual care. This is in contrast to the surface retrievable concept, which requires continual monitoring.

R&D Strategy

--ERDA's basic strategy of starting with a large number of potential sites, narrowing that number down and then simultaneously developing pairs of sites in different media appears sound in terms of minimizing the cost of failing at any particular site. That is, if one site fails, another site is planned to be ready

to accept the waste. Further, if the early sites prove successful, development of the other sites can be scheduled as required, as opposed to a crash program. (This is in contrast to the Lyons, Kansas approach).

--the R&D program itself is simultaneously examining the key factors for isolation such as solidification, canister to media effects, etc., rather than a sequential trail and error approach. While this leads to duplication, it accelerates the program and broadens the potential alternatives available to the decision maker. In view of the high costs of failure of the program, this duplication seems acceptable.

--ERDA is drawing on its experiences of temporarily storing defense wastes, especially in the area of developing methods of handling commercial waste. Unfortunately, the defense program has not been of assistance in determining the effects of radiation on the storage sites.

Status of Technology

Currently, the technology to store waste for several thousand years safely cannot be fully tested. Deep geological burial appears to be the most promising concept because the fundamental techniques have been tested and techniques for forecasting future conditions are available. (ERDA will continue to investigate on a low priority basis more exotic techniques which have not yet become technologically feasible.)

While the basic technology for deep geological is available, refinement of several techniques and procedures must take place. This includes:

--Siting

Since the material must be stored for lengthy periods and requires extensive shielding, ERDA plans to place the material at least 1000 feet beneath the ground and allow the media to absorb the predicted effluences of the waste. The exact effects of canisters on the media has not been completely determined. ERDA's work in the salt vaults of Lyons, Kansas gives preliminary evidence on the effects of fuel elements on the media. Unfortunately, this test is insufficient to conclude the effects of HLW on a larger scale repository.

Another problem is the sheer selection of a site. The earth science process requires numerous tests. USGS estimates at least 3 years of intensive work to find an acceptable site even though most of the work can be done in parallel fashion. To improve the odds of acceptability, ERDA plans to examine several sites simultaneously. The number of sites that can be examined simultaneously is constrained by the number of qualified experts in the field rather than money. While it appears possible for ERDA to examine in depth the initial pair of sites, more extensive earth science work will continue to be constrained by the availability of geologic experts.

--Excavation

ERDA's program for excavating could use current technology. The biggest concern is the technique of closing the repository to maintain the integrity of the site. ERDA's R&D is now experimenting with various techniques to solve this.

--Solidification

ERDA's defense work assisted in providing a basis for the development of solidification. Current work is designed to develop glass that can be safely transported, retrieved relatively easy, and display a very low leachability factor. ERDA currently has developed several techniques of vitrification with leachability factors less than pyrex glass. This solidification project should enable the waste to be easily transported and to maintain its solidified form for at least 20 years so that it can be retrieved.

--Canister

ERDA is just initiating various types of canister design and charateristics to determine the optimal canister for a particular type of glass and media. A canister must be retrievable for at least a 20 year period. Each canister will contain about 6.5 cubic feet of solidified HLW, meaning that 14 canisters could contain all the solidified waste from a 1000 MWE plant for one year. ERDA does not view canister development as a major problem.

--Handling

ERDA's work with defense waste has provided an excellent opportunity to develop techniques for handling HLW. These techniques can be used for the commercial waste almost without further development.

Flexibility of the program

--Ability to handle different amounts of waste

ERDA estimates that an optimal size repository would handle about 80,000 canisters. 500 GWE will produce annually about 7000 canisters, which means a capacity to store 10.5 years of waste at that level. The following table summarizes the storage capability in terms of domestic requirements by the year 2000.

- under current projections, the amount of waste to be stored by 1985 would be about 6000 canisters, or 7% of the capacity of the first repository;
- a single repository would be filled to about 60% capacity in year 2000, and would fill up rapidly thereafter;
- however, if ERDA is successful in developing multiple repositories, storage capacity that would open by the 1990's could accommodate projected waste to year 2027.

DOMESTIC

Number of sites	Cumulative capacity (canisters)	Year 2000 Domestic Requirement	% capacity	Date of Full capacity (500 GWE of electricity)
1	80,000	47,692	60%	2005
2	160,000	47,692	30%	2016
3	240,000	47,692	20%	2027

The ERDA program could accept significant volumes of foreign wastes if multiple sites are available. Below is an illustration of the projected waste from non-European, non-Japanese sources. Again, if only one repository were available, however, U.S. ability to promote multinational storage would be limited.

FOREIGN IMPACTS

(Latin America, Middle East, Africa and Asia [without Japan])
(Cumulative to year 2000)

U.S. Capacity	Foreign Waste (Metric Tons)	Number of Canisters	% Capacity of Repository (includes Domestic Waste	Date of Capacity w/o Further Foreign Waste aft. yr. 2000	Date of Capacity with Foreign Waste
80,000 (1 site)	78,940	37,590	106	2000	2000
240,000 (3 sites)	78,940	37,590	36	2022	2011

It is estimated that defense waste will occupy about 10 times the space commercial reprocessing will require. Hence, the defense waste management program cannot be accommodated in the commercial program.

--Ability to accept different forms of wastes

The ERDA program is designed to be available and accept wastes from the civilian reprocessing industry by around 1985. If for some reason it were decided to store fuel rods in the repository, the area required would be similar but the volume required would be about 30-50% greater due to the height of the rods. ERDA estimates that this additional height would not be a major factor in excavation since the operational factors for wall and floor integrity will be geared to handling equipment requirements.

--Timing

The 1985 target date for the first repository was originally geared to receiving wastes from reprocessing plants operating in the U.S. by 1972-74. However, it does not appear that the first reprocessing plant can be initiated even on a limited scale until 1978 with full operation by 1981. Under existing regulations, the first wastes would not be legally required to be shipped until 1988. This allows ERDA some slippage in its schedule before large volumes of waste would have to be stored.

The 1985 date appears feasible from a technical point of view, and will force the system to operate and meet certain schedules. Completion by 1985 will allow time to test the effects of the repository before large volumes would require storage. It also allows for unplanned slippages. However:

- the amount of waste projected to be solidified and ready for storage by 1985 is relatively small and could easily be handled without a repository. In fact, there is some concern that there will not be enough commercial waste available in 1985 to perform the necessary tests in-situ.

- the 1985 date places a tremendous burden on the institutional and technical steps that have to be accomplished in the early phases of the program.

Hence, it would appear that efforts to speed up the program may be unnecessary and counter productive.

Public acceptance and credibility

It seems certain that a well planned and executed high level waste program cannot be technically demonstrated before the mid 1980's. ERDA should be able to fully explain the program and how the mechanisms work both theoretically and technically in the near future.

ERDA currently has planned a series of steps to bring the public into the process, in addition to performing the required EIS's and other programmatic actions. Probably the single most important action for ERDA to take in the meantime, however, is to develop a coherent statement of what the licensing procedure will be. Ad hoc meetings around the country have in the past had little impact on public acceptance. Furthermore, until the licensing question is addressed, ERDA will continue to have difficulty explaining just what the 1985 repository is--a pilot repository implying that waste management is still in the experimental phase and that the technology is not well developed.

The licensing question is the subject of a later issue, including the question of whether a licensing procedure can satisfy the California legislation.

Summary

ERDA's high level waste management program appears adequate, at least at this stage of its development, which is still largely on paper.

- The program is directed at long-term terminal storage that does not require human maintenance, yet has a retrievable option to correct for mistakes in early development.

- The R&D strategy is designed to minimize the probability of failure to find an acceptable site by the mid-1980's.

- The technology employed seems sufficiently advanced, with the major problem being to identify and prove that various sites are geologically acceptable and can stand the thermal exposure of the stored waste.

- The capacity of the initial repository should be sufficient to handle projected commercial volumes through the year 2000, although other capacity will have to be made available shortly thereafter. The program would offer some flexibility to accommodate international wastes, although a large program would likely require more than one repository. The 1985 target date seems achievable and some slippages would be accommodated.

- The largest problem concerning assurance of public acceptability revolves around defining what the licensing procedure will be.