

**The original documents are located in Box 10, folder “FY 1977 - 11/26/75, ERDA Background Book (2)” of the White House Special Files Unit Files at the Gerald R. Ford Presidential Library.**

### **Copyright Notice**

The copyright law of the United States (Title 17, United States Code) governs the making of photocopies or other reproductions of copyrighted material. Gerald Ford donated to the United States of America his copyrights in all of his unpublished writings in National Archives collections. Works prepared by U.S. Government employees as part of their official duties are in the public domain. The copyrights to materials written by other individuals or organizations are presumed to remain with them. If you think any of the information displayed in the PDF is subject to a valid copyright claim, please contact the Gerald R. Ford Presidential Library.

Issue Paper  
Energy Research and Development Administration  
1977 Budget  
Issue #6: Nuclear Fuel Reprocessing and Recycle Support

Statement of Issue

To what extent should ERDA increase its involvement in and responsibility for nuclear fuel reprocessing?

Background

Reprocessing of spent nuclear fuel discharged from Light Water Reactors (LWRs) is planned to (a) recover valuable uranium and by-product plutonium which can be reused ("recycled") as fuel in power reactors and (b) process the radioactive waste material into a form for ultimate disposal. (See the attached diagram which describes the entire nuclear fuel cycle, including the reprocessing and recycle stages. ). Eventually part of the plutonium recovered from LWR fuel must also be used as the initial fuel for the breeder reactor (1990's).

The basic technologies used in this reprocessing were developed and demonstrated by the AEC in association with their nuclear weapons production activities although there are significant differences in the reprocessing of commercial spent fuel. Development of these technologies by the AEC ceased in the mid-60's when a commercial nuclear fuel reprocessing plant, the Nuclear Fuel Services (NFS) plant in West Valley, New York, began operation. At that time, there were two additional plants under design and construction which led the AEC to conclude that a private competitive reprocessing industry was assured.

The following series of events has led to the virtual paralysis of that industry:

- In the summer of 1971, the NFS plant shutdown for an expansion. Due to this expansion, the plant will now require a new operating license from NRC which has the NFS plant caught in the same regulatory process as a new plant nearing completion.



The 1971, Allied Gulf Nuclear Services (AGNS) commenced construction of a commercial reprocessing plant planned for operation in 1976. The initial cost estimate for the plant was \$90 million. The AGNS plant has already cost over \$250 million and the estimate to complete the fuel reprocessing complex is now \$800-900 million. This overrun is due to poor estimating and new regulatory requirements which result in additional and expensive steps in reprocessing.

- In July 1974, an AEC regulatory decision preventing the shipment of plutonium (Pu) in a nitrate form resulted in the necessity for an additional step at the reprocessing site (the conversion of liquid Pu nitrate to solid Pu oxide). This adds about \$150 million to the capital cost of a reprocessing plant.
- In July 1974, a small reprocessing plant built by General Electric at Morris, Illinois, at a cost of \$80 million was completed, but cannot be operated because of technical problems which are not shared by the NFS and AGNS plants.
- In January 1975, CEQ recommended that NRC not make a decision on the use of plutonium-uranium mixed oxide fuels in nuclear plants (i.e., plutonium recycle) until the NRC supplemented the Generic Environmental Impact Statement on Mixed Oxide Fuels (GESMO) with an additional study of alternate ways of safeguarding plutonium against theft. In April 1975, NRC provisionally decided to accept this recommendation from CEQ and on November 12, 1975, announced its final acceptance of it. Completion of the Environmental Impact Statement review and hearing process on safeguarding plutonium will delay to mid-1977 the NRC's final decision on whether to permit plutonium recycle. This NRC decision effectively prevents the start of any work on the Pu conversion facility by the AGNS organization. The AGNS complex cannot be completed and operated until after NRC's final Pu recycle decision is made. However, part of this complex, the separation facility, could be licensed to operate but it would be of no value to AGNS to operate only this part.
- The NFS plant licensing could also be delayed by the provisional NRC decision resulting in the plant's operation slipping from 1979 to 1983 but this plant is less critical because of its smaller size.

In summary, no reprocessing plants are now operating or are able to operate.

For the shorter term, there is an option to nuclear fuel reprocessing, namely storage of spent fuel in water-cooled basins. However, current storage capacity is limited. To prevent nuclear power plants from shutting down due to lack of reprocessing capacity spent fuel capacity must be expanded. Utilities are making plans for these expansions. This storage of spent fuel is not a realistic option for the longer term since spent fuel cannot be safely stored in water indefinitely. Thus, on safety grounds, we will need fuel reprocessing within 10-20 years. In fact, there are probably economic and other benefits for achieving fuel reprocessing earlier than this (within 10 years).

The problem currently preventing industry from developing reprocessing is one of uncertain economics resulting from (a) the total uncertainty on whether Pu recycle will be permitted by NRC; (b) the degree of regulated constraints on plants if recycle is permitted; and (c) the questions now being raised regarding the performance and cost of the technologies involved in reprocessing.



These uncertainties present very large obstacles to any private corporation investing additional money in the present AGNS plant or new money in subsequent plants required to keep up with the growing nuclear power industry. Since NRC will not license until after 1977 a Pu conversion facility, AGNS will not spend any more on building additional facilities at the AGNS plant. The AGNS organization has proposed that ERDA build, own and operate separate Pu conversion (\$150M) and waste solidification (\$500M) facilities adjacent to the AGNS reprocessing plant. These facilities, which are essential to bring the AGNS plant into operation, would not have to be licensed by NRC if they were built as ERDA demonstration plants. AGNS would then license and operate the separation facility (already 90% completed) and would plan to buy the ERDA facilities and obtain NRC licenses after these facilities attain operating status.

AGNS has been led to expect a decision on this in the FY 77 budget. If there is no decision or any indication of a decision in the near future, they are likely to moth-ball the completed plant which would delay any demonstration of reprocessing by another two years. If the decision is not to participate in a joint program at the AGNS plant, the AGNS owners indicate that they would close down the plant and lose the \$260 million already sunk into the plant.

It is the difficulties facing the AGNS complex--all deriving from new regulatory constraints and uncertainties--that have caused reprocessing to become an immediate issue requiring this Administration's attention. The AGNS situation is new, typifying this industry's problems and the whole future of reprocessing in this country. Complicating further ERDA's dealing with the AGNS situation are the tentative proposals made to ERDA by other potential reproprocessors which are seeking support but have not developed programs or constructed facilities as far along as AGNS'.

The issues facing the Federal Government are:

Is Reprocessing Beneficial to the Nation? Over the past three months, three different studies were initiated under contracts to ERDA and NSF's Office of Energy R&D Policy to evaluate the economic benefits on Pu recycle under these uncertainties. The consensus of all three studies, based on assuming very high (but realistic) costs for reprocessing and recycle to provide adequate safeguards and environmental protection, is that reprocessing nuclear fuel and recycling uranium and plutonium in LWRs would be beneficial to electricity consumers in this country. However, these benefits are small, from \$2 to \$4 billion over the next 20 years (0.5% of the nation's electricity bill). These small benefits do not justify a very aggressive attempt by industry, Government or both to establish a reprocessing industry in this country. However, there are other benefits to having a reprocessing capacity in this country which may transcend the direct savings to consumers:

- Reprocessing spent nuclear fuel reduces the radioactive waste material to a form which can be managed and disposed of in a more environmentally sound fashion than disposing of fuel assemblies directly.
- The existence of an active reprocessing capacity in this country assures us a stronger worldwide position in establishing adequate nuclear safeguards by virtue of our complete understanding of the technologies involved and the ability to service foreign reprocessing needs when necessary.
- The lack of wide-scale uranium and plutonium recycle in 1985 would increase the demand on the uranium mining, milling and enrichment industries by 15% over what is currently being projected. These industries are now claiming that they may not be able to expand rapidly enough without some Government support in order to meet current projected demands. Increasing this demand will surely result in more uncertainty about their ability to expand and therefore increase pressures on the Government to help their financial expansion, or potentially the slowing down of projected nuclear power growth due to lack of adequate uranium supply.
- One dollar of capital invested in reprocessing is equivalent, in terms of energy eventually generated, to about \$2 of capital invested in mines, mills, and enrichment plants. Thus, reprocessing reduces the financing requirements of the whole nuclear industry.
- If there is an assured method for caring for spent nuclear fuel (e.g., reprocessing it) one of the bigger uncertainties faced by utilities in their decision to buy nuclear powerplants will have been removed.

When should a Reprocessing Capacity be available? The long construction lead-times combined with the present regulatory and economic uncertainties indicate that the private sector alone will not be able to develop reprocessing and recycle capacity by 1985 which would result in the loss of the economic benefits previously mentioned but more importantly--would lead to higher demands for uranium mining, milling, and enriching capacity.



Should the Government become involved in Reprocessing? The private sector might be able to overcome the present obstacles to their financing reprocessing endeavors and develop an industry on their own, but it would develop over a much longer time schedule than would be required to avoid some of the disadvantages associated with not having reprocessing and recycle by 1985. Beyond this, the possibility is large that without some U.S. Government involvement the industry would never overcome the present regulatory and technical uncertainties and no capacity at all would be developed. This situation could initially result in the shutting down of some on-line power reactors and could eventually lead to the Government performing all the fuel reprocessing which then would be required for waste treatment and disposal, a potential \$20 billion program (cost recoverable over time).

What U.S. Government activities are appropriate in Reprocessing? There are demonstrated technical and regulatory uncertainties facing any prospective private reprocessor. Both of these uncertainties translate into economic (i.e. the cost of reprocessing) uncertainties. Coupling this economic doubt with the recent major losses and potential losses of investment by companies entering the business, has led prospective investors in reprocessing to be very wary of investing \$1 billion in a reprocessing plant.

The U.S. Government could play the role of stimulating the private sector to perform their function of building reprocessing capacity by attempting to remove these uncertainties which could be done in a number of possible ways:

(a) Demonstration and licensing of commercialized facilities.

- Providing direct subsidies to the constructors of the first separations, conversion, waste solidification, and fuel refab plants (i.e. demonstrating plant licensing, performance and costs) by creating jointly funded Government/Industry ventures to build these or by giving direct grants to reprocessing plant construction.
- Providing industry with some risk coverage through guarantees against subsequent regulations preventing Pu recycle or plant operation.
- Providing an assured market by being willing to buy some amount of the plutonium product.

(b) Incentives to industry to achieve future required capacity levels.

- If a demonstration plant program does not sufficiently remove the uncertainties faced by the reprocessing industry, some additional financial support to subsequent plants may be required to achieve future production capacity levels. This type of potential future support is not included in the current ERDA request.



- There is simply not enough information at hand to make a judgment as to the degree or nature of any such Government assistance in the context of the FY 77 budget.

### Alternatives

- #1. Let private industry resolve the nuclear fuel reprocessing problems themselves (i.e. decide that the Government has no direct responsibility for assuring the development of a reprocessing industry). Rely upon spent fuel storage until regulatory uncertainties are clarified and economic incentives lead industry to proceed without Government support.
- #2. ERDA request. Initiate a \$1B cost-shared ERDA/industry program to demonstrate complete nuclear fuel reprocessing, waste solidification, and fuel refabrication capability in commercial-scale facilities. ERDA determine the extent of its participation after evaluating competitive responses by industry to requests for proposals issued by ERDA in FY 1976. ERDA could support multiple facilities for each technology or a single comprehensive recycle project. (If facilities are wholly owned by ERDA, no NRC license would be required. If facilities are cost-shared, an NRC license would be required.) In addition to funds for supporting R&D, include \$97M of BA in FY 1977 budget for ERDA/industry joint programs.
- #3. OMB Recommendation. As in Option #2. ERDA issues requests for proposals in FY 1976 which would allow industry to identify on a competitive basis the support industry believes it needs to proceed with the construction of commercial-scale fuel recycle demonstration facilities. However, Option #3 would differ from Option #2 in the following ways:
  - No funds would be included in the ERDA's FY 1977 budget for the ERDA/industry joint program (although a contingency of \$67M BA would be included in the overall President's budget). Depending upon evaluation by ERDA and OMB of the industry responses to the ERDA RFP, a decision would later be made on whether to submit an amendment to ERDA's FY 1977 budget.
  - For each phase of the reprocessing process (i.e. plutonium separation, plutonium nitrate to oxide conversion, mixed oxide fuel fabrication, and radioactive waste solidification) there would be no more than one demonstration facility.
  - The RFP would be written broadly to permit industry to respond with other possible support mechanisms such as financial guarantees, purchasing plutonium produced in reprocessing plants or Government coverage of future regulatory requirements (rather than focus mainly on ERDA support and partial ownership of demonstration facilities as in Alternative #2).



- No funds would be included for a fuel recycle technology training facility.

- #4. The U.S. Government takes primary responsibility for financing, building and operating the first 2-4 reprocessing plants with private sector involvement as contractors in these plants on a time scale consistent with assuring that all needs for fuel reprocessing capacity are met.

Analysis

Budget Authority/Outlays (\$ Millions)	1975		1976		July 1 to Sept. 30, 1976		1977		1978		1979		1980		1981	
	BA	O	BA	O	BA	O	BA	O	BA	O	BA	O	BA	O	BA	O
Alt. #1	--	--	16.5	12.5	3.8	3.8	29	25	18	20	14	15	9	10	5	6
Alt. #2 (Agency req.)	--	--	16.5	12.5	3.8	3.8	135	69	200	100	200	200	200	300	200	200
Alt. #3 (OMB rec.)	--	--	16.5	12.5	3.8	3.8	35	30	9	10	9	9	8	8	7	7
(Contingency Allow.)*	--	--	--	--	--	--	(67)	(19)	(100)	(50)	(100)	(100)	(100)	(150)	(100)	(100)
Alt. #4	--	--	18.0	13.8	4.0	4.0	1000	850	2000	180	2000	470	2000	755	2000	880

\* Following a review by ERDA and OMB of industry's response to the RFP's an amendment to ERDA's FY 77 budget could be submitted to authorize this allowance, if required.

A detailed comparison of these alternatives is attached, see Alternatives Evaluation Table.

The ERDA program, Alternative #2, has not yet been clearly defined by ERDA. ERDA has not evaluated the various forms of Government assistance previously mentioned before selecting their approach and, in fact, gives all indications that they are not quite certain of this approach themselves. For these reasons ERDA must put much more effort during FY 76 into analyzing how to proceed in the reprocessing area in FY 77.

ERDA, however, is requesting authorization (\$97M) to contract with potential reprocessors after the RFPs are returned at the beginning of FY 77. This \$97M is the minimum ERDA feels will be required by industry and is directed primarily at the waste solidification portion of reprocessing complexes where a Government role is more needed. Although ERDA does not now have a clear idea of how the \$97M would be spent by major activity, ERDA believes that the \$97M would give substance to any Presidential statement regarding support of the nuclear option. However, OMB staff feels that the inclusion of the \$97M in ERDA's budget is unjustified until the program is better defined.





Agency Request. Alternative #2. In order to demonstrate that the U.S. Government is serious about solving the nuclear fuel reprocessing problems and in order to have the authority to sign agreements immediately after evaluating the RFP's, ERDA feels it necessary to authorize funds in FY 77 for their cooperative programs in reprocessing. The details of these programs will be defined by requesting proposals from industry for joint ERDA/industry owned and operated reprocessing facilities.

OMB Recommendation. Alternative #3. OMB staff concludes that in order to take full advantage of the potential national benefits of nuclear fuel reprocessing this country should have reprocessing capacity developed by the mid-1980's. The capacity should be owned, built and operated by the private sector. In order to assure that the private sector can do this, the uncertainties (regulatory, economic or technical) now impeding them must be removed in a timely manner and at the least cost to the U.S. Government. The nature of the support required has not been adequately analyzed yet by ERDA to justify the U.S. Government committing to any particular method of support (i.e. simple financial risk minimization or direct subsidization). ERDA should proceed to solicit expressions of interest from industry followed by requests for proposals to find out the specific Government support required by industry. ERDA and OMB can then review the industry response and determine whether to submit an FY 77 budget amendment. In the meantime, the Administration could state its support for the national objective of assisting industry in closing the nuclear fuel cycle by citing (a) the increased R&D and conceptual design funds provided (including R&D on commercial waste management discussed in Issue #7) and (b) the plan to request proposals from industry for demonstration projects.

The point has recently been made strongly with the nuclear industry that if they fail to support the Administration on private uranium enrichment, ERDA would be forced to divert funds to expanding the Government's uranium enrichment plants. Within a constrained overall budget for nuclear programs, there would not be enough funds available for major Administration initiatives on reprocessing and commercial waste management. By refraining from committing now to a definite dollar level for reprocessing demonstration plants, we would be exerting continued pressure on the nuclear industry to support the Administration's private uranium enrichment plan.

Alternatives Evaluation

<u>Alter- native</u>	<u>ERDA Costs (\$ M)</u>	<u>Industry Cost &amp; Responsibility Sharing Potential</u>	<u>Effect on Develop- ment of U.S. Repro- cessing Capacity</u>	<u>Effect on AGNS Plant</u>	<u>Effect on Waste Mgmt.</u>	<u>Public, Utility &amp; Congressional Perception</u>
#1	175	Industry accepts responsibility and cost of building all facilities.	Reprocessing never sufficient to meet current light water reactor needs. Potentially not available for adequate waste disposal or breeder needs.	AGNS would probably fold.	No LWR wastes available for experimental purposes until late 80's. Delays(10 years or so) answering waste disposal issues.	Public utilities perceive this as an indication of U.S. Government's lack of interest in nuclear power, therefore, more uncertainty over its future and less purchase of nuclear.
#2	500- 1000	Management responsibility and costs shared by industry and U.S. Government.	Depends greatly on future negotiations with industry and U.S. Government decisions. Potentially could meet all economic requirements.	AGNS would have to compete for U.S. Government support.	LWR wastes available for commercial waste disposal R&D program.	U.S. Government is genuinely concerned about the nuclear option. Larger management role of ERDA compared with #3 preferred by Congress.
#3	0 - 1000 (If financial guarantees of plant operation were effective costs could be zero but the U.S. Government would incur liability of up to \$1B.)	Would be evaluated by end of FY 76. Presumably less U.S. Government involvement could be achieved than in Option #2 and management responsibility for reprocessing would clearly lie in the private sector.	Same as #2	Same as #2.	Same as #2.	U.S. Government perceived as genuinely concerned about the nuclear option. Completion guarantees and risk reduction method disliked by Congress since U.S. Government is liable but has little control over industry decisions.



<u>Alter- native</u>	<u>ERDA Costs \$ Million</u>	<u>Industry Cost &amp; Responsibility Sharing Potential</u>	<u>Effect on Develop- ment of U.S. Repro- cessing Capacity</u>	<u>Effect on AGNS Plant</u>	<u>Effect on Waste Mgmt.</u>	<u>Public, Utility &amp; Congressional Perception</u>
#4	12,500	No industry involve- ment with the excep- tion of the oper- ation of the now completed portion of AGNS.	Meet all reprocessing needs, economic or not.	AGNS would be sup- ported.	Same as #2	Congress probably oppose due to sub- sidy to industry concerns.



# The Nuclear Fuel Cycle

Nearly all of today's commercial nuclear power plants utilize Light Water Reactor (LWR), meaning that these reactors use ordinary water as a coolant.

The production of power from reactors, however, is only one link in a series of interrelated steps known as the nuclear fuel cycle.

The first step in the nuclear fuel cycle is the mining of uranium ore from the earth. The ore is shipped to a mill where uranium concentrate is produced. This uranium concentrate is often referred to as yellowcake, whose chemical symbol is  $U_3O_8$ . There are 14 mills presently operating in the United States. The yellowcake is then sent to a converter where it is converted into uranium hexafluoride, or  $UF_6$ . Uranium hexafluoride is the only simple form of uranium that can be

gaseous at conditions near room temperatures and pressures. There are two  $UF_6$  conversion plants operating in the U.S.

Uranium hexafluoride is then sent to a uranium enrichment plant. Once the desired enrichment is conducted, the material is shipped to a fuel fabrication plant. There, the enriched uranium is converted to uranium dioxide,  $UO_2$ , formed into pellets, and placed in zirconium tubes. The tubes are assembled into bundles and sent to nuclear power plants. Seven domestic companies are involved in the fabrication of nuclear fuel.

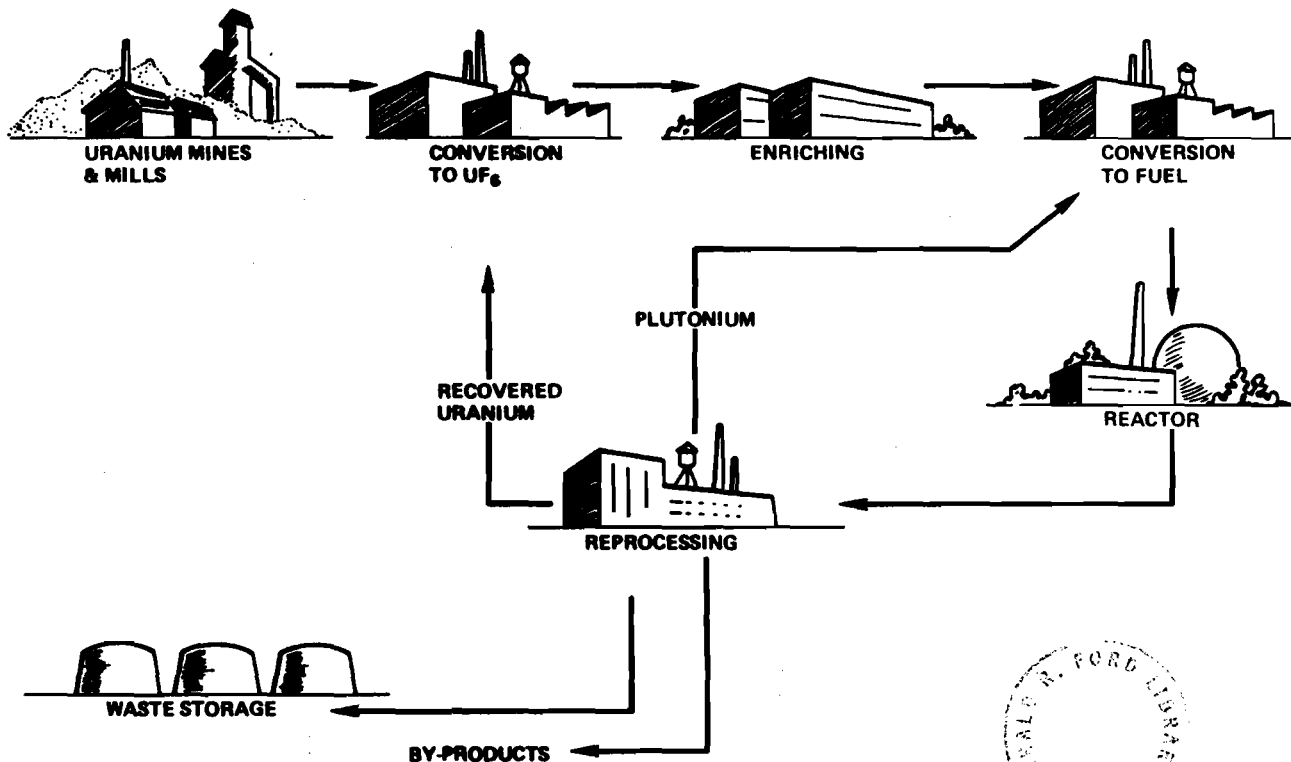
After the fuel is used in the nuclear power plant, it is discharged and cooled in a large water basin at the plant. The spent fuel will then be sent to a chemical reprocessing plant.

There the uranium and reactor-produced plutonium will be separated from the highly radioactive fission products generated while in the nuclear power plant. The radioactive wastes, converted into a solid, will then be shipped to a Government repository. The recovered uranium will be converted again into the hexafluoride gas and reinserted into the enrichment plant for re-enrichment.

The extracted plutonium, which is also a fissionable material, can be used as fuel in a nuclear power plant. If use of the plutonium is granted by the Nuclear Regulatory Commission, it would be sent to the fuel fabrication plant. There it would be mixed with uranium and formed into pellets for nuclear fuel. This process is known as plutonium recycle.

## THE NUCLEAR FUEL CYCLE

### STEPS



Issue Paper  
Energy Research and Development Administration  
1977 Budget  
Issue #7: Commercial Waste Management



Statement of Issue

Should ERDA significantly accelerate its Commercial Waste Management program for the storage and disposal of commercial nuclear wastes?

Background

The management, storage and ultimate disposal of radioactive wastes from commercial nuclear plants has been identified as the major drawback and problem associated in the public mind with the use of nuclear power plants. The technical community likewise feels that waste management is the largest unresolved problem associated with nuclear power but they see it as a problem which can readily be solved.

In 1970 the Federal Government, through the regulatory powers of the Atomic Energy Commission assumed ultimate responsibility to store and dispose of commercial radioactive wastes on a full-cost recovery basis. Because these wastes were known to be so hazardous and long lasting, the Commission determined that it was in the public interest to have the responsibility for the disposal and long term management of these wastes rest with the Federal Government instead of in the private sector.

The Atomic Energy commission had attempted to solve the problems of commercial radioactive waste disposal several times in the past. These attempts included proposals for interim surface storage and long term underground storage in a variety of locations. These attempts failed for a number of reasons which included technical and political problems with the specific sites chosen. The proposed ERDA program is a large scale departure from the previous AEC attempts to solve this problem.

ERDA has proposed a large increase in its Commercial Radioactive Waste Management R&D program for FY 1977, (ERDA's FY 1977 budget request is for \$90.6 million BO compared to \$14.4 million BO for FY 1976). The objectives of the Commercial Waste Management program are to provide for the research, development, and demonstration of technologies for (1) long-term isolation and storage of commercial high-level radioactive wastes (either directly from reactors or from nuclear fuel reprocessing plants); and (2) the long-term collection, management and storage of other forms of radioactive wastes (such as airborne noble gas wastes).

The proposed ERDA program is directed at solving the technical problems involved in the management and storage of these wastes. These problems include:

- The fact that the radioactive streams from nuclear fuel reprocessing plants using current technology contain fractions of highly toxic radioactive isotopes such as cesium, strontium, plutonium, curium and americium which:
  - a. represent direct health hazards from their high-level radioactivity
  - b. can cause genetic changes in humans
  - c. will emit quantities of heat for long periods of time
  - d. will remain toxic for up to 100,000 years or more.
- The necessity for processing the acid liquid radioactive waste streams leaving reprocessing plants into more stable and manageable waste forms such as calcined powders, concretized compounds, or glass-like compounds.
- The requirement to develop and test containers to store the processed wastes.
- The question of whether or not to develop interim storage facilities which are environmentally acceptable, protect against public health risks and are defensible against attempts at willful dispersion.
- The task of finding and developing sites and facilities for ultimate radioactive waste disposal in whatever form of waste packaging ERDA determines to be the most stable. Sites chosen for ultimate waste disposal will either be:
  - a. geologic (e.g., mined cavities, man-made structures in geologic formations)
  - b. sea-bed (e.g. deep sea floor disposal)
  - c. ice sheet (burial in large ice formations).

Such sites must be geologically stable over the period of radioactive "life" of the disposed isotopes (at least 100,000 years) and must be inaccessible and defensible. (Future technology improvements in fuel reprocessing may reduce this time to about 1,000 years.)

The development of adequate means to store and ultimately dispose of commercial radioactive wastes is of central importance to the future of the nuclear power industry.

- As pointed out above, waste management is cited as the key public concern about nuclear power.

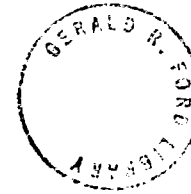
- The decisions on the waste form and delivery schedules for these wastes from reprocessing plants must be made early so as to remove another uncertainty facing the potential private sector owners of reprocessing plants. The lack of reprocessing capacity due to technical, regulatory and economic uncertainties, one of which is the waste form issue, is presenting the nuclear industry and the Government with major problems.

ERDA, the NRC and EPA all have responsibilities in the management of radioactive wastes, but thus far no clear-cut federal strategies or agreements coordinating the activities of these agencies have been formulated. The Council on Environmental Quality, which has the responsibility to review Federal programs effecting the environment and to recommend policies to improve environmental quality, has recommended the establishment of an Interagency Task Force on Radioactive Wastes to develop a comprehensive Federal strategy of dealing with radioactive wastes and to draft interagency agreements for its implementation. It is essential that this be done as soon as possible to avoid a great deal of program overlap among the agencies and to satisfy all National Environmental Policy Act (NEPA) requirements in an organized timely fashion. The latter will avoid the possibility that one agency will be enjoined against proceeding with the fulfilling of its waste management responsibilities until another agency completes an EIS.

### Alternatives

- #1. Greatly accelerate ERDA's current commercial waste management R&D program. This includes a major program to find and begin the development of multiple terminal storage sites for commercial radioactive wastes. (Agency req.)
- #2. Allow ERDA to accelerate its current program but limit the number of proposed drillings to half the number of sites requested by ERDA until further program development and planning has been done by ERDA. (OMB rec.)
- #3. Continue ERDA's current program. Request further study of the economic, technical and legal-political questions involved in this issue before any expansion is permitted.





Analysis

Budget Authority/Outlays (\$ Millions)	1975		1976		July 1 - Sept. 30, 1976		1977		1978		1979		1980		1981	
	BA	O	BA	O	BA	O	BA	O	BA	O	BA	O	BA	O	BA	O
Alt. #1 (Agency req.)	13.2	11.4	16	14	4.8	4.2	120	91	113	96	128	110	132	115	133	125
Alt. #2 (OMB rec.)	13.2	11.4	16	14	4.8	4.2	85	66	75	70	100	80	100	90	100	100
Alt. #3	13.2	11.4	16	14	4.8	4.2	18	17	25	20	25	25	25	25	25	25

Analysis

ERDA's FY 77 budget request for commercial waste management provides for a greatly accelerated R&D and demonstration program to develop acceptable methods of radioactive waste disposal on a time schedule to keep pace with the growth of the nuclear, industry and to answer public concerns about the ultimate disposal of nuclear wastes.

The major component of ERDA's proposed FY 77 program is a greatly expanded terminal storage program (BO in FY 76 was \$4.6M and BO request for FY 77 is \$50.5M). The objectives of this program are to survey via drilling many terminal storage sites in nine different geologic formations throughout the country in order to demonstrate the existence of acceptable terminal storage sites. ERDA justifies this approach on the following basis:

- Multiple sites in different formations will reduce the risk of delay from technical difficulties with any one particular site or rock type.
- Reduce the risk of technical failure (which has already contributed to the failure of two AEC proposals).
- Will ultimately deploy, starting in 1987, nuclear wastes to a number of sites (5) through out the country thereby minimizing the political objections to the location of such wastes at any particular site.
- Locates storage facilities at or near fuel cycle facilities and nuclear plant concentrations thereby reducing the cost, risk and vulnerability in transportation.

OMB agrees that it is very important to resolve quickly the question of how commercial wastes will be stored and ultimately disposed of because:

- The ultimate public acceptability of nuclear power will, in large measure, be determined by the acceptable resolution of the waste disposal question.



- It is important to accelerate this program and therefore the solution of this problem in FY 77; because:  
(1) it is the only portion of the nuclear fuel cycle where the Government has sole responsibility to solve the problem through regulatory and programmatic actions and (2) the solution of this problem will greatly reduce the uncertainties associated with nuclear power and by so doing accelerate its development in accord with the President's goals.

Although we agree with the necessity to solve quickly and finally the commercial wastes problem, we do not believe that it is necessary to support fully ERDA's accelerated FY 77 program for the following reasons:

- ERDA's program calls for a large scale drilling program in nine geologic formations in at least 50 locations, the initiation of in-situ experimentation with simulated high-level wastes in two different rock types, and the initiation of pilot plant site selection investigations in the Southwest and Northeast United States. The drilling program is to lead to the demonstration of five terminal storage demonstration facilities. OMB believes that expensive in-situ experimentation and the commitment to pilot plants should follow a much more extensive geologic and economic evaluation designed to limit the number of sites and to better plan for the location and operation of the demonstration facilities.
- ERDA's planned demonstration program is not accompanied by any analysis of the costs, either short or long term of operating these demonstration facilities or a risk analysis which demonstrates the cost-effectiveness of developing five alternative locations for waste disposal. ERDA should be required to fully evaluate the anticipated costs of these demonstration facilities before selecting among alternatives and committing future resources to them.
- ERDA's proposal does not answer the questions of whether or not these waste facilities will require surveillance. If they do, large costs to provide such surveillance are likely. Moreover, the ERDA proposal does not answer the legal-political and moral questions of whether this society should impose the burden of surveillance upon tens of thousands of succeeding generations who will receive no benefits from them.

At this time, the final form the nuclear wastes will have to take for perpetual storage is unknown, and ERDA is undertaking R&D to solve this problem. NRC is expected by next year to define, by regulation, the final permitted form of wastes. ERDA's storage site demonstration program should be timed and structured so that the decisions on sites and waste forms are compatible. ERDA, therefore, should be required to further plan its proposed program so that potential problems of timing and coordination with its own research and the NRC are avoided.

Agency Request. Alternative #1. ERDA believes that a major integrated R&D site survey and demonstration program is necessary now to solve the political and physical problems of the nuclear industry. Past failures in finding suitable sites leads ERDA to support the need for multiple site drilling and the necessity of demonstrating three terminal storage facilities.

OMB Recommendation. Alternative #2. While recognizing the need to move quickly in this area, the ERDA program does not represent a comprehensive plan to answer the political, legal, economic and moral issues implicit in the management of commercial wastes. Alternative #2 provides for a large scale ERDA program which will require that ERDA develop a comprehensive plan before committing itself to many in-situ experiments and a terminal storage pilot plant demonstration program. This alternative permits a significant expansion in drilling in different geologic formations since the information generated by this drilling will be an important input to the development of a program plan and to the delayed selection of other in-situ experiments and pilot plant demonstrations.

An Interagency Task Force on Waste Management should be formed immediately and jointly chaired by OMB and CEQ. This Task Force would develop a comprehensive Federal waste management strategy, to coordinate the activities of NRC, ERDA and EPA and to draft, as soon as practicable, interagency agreements which clearly define the agency roles and their regulatory and NEPA (EIS) responsibilities needed for timely implementation of that strategy.



Issue Paper  
Energy Research and Development Administration  
1977 Budget  
Issue #8: Light Water Reactor (LWR) Technology Program

Statement of Issue

Should ERDA initiate a five-year, \$300 million technology program to improve the performance of existing Light Water Reactors (LWRs) and to reduce construction times for new LWRs?

Background

LWRs which became commercially available in the mid-1960's, are supplied by four U.S. manufacturers. LWRs now produce 8.3% of U.S. electricity requirements and are projected to produce over 30% by 1985. In the mid-1960's, as the private sector began marketing LWRs in large quantities, AEC terminated all related R&D with the exception of reactor safety research. This safety research is now being conducted by NRC (\$105M in FY 77) but no U.S. Government activities towards improving the performance of LWRs are now being conducted.

Plant Performance:

Plant performance of LWRs as measured by their capacity factors (the ratio of the energy<sup>o</sup> actually produced to the energy that could have been produced had the plant operated at 100% power all year) has been poor (57% in 1973 and 1974). Low capacity factors have been largely due to forced outages resulting from component failures of many kinds (e.g. pumps, valves). Since nuclear fuel is much cheaper than fossil fuel, any improvements in nuclear power plant capacity factors will result in very large benefits to electricity consumers due to the direct replacement of coal and oil by nuclear. In addition, increased nuclear plant capacity factors reduce the nuclear capital cost required to produce a kilowatt hour of electricity. This reduced cost could save upwards to \$1 to \$2 billion/year around 1985 in new plant construction.

Projected industry expenditures by manufacturers of nuclear plants and equipment on programs to increase capacity factors will total around \$150-\$200 million per year through 1985. However, the Electric Power Research Institute (EPRI) which is responsible for most of the R&D on operating reliability performed by utilities--the chief corporate beneficiary of any improvements in LWR performance--recently started a program in this area that will spend only \$4.2 million in 1975.

Plant Licensing and Construction:

Nuclear power plant licensing and construction now requires from eight to ten years. Due to the large capital costs of these plants and the interest on capital during construction, reduction in the time required for plant licensing and construction would result in major savings--approximately 45% of the total plant cost is in interest costs and escalation during construction. For example, reducing a plants licensing and construction time





by one year could save over \$40 million and for the 150 plants now under construction this would mean a net savings of \$8 billion.

In the OMB review of ERDA's FY 76 Energy Amendment it was decided not to embark on a large ERDA program in LWR Technology in FY 1976, until an extensive analysis was completed which would identify more clearly the reasons for the present low capacity factors in LWRs, why the market place incentives are failing to provide improved capacity factors, and what the Government should do, if anything, to remedy this problem.

The ERDA analysis has been completed and has found among other things that:

- The majority of the forced outages of nuclear plants, over 90%, were due to the failure of components outside the nuclear portion of the plant, (e.g. steam generators, turbines and valves).
- Improvements by 1% in LWR capacity factors may have only marginal significance to an individual utility but represents a potentially greater aggregate amount of energy than can be made operable in the next decade by any advanced technology efforts and might well equal the effectiveness of all conservation efforts.
- Between 70-80% of the \$100-200 million of the R&D done by manufacturers of nuclear plants and components are aimed at short-term payoffs (e.g. the removal of licensing problems, the demonstration of compliance with new safety pollution control requirements) rather than at improving the performance of a plant that would have payoffs extending throughout the life of the plant.
- Pressure on utilities to cut costs, including maintenance, to boost short-term profits can adversely affect LWR reliability.
- Regulation of the nuclear reactor designs subtly deters innovation and product improvement which could lead to better plant reliability by virtue of the fact that it is simpler to license a design that already has a license than a new design.
- State utility rate regulation at present provides a negative incentive to provide more capitally intensive but better performing nuclear plants because capital costs are not automatically passed through to consumers, unlike "fuel cost passthroughs."
- Licensing and regulatory problems have resulted in 50% of the total delays to nuclear plants under construction.

- The engineers and constructors of nuclear plants, architect-engineering firms, are conducting almost no R&D aimed at improving construction times, e.g. offsite system construction and modularization, since a large source of their income comes from custom-designed and built plants which require specialized engineering skills.
- The market mechanisms have failed to bring the desired allocation of resources to this problem from the private sector because an individual equipment manufacturer cannot capture enough of the overall benefits of an R&D effort in order to compensate for the costs of that R&D. Most of these benefits would accrue to the utilities which, to date, do not effectively evaluate performance in their purchasing decisions.
- Improving LWR reliability is one of a limited number of actions which can increase near-term domestic energy supply, a major goal of the President's energy policy.

ERDA's proposed program will address R&D problems not now being worked on by private industry. It will cooperate and cost share with industry and to the maximum degree possible all R&D will be performed by industry on contract from ERDA and not by ERDA or in ERDA laboratories. The ERDA program is designed to:

- Improve plant performance (e.g. collect and evaluate data, test key components, improve basic technologies important to pumps, valves).
- Reduce plant licensing and construction time (e.g. develop modularization techniques ; support licensing of nuclear plants manufactured at land-based shops and sited off-shore on barges; improve nuclear plant designs to reduce construction time).

### Alternatives

- #1. Continue the present Government policy of having ERDA conducting no LWR R&D.
- #2. Permit a small number of ERDA programs, only those with the greatest potential benefits which are not likely to be performed by the private sector and which will not interfere with the competitive environment now existing in the manufacturing of nuclear power systems and components.
- #3. Initiate a large R&D program in the LWR technology development area with programs that have benefits but which because of their broad scope could possibly interfere with the industry's competitive environment.



Analysis

Budget Authority/Outlays (\$ Millions)	1975		1976		July 1 - Sept. 30, 1976		1977		1978		1979		1980		1981	
	BA	0	BA	0	BA	0	BA	0	BA	0	BA	0	BA	0	BA	0
Alt. #1			3	2			--	--	--	--	--	--	--	--	--	--
Alt. #2 (OMB rec.)			7	5	2	2	10	8	9	9	10	10	10	10	10	10
Alt. #3 (Agency req.)			7	5	2	2	52	40	41	45	41	41	41	41	41	41

Any improvements in LWR performance will bring large benefits to the consumers of electricity. However, the recognition that many existing regulatory and economic impediments to individual manufacturer's ability to sell better (i.e. higher performance) products to utilities raises doubt as to what extent the R&D performed by ERDA would ever be used by manufacturers to improve their products. The institutional situations which result in this phenomenon are the nuclear industry market structure and the existence and method of utility rate regulation. ERDA has no program investigating these but FEA has ongoing programs aimed at identifying ways to alter these institutional disfunctions. If these attempts are successful they may be far more fruitful than an R&D program in ERDA.

What product improvement is being worked on by industry will bring some benefits at some time in the future. ERDA's analysis implies that these benefits would be lost if ERDA does not proceed with its program. In fact, these benefits are delayed, not lost. ERDA has not analyzed the extent or implication of this delay but rather assumes that the benefits are all lost in their justification of this program. NRC is to reform its licensing process to reduce the regulatory caused by construction delays by standardizing review formats, attempting to issue standard plant licenses and by issuing more limited work authorizations which permit early plant site construction. ERDA's statutory responsibility to increase energy supply efficiencies is alone not a justification for initiating this program.

However, since Government regulation at all levels is in part responsible for the delays in improvements to nuclear power plant performance; since there are large potential benefits associated with relatively small R&D expenses in this area; and since ERDA will probably be able to get very favorable cost sharing arrangements with industry in this area, the U.S. Government is justified in performing a limited amount of LWR technology R&D.

Agency Request: Alternative #3. Initiate a large program in LWR technology covering many different kinds of R&D.

OMB Recommendation: Alternative #2. Limit the R&D program for four well selected projects so that the program's success can be more effectively measured. Select only those high return projects which are applicable to all

manufacturers of a particular product; those projects in fields that may already have a manufacturers association through which the work could be performed and where cost sharing interest is highest. This alternative also will provide a test of the transferrability of ERDA sponsored R&D into product improvements and would further demonstrate the Administration's interest in seeing nuclear power play its proper role in this country's energy future.



Issue Paper  
 Energy Research and Development Administration  
 1977 Budget  
 Issue #9: Employment Levels for ERDA

Statement of Issue

Should ERDA's personnel ceilings be increased?

Background

ERDA was created out of AEC, the Office of Coal Research, and certain functions from Interior, EPA and NSF. Like AEC, ERDA operates through intensive use of contractors. About 7600 Full Time Permanent (FTP) government employees now manage a \$5B program and over 90,000 contractor employees at Government-owned facilities.

In recognition of organizational needs and FY 1976 program growth, ERDA's authorized FTP ceiling has been increased from an initial allowance of 7155 to the present total of 8052 (+897).

Alternatives

- #1. Provide the additional personnel requested by ERDA (1976: +505 FTP; 700 Total)(1977: +1040 FTP: +1311 Total). (Agency Req.)
- #2. Provide additional personnel closely tied to workload increases and management improvements (1976: +235 FTP; +325 Total)(1977: +491 FTP; +575 Total). (OMB Recommendation.)
- #3. Require ERDA to adhere to current ceiling in view of overall budget stringency.

Analysis

Budget Authority/Outlays (\$ Millions)	1975		1976		July 1 - Sept. 30, 1976		1977		1978-81	
	BA/O	BA/O	BA/O	BA/O	BA/O	BA/O	BA/O	BA/O	BA/O	
Alt. #1 (Agency req.)	158	(*)	(*)	(*)	209	213				
Alt. #2 (OMB rec.)	158	183	48	200	204					
Alt. #3	158	181	47	193	195					
<u>Position Ceilings</u>	<u>FTP</u>	<u>Total</u>	<u>FTP</u>	<u>Total</u>	<u>FTP</u>	<u>Total</u>	<u>FTP</u>	<u>Total</u>	<u>FTP</u>	<u>Total</u>
Alt. #1 (Agency req.)	7550	8016	8557	9403	8557	9403	9092	9903	9092	9903
Alt. #2 (OMB rec.)	7550	8016	8287	8917	8287	8917	8543	9267	8543	9267
Alt. #3	7550	8016	8052	8592	8052	8592	8052	8592	8052	8592

\* No amendment has yet been requested by ERDA to cover the cost of the additional 505 positions requested in FY 1976.

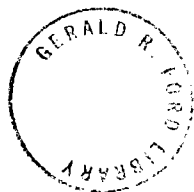


ERDA's FY 1977 program will grow 20% in total costs compared to FY 1976 (which grew 25% over FY 1975). This growth is made up of both increasing efforts in established programs and expansion into new areas such as conservation, nuclear fuel recycle, radioactive waste management, and synthetic fuels.

Growth in new areas is particularly personnel intensive because of the need for careful program definition and planning. Also, the new areas frequently require smaller, more numerous contracts than established programs.

Agency Request: Alternative #1. ERDA strongly believes that it needs additional staff to carry out its program responsibilities. As part of its response to the budget cutback exercise, ERDA has identified a minimum request of 607 FTP positions.

OMB Recommendation. Alternative #2. Our detailed recommendations are summarized in the following table and discussed briefly.



Summary of ERDA Request and OMB Recommendations

	1975 Actual	Present Ceiling	ERDA Request Increases				OMB Rec. Increases		
			1976	1977	Total	Minimum	1976	1977	Total
Nuclear energy.....	505	532	30	25	55	30	20	15	35
Fossil energy.....	201	380	--	50	50	33	--	37	37
Conservation.....	138	142	40	51	91	40	15	20	35
Advanced energy.....	185	279	47	90	137	58	11	17	28
(Physical research).....	( 63)	( 68)	( --)	( 7)	( 7)	(NA)	--	--	--
(Controlled thermonuclear fusion).....	( 59)	( 75)	( 10)	(30)	( 40)	(NA)	( 5)	( 5)	(10)
(Geothermal energy).....	( 13)	( 46)			( 29)	(NA)	( 1)	( 2)	( 3)
(Solar energy).....	( 42)	( 75)	(24)	(31)	( 55)	(NA)	( 5)	(10)	(15)
Environment & Safety.....	237	246	27	38	65	25	15	20	35
National security.....	274	296	23	29	52	23	--	10	10
Staff offices (e.g. General Counsel, Controller, Inspect.)	522	635	43	60	103	52	10	5	15
Administration (e.g. Admin. services, management infor- mation, procurement).....	525	585	99	122	221	115	23	30	53
Field offices.....	2772	2831	124	10	134	124	28	27	55
Energy Research Centers.....	779	779	50	--	50	50	10	20	30
Other programs (e.g. weapons, guards and inspectors, Tech- nical Information Center)..	<u>1322</u>	<u>1347</u>	<u>22</u>	<u>60</u>	<u>83</u>	<u>57</u>	<u>3</u>	<u>5</u>	<u>8</u>
Total Full-Time Permanent....	7457	8052	505	535	1040	607	135	206	341
Synfuels.....							<u>100</u>	<u>50</u>	<u>150</u>
							235	256	491



	<u>Present Ceiling</u>	<u>FY 1976 Request</u>	<u>FY 1977 Request</u>	<u>Total Request</u>	<u>Minimum Request</u>	<u>FY 1976 Recom.</u>	<u>FY 1977 Recom.</u>	<u>Total Recom.</u>
Nuclear energy.....	532	30	25	55	30	15	10	35

The increases of 15 (FY 1976) and 10 (FY 1977) are for increased workload for program growth recommended in the budget in the areas of nuclear fuel cycle and light water reactor technology. These increases include offsets of -5 (FY 1976/77) for the space nuclear systems program reflecting program decreases.

	<u>Present Ceiling</u>	<u>FY 1976 Request</u>	<u>FY 1977 Request</u>	<u>Total Request</u>	<u>Minimum Request</u>	<u>FY 1976 Recom.</u>	<u>FY 1977 Recom.</u>	<u>Total Recom.</u>
Fossil energy.....	380	--	20	20	33	--	37	37

The increase of 37 (FY 1977) is primarily for growth in the demonstration plant program that will result from the construction of the Clean Boiler Fuel plant, and the design of six additional plants. Additional personnel are also expected to be utilized in the expanded In-Situ Technology program and in the formation of a Process Evaluation office.

	<u>Present Ceiling</u>	<u>FY 1976 Request</u>	<u>FY 1977 Request</u>	<u>Total Request</u>	<u>Minimum Request</u>	<u>FY 1976 Recom.</u>	<u>FY 1977 Recom.</u>	<u>Total Recom.</u>
Conservation.....	142	40	51	91	40	15	20	35

The increase of 15 (FY 1976) is for the Office of the Assistant Administrator, for his Office of Planning and Evaluation, and for increases in other divisions. The increase of 20 (FY 1977) is for program growth recommended in the budget: transportation, energy storage, and buildings.

	<u>Present Ceiling</u>	<u>FY 1976 Request</u>	<u>FY 1977 Request</u>	<u>Total Request</u>	<u>Minimum Request</u>	<u>FY 1976 Recom.</u>	<u>FY 1977 Recom.</u>	<u>Total Recom.</u>
Physical research.....	68	68	75	7	N/A	--	--	--

No increases are recommended. Program growth is minimal. Changes in program mix can be handled by reassigning existing staff.



	<u>Present Ceiling</u>	<u>FY 1976 Request</u>	<u>FY 1977 Request</u>	<u>Total Request</u>	<u>Minimum Request</u>	<u>FY 1976 Recom.</u>	<u>FY 1977 Recom.</u>	<u>Total Recom.</u>
Controlled thermo-nuclear fusion .....	75	9	3	40	N/A	5	5	10

The recommended increases of 5 (FY 1976) and 5 (FY 1977) reflect the need for increased staff capabilities in the areas of contract management, proposal review and program planning. The CTR program has grown rapidly and this growth will continue through FY 77. The increases in personnel are recommended to keep pace with the growth in the program.

	<u>Present Ceiling</u>	<u>FY 1976 Request</u>	<u>FY 1977 Request</u>	<u>Total Request</u>	<u>Minimum Request</u>	<u>FY 1976 Recom.</u>	<u>FY 1977 Recom.</u>	<u>Total Recom.</u>
Geothermal energy .....	46	10	19	29	N/A	1	2	3

An increase of 1 slot in FY 1976 and 2 in FY 1977 has been allowed recognizing the modest acceleration of the overall program and the anticipated increase in research and development of advanced concepts and the administration of the loan guarantee program. Recognition has also been given to the status of contractual and correspondence activities.

	<u>Present Ceiling</u>	<u>FY 1976 Request</u>	<u>FY 1977 Request</u>	<u>Total Request</u>	<u>Minimum Request</u>	<u>FY 1976 Recom.</u>	<u>FY 1977 Recom.</u>	<u>Total Recom.</u>
Solar energy.....	75	24	31	55	N/A	5	10	15

An increase of 5 in FY 1976 and 10 in FY 1977 has been allowed recognizing the overall acceleration of the solar energy program, and in particular, expanded efforts in the research and development of solar heating and cooling technology, the development of solar thermal electric technology, the research and development of photovoltaic technology, and the technical and economic assessment of solar resource potential. Recognition has also been given to the backlog in correspondence and contractual activities.

	<u>Present Ceiling</u>	<u>FY 1976 Request</u>	<u>FY 1977 Request</u>	<u>Total Request</u>	<u>Minimum Request</u>	<u>FY 1976 Recom.</u>	<u>FY 1977 Recom.</u>	<u>Total Recom.</u>
Environment & safety..	246	27	38	65	25	15	20	35

The increases recommended provide for additional personnel in: the Office of the Assistant Administrator for planning and evaluation activities; the Division of Biomedical and Environmental Research for contract award and monitoring to keep pace with recent rapid growth in the contract research program; the Division of Operational Safety to carry out high priority environment, health and safety programs at ERDA facilities which came from other agencies and to assure ERDA's compliance with applicable occupational, environmental, health and safety regulations; and, in the Division of Environmental control technology to begin high priority work on environmental control technology monitoring.



	<u>Present Ceiling</u>	<u>FY 1976 Request</u>	<u>FY 1977 Request</u>	<u>Total Request</u>	<u>Minimum Request</u>	<u>FY 1976 Recom.</u>	<u>FY 1977 Recom.</u>	<u>Total Recom.</u>
National Security.....	296	23	29	52	23	--	10	10

The recommended increase is for the Division of Military Application Reflecting program growth in the laser isotope separation and laser fusion programs.

	<u>Present Ceiling</u>	<u>FY 1976 Request</u>	<u>FY 1977 Request</u>	<u>Total Request</u>	<u>Minimum Request</u>	<u>FY 1976 Recom.</u>	<u>FY 1977 Recom.</u>	<u>Total Recom.</u>
Staff offices.....	635	43	60	103	52	10	5	15

The 1976 recommended increase of 10 is for an expansion of the internal review program to emphasize comprehensive management and program type audits. The 1977 recommended increase of 5 is for the General Counsel's office in view of new legal workload connected with energy commercialization.

	<u>Present Ceiling</u>	<u>FY 1976 Request</u>	<u>FY 1977 Request</u>	<u>Total Request</u>	<u>Minimum Request</u>	<u>FY 1976 Recom.</u>	<u>FY 1977 Recom.</u>	<u>Total Recom.</u>
Administration.....	585	99	122	221	115	23	30	53

The 1976 recommended increase of 23 is for (1) 10 for Administration Services, primarily for unexpected workload resulting from split headquarters location; (2) 8 to improve facilities and major construction management; (3) and 5 for additional telecommunications facilities due to split headquarters location. The 1977 recommended increase is for additional procurement staff reflecting growth in workload in new energy programs.

	<u>Present Ceiling</u>	<u>FY 1976 Request</u>	<u>FY 1977 Request</u>	<u>Total Request</u>	<u>Minimum Request</u>	<u>FY 1976 Recom.</u>	<u>FY 1977 Recom.</u>	<u>Total Recom.</u>
Field offices.....	2831	124	10	134	124	28	27	55

The recommended increase of 55 reflects program growth as field offices are involved in administering almost all ERDA programs. ERDA is presently conducting a study of its headquarters field office structure which may result in a request by ERDA for additional positions in the field later this year.

	<u>Present Ceiling</u>	<u>FY 1976 Request</u>	<u>FY 1977 Request</u>	<u>Total Request</u>	<u>Minimum Request</u>	<u>FY 1976 Recom.</u>	<u>FY 1977 Recom.</u>	<u>Total Recom.</u>
Other programs.....	2126	72	60	132	107	13	25	38

The recommended increases of 13 and 25 reflect fossil program growth in the Energy Research Centers (10 and 20) and power reactor growth in Idaho (3 and 5). No increases were provided for technical information or EEO.



	<u>Present</u> <u>Ceiling</u>	<u>FY 1976</u> <u>Request</u>	<u>FY 1977</u> <u>Request</u>	<u>Total</u> <u>Request</u>	<u>Minimum</u> <u>Request</u>	<u>FY 1976</u> <u>Recom.</u>	<u>FY 1977</u> <u>Recom.</u>	<u>Total</u> <u>Recom.</u>
Synthetic Fuels Commercial Demonstration Program .....	--	--	--	--	--	100	50	150

There is currently pending Administration supported legislation to provide an incentives program for the commercial demonstration of technologies to convert coal, oil shale, and other domestic resources to synthetic fuels. These 100 additional personnel will be needed by January 1, if the legislative approval proceeds on schedule. The additional 50 will be required for program growth in 1977.



OTHER ISSUES

Fossil Energy: Coal Demonstration Plant Program

		1977							Total Est. Fed. Cost Per Plant
		Funding Thru FY1975	FY1976/ <sup>1</sup>	Original ERDA Req.	Rev. ERDA	ERDA Ceiling Case	OMB Rec.	FY1978	
<u>Clean Boiler Fuel Demo.:</u> (one plant)	BA	13	30	30	30	30	30	15	91
	B0	3	14	31	24	24	31	24	
<u>Gasification Demos.:</u> (four plants)	BA	-	20	113	73	73	57	100	100-150
	B0	-	10	46	39	39	36	30	
<u>Advanced Demos.:/<sup>2</sup></u> (two plants)	BA	13	5	20	12	12	5	35	100-200
	B0	-	-	6	5	5	5	18	
<u>Total Demo. Program:/<sup>3</sup></u>	BA	26	62	178	130	130	100	165	
	B0	3	27	99	84	84	80	92	

- <sup>1</sup> During the transition quarter, the program is estimated to receive a total of \$17 million (BA) and \$8 million (B0).  
<sup>2</sup> A second liquefaction project and a direct combustion demonstration project.  
<sup>3</sup> The columns do not add because the total includes technical support subprogram not broken out above.

ERDA Request: The general objective of the Coal Demonstration Plant Program is to demonstrate, on a near-commercial scale (1/5 to 1/10 commercial size) selected second-generation (advanced technology) processes for coal utilization, either by converting it to a clean liquid or gas, or burning it directly in an advanced combustor which can remove potential pollutants. Through full Federal funding of each demonstration project's design and 50% cost-shared funding with industry of the construction and operation, the program is aimed at accelerating private industry's development programs to prove the technical, economic, and environmental viability of each process.

FY 1976 activities include the continuation of the Clean Boiler Fuel demonstration (coal to liquid fuel) begun in FY 1975 and the startup of design efforts on two gasification demonstration plants (one high-Btu pipeline gas and one low-Btu utility fuel). For the Clean Boiler Fuel demo, ERDA has received a cost-sharing commitment from a consortium of companies called Coalcon. Although appropriations for this project were received in both FY 1974 and FY 1975 and ERDA signed a contract in January 1975, Congressional authorization was only formally requested in the FY 1976 budget. Though the fully Federally funded design of the Coalcon demonstration is expected to be completed during FY 1976, there is currently great uncertainty about whether/how the Coalcon consortium will agree to proceed to the construction stages during FY 1977.





The FY 1977 ERDA funding request would provide for the following activities:

- Final design, equipment ordering, and most construction of the Coalcon Clean Boiler Fuel Demonstration Plant scheduled for operation in 1980.
- Initiation of two projects and the continuation of two other plants to demonstrate the production of gaseous fuels from coal.
- Initiation of conceptual design of two "advanced" process demonstration plants: a second coal-to-liquid fuel process (liquefaction) which is more advanced than the Coalcon process; and a plant to demonstrate a method for directly and cleanly burning coal (i.e., fluidized bed combustion).
- Seek Congressional authorization to proceed with all four gasification plants and the second coal-to-liquid fuel advanced demonstration. Congressional authorization is considered necessary to attract industrial cost-sharing commitments (despite fully Federally funded design phases), and would permit rapid acceleration of effort if circumstances merited it.

The impact of ERDA's revised request over its original request would be to delay completion of construction of the third and fourth gasification plants and the second liquefaction plant by three to nine months in the 1981-82 time period.

OMB Recommendation: The recommended funding level (\$30 million below revised request) provides for continuing and initiating work requested by ERDA for the Clean Boiler Fuel demonstration and for two gasification demonstration plants. The conceptual design effort on advanced processes for liquefaction and direct combustion of coal, and the design of two additional gasification demonstrations would not proceed as rapidly as requested. FY 1977 Congressional authorizations would only be sought for two gasification demonstration plants. There are three factors that were considered in arriving at the recommended level:

- The Synfuels Commercial Demonstration Program will be initiating its first projects in FY 1977, of which several are expected to be coal gasification projects. The more orderly phasing contained in the OMB recommendations will insure that the Synfuels Commercial Demonstration and the Coal Demonstration Programs do not overlap in the type of processes demonstrated, will not over-commit or prematurely commit private sector participants, and will minimize the possibility of any shortages of engineers, manufacturing capability, and construction workers. Although the recommended level will result in a delay (possibly of one year) in expanding the Coal Demonstration Plant Program, it will increase the probability of a smooth start for the Synfuels Commercial Demonstration Program.



- . The advanced liquefaction and direct combustion processes proposed for the Advanced Demonstrations are still in the pilot plant R&D stages. It is unnecessary and possibly unproductive to dedicate a demonstration plant to either of these processes until the R&D work is further along, and a comparative analysis of several different technologies is undertaken. The funding provided within the recommended level is sufficient to continue and enlarge such an effort.
- . The management of this program has been in a constant state of change since its inception in early 1974. It is still unknown whether or not the contract provisions or cost-sharing incentives in use by the program are adequate to achieve the original objectives, or need to be changed possibly because of the introduction of the Synthetic Fuels Commercialization Program. The program's progress during FY 1977 will settle many of these questions but commitment, with Congressional concurrence, to five new demonstrations may foreclose our utilizing the answers. Consequently, it is recommended that Congressional authorization be requested only for the two gasification demonstrations farthest along.

As the Coal Demonstration Plant Program's management becomes more experienced, and the role of the program vis-a-vis the Synthetic Fuels Commercial Demonstration Program is further clarified, it is expected that major growth will continue. The FY 1978 funding projection assumes that the three demonstrations delayed under the FY 1977 recommendation will be approved in FY 1978.



Fossil Energy: In-Situ Technology

		FY 1977							
		FY 1975	FY 1976	Orig. ERDA Req.	Rev. ERDA	ERDA Ceiling Case	OMB Rec.	FY 1978	
<u>Oil Shale:</u>	BA	4	14	26	21	21	21	21	
	0	4	10	16	12	12	12	12	
<u>Coal:</u>	BA	6	5	15	15	15	5	5	
	0	2	4	10	10	10	5	5	

ERDA Request: The In-Situ Technology program is involved in developing coal and oil shale resource extraction techniques that do not require conventional mining and surface ore processing. These in-situ technologies process the resource in-place underground (i.e., in-situ) by drilling, fracturing the rock, injecting air/oxygen, initiating combustion, and extracting liquid/gaseous fuels. ERDA's funding request provides for:

- Continuing three cost-shared field tests to develop modified in-situ techniques on both eastern and western oil shales;
- Expansion of the eastern gas-from-shale experiments, and the detailed design of a large-scale western gas-from-shale test facility;
- Development of three major coal in-situ gasification processes by executing three additional field tests, constructing a pilot plant, and performing additional technical studies.

OMB Recommendation: Oil shale is the country's third largest domestic energy resource and the only one to remain almost entirely unexploited. It now appears that world energy prices are high enough and that production from other domestic resources is so constrained that it will soon be profitable for the private sector to engage in large-scale oil shale development utilizing well-known mining and surface refining techniques. In-situ oil shale techniques are being developed by both private industry and Government because they potentially offer the opportunity to produce shale oil/gas with less waste, less water use, and less labor than the surface refining approach. ERDA's request appeared consistent with the progress the program has achieved and the potential benefits of in-situ technology. On the other hand, the in-situ coal gasification program has not yet achieved the results that would warrant the widely diversified projects in the FY 1977 request. The in-situ coal gasification budget has to be viewed in the context of advanced coal mining R&D program with which it might compete, and at its recommended level this program represents about 10% of the Federal coal mining R&D effort. Given its limited potential near and mid-term benefits, no greater level can be justified at this time.



Synthetic Fuels Commercial Demonstration Program

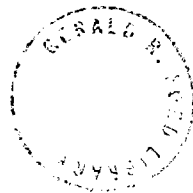
		Funding Thru FY 1975	FY 1976	1977			OMB Rec.	FY 1978
				Original ERDA Req.	Rev. ERDA	ERDA Ceiling Case		
<u>Administration:</u>	BA	--	(3)	--	--	--	10	10
	BO	--	(3)	--	--	--	10	10
<u>Construction Grants:</u>	BA	--	600	--	--	--	--	--
	BO	--	--	--	--	--	7	23
<u>Revenues:</u>	BA	--	-1	--	--	--	-5	-12
	BO	--	-1	--	--	--	-5	-12
<u>Loan Guaranty:</u>	BA	--	1500 *	--	--	--	--	--
	BO	--	--	--	--	--	--	--
<u>Price Guaranty:</u>	BA	--	1000 *	--	--	--	--	--
	BO	--	--	--	--	--	--	--
<u>Net Total:</u>	BA	--	3102	--	--	--	5	-2
	BO	--	2	--	--	--	12	21

\* This BA represents borrowing authority.

The Synthetic Fuels Commercial Demonstration legislation currently pending before Congress would create a major new energy program within ERDA. This program would provide a variety of financial incentives (loan guaranties, price guaranties, and construction grants) in order to encourage the construction of about 15 plants by the early 1980's with a total production capacity of 350,000 barrels per day of synthetic fuels. The passage of the \$6 billion loan guarantee legislation is expected to occur in the next few weeks, and ERDA has agreed to reprogram \$3 to \$5 million for administrative expense during FY 1976 to initiate promptly this effort. ERDA has not yet formally requested any FY 1977 funding, but based on the Interagency Synfuels Commercialization Task Force Report some tentative recommendations and decisions can be made now:

- Taking into account program support and fossil energy activities already in-place at ERDA, it is estimated that the program can be adequately administered by a staff of 150 with a salaries and contract budget of \$10 million.

- . Assuming passage of the proposed Construction Grant legislation along with an advance appropriation of \$600 million, then at least one project will be started in FY 1977 resulting in outlays of \$7.0 million.
- . The proposed Loan Guaranty Program provides for creation of a revolving fund in Treasury and the collection of loan guaranty fees (up to 1% per year of outstanding guaranteed debt). Consequently, it is estimated that \$5.0 million in revenues will be collected by ERDA during FY 1977.
- . The Loan Guaranty and Price Guaranty amounts shown for budget authority represent the limits on borrowing authority that ERDA will have to cover possible loan defaults and price guaranty payments.



## FACT SHEET

### Program Budget Estimates - Synthetic Fuels Commercial Demonstration Program

Estimating the exact expected cost and corresponding budgetary authority necessary for the commercial demonstration program is complicated by the long-term nature of the synthetic fuel plant construction and operation (25-30 years) and by other significant uncertainties including:

- the future foreign/domestic market prices of oil and gas
- the cumulative effect of inflation over this time frame
- the overall success/failure rate of the plants.

In view of these uncertainties and the need to develop "best possible" estimates for the program, a rigorous financial analysis effort has been completed. This analysis included:

- detailed plant cost estimates for the various technologies
- detailed social infrastructure development cost estimates based on estimated increases in population in a locality attributable to the synthetic fuel plants
- use of a series of computerized cost models for each plant type with flexibility to change plant mixes to evaluate differing programs and the capacity to estimate capital as well as operating phases for each plant
- the capability to alter key assumptions for future market prices, inflation rates, plant and operating costs and the cost of energy resources used by the conversion technologies.

In the process of developing budgetary estimates, numerous program cost scenarios were estimated by changing assumptions for the market price of oil, inflation rates, cost of coal resources. Extreme scenarios were calculated based on pessimistic assumptions, e.g., market price of oil \$7 per barrel. As a result of the many differing calculations, recommended budgetary requests have been formulated that are adequate for the program and will be ample to cover most unforeseen



contingencies. The estimates are for the full term of the program and unless extremely adverse developments occur, the authorizations will be adequate to complete the program. It must be recognized that the budgetary authorization estimates do not represent actual cost to the government but rather reasonable estimates of funding authority necessary to implement the program.

### Authorizations

Exhibits 1, 2 and 6 show the individual plant cost estimates by type of plant including social infrastructure costs and the estimated number to be included in the commercial demonstration program. The basic assumptions used in developing these estimates are enumerated on the Exhibits. The requested levels of funding authorizations for loan guaranties, price guaranties and construction grants are shown at the bottom of the Exhibits and derived directly from the plant cost and operating estimates. Except for the most unusual circumstances, the following authorization levels will be adequate to allow execution of Phase I of the Synthetic Fuels Commercialization Program:

Loan Guaranty.....	\$6.0 billion
Price Guaranty.....	4.5
Construction Grants.....	<u>.6</u>
Total Budgetary Authority.....	\$11.1 billion

Section 103 of Senate ERDA Authorization bill (S. 598) provides an adequate loan guaranty authorization of \$6 billion for the Phase I program. In addition, an authorization request for price supports and construction grants will be necessary since a number of the plants in the proposed program involve these incentives.

\$400 million of the \$6 billion authorization will be reserved for the guaranty of municipal debt for necessary social infrastructure development caused by substantial increases in municipality population because of a synthetic fuel plant. Under this proposal the ERDA Administrator would be given the authority (under Section 103) to guaranty municipal bond issues that are necessary to finance the construction of needed basic municipal facilities (e.g., sewers, water, public safety) to service the influx of new population caused directly by the synthetic fuel plant. A detailed description of this proposal is contained in the Social Impact Assistance Fact Sheet.



In order for the government to proceed with the complete program, the requested authorizations are needed prior to the execution of any agreements with the private sector. However, certain plants can be initiated with only a loan guaranty authorization.

While the total authorizations requested for the program exceed \$11 billion, the actual cost to the government of the program is expected to be a small fraction of the requested authorization because:

- most loan guaranties are expected to be repaid and at least a portion of any defaults will be covered by fees charged for the loan guaranty and sale of any project assets that are recovered.
- actual price guaranty payments are likely to be significantly lower than the requested authorization if the world price of oil continues to increase which is likely.

Costs to the government will be incurred for the construction grants up to \$600 million and for expenses to administer the program estimated at \$10-\$15 million annually. Overall, for the 20 to 30 year life of the program, it is anticipated that it will cost the government about \$2. billion (Exhibit 5).

#### Borrowing Authority/Appropriation Approach/Estimates

Although there is a possibility that guaranties will never result in the expenditure of Federal funds, the ERDA Administrator must have the full authority to outlay funds in the very unpredictable circumstances when they may become needed in order to make the recommended guaranties credible and effective. To accomplish this purpose, it is proposed that the ERDA Administrator be empowered with a limited, renewable authority to issue notes or other obligations to the Treasury should payments be required, either because of a default on a guaranteed loan or because of price guaranty payments that may arise subsequent to completion of the commercial demonstration plants.

The authority to borrow from the Treasury to make payment, if required for price and loan guaranties, was selected in favor of no specific appropriation authority or an advance appropriation arrangement for several reasons including:





- It is important for the ERDA Administrator to have a clear-cut authority to make payments on defaults in advance to remove the uncertainty on the part of investors about the timeliness of payment and/or the USG intent to pay.
- Default or price guaranty payments are not likely to occur for a number of years.
- The precise amount of such payments are difficult to estimate and may not occur if favorable conditions result in the future.

In view of these factors, giving the ERDA Administrator limited authority to issue debt, if and when the need arises, is the most expeditious and efficient means of financing the program. Repayment of ERDA's debt held by the Treasury would be accomplished through subsequent specific Congressional appropriations.

The Administration will transmit to the Congress separate appropriation requests for the borrowing authority consistent with the terms of the Budget Reform Act.

The following basic factors were considered in assessing the amount of borrowing authority needed:

- Time-phasing of projects starts over the 1976-1978 period.
- Likelihood of projects simultaneously defaulting on loan guaranties and likely cost of default to the government.
- The future market price of oil and gas and the resultant rate of revenues, if any, and/or price guaranty expenditures.
- The 20 to 30-year economic life of the synfuel projects.
- The need for flexible and credible program administration as well as periodic accountability to the Congress.

After analyzing these factors, it is recommended that \$1.5 billion in loan guaranty borrowing authority be provided to cover loan default costs. Debt outstanding under this authority could not exceed \$1.5 billion at any time. Outstanding debt would be repaid by the ERDA Administrator by obtaining specific appropriations. This amount is 25% of the gross Federal loan

guaranty liability (Exhibit 3). Although default costs could exceed 25%, it is very unlikely that this would occur before Congress had the opportunity to repay ERDA's debt to the Treasury. The \$1.0 billion borrowing authority recommended for price guaranties will provide for about 3 years of price guaranty payments under the very pessimistic assumption that oil prices fall to \$7 per barrel. Should recent trends continue for the price of oil, it is unlikely that any price guaranty payments will be made.

Construction grants are different from loan and price guaranties because they will require budgetary expenditures. A straightforward appropriation request will be made for this incentive. Consequently, even though construction grant outlays are not anticipated during FY 1976 because of the lead time in incurring construction costs, the full appropriation of \$600 million is requested so that the Administrator can enter into contractual agreements during FY 76 even though outlays will be spread over a number of subsequent years.

In summary, the following borrowing authorities and appropriations are recommended to be enacted:

Loan Guaranty.....	\$1.5 billion
Price Guaranty.....	<u>1.0</u>
Total Borrowing Authority...	\$2.5 billion
Construction Grants.....	<u>\$ .6 billion</u>
Total Appropriations.....	\$ .6 billion

The program's five-year projections for construction grants, administrative costs, and guaranty fees are shown in Exhibit 4.



Exhibit A  
Phase I Program Budget Authorizations  
(\$ million, statistics include 7% annual inflation)

Plant Type	Number Scheduled for 1976-1978	Total Capital Invested	Construction Phase		Operation Phase
			Loan Guaranty	Construction Grant	Price Guaranty
High BTU Gas (regulated)	3	2,700	2,000	-	-
Shale Oil (unregulated)	2	2,100	1,050	-	900
Utility/Industrial Fuel (unregulated)	2	1,300	650	-	3,600
Utility Industrial Fuel (regulated)	2	1,000	-	500	-
Biomass (regulated & unreg.)	5	1,200	900	-	-
Social/infrastructure asst.			400		
CONTINGENCY			<u>1,000</u>	<u>100</u>	<u>-</u>
TOTAL BUDGET AUTHORIZATION REQUESTED			<u><u>6,000</u></u>	<u><u>600</u></u>	<u><u>4,500</u></u>

Specific Key Assumptions:

- Assumes recommended incentives of 50% loan guaranty for unregulated utility/industrial fuel, and oil shale plants; 75% loan guaranty for biomass and high-BTU gas plants; and price guaranties for shale oil and unregulated utility/industrial fuel. Should higher than recommended percentages for loan guaranties be necessary, the Contingency Reserve could accommodate.
- All statistics include 7% annual inflation rate for capital and operating costs.
- Total project investment is based on a 7-year development schedule for all plants, except for biomass conversion which are expected to be completed in a 3-year period. Plants are assumed to have a 20-year operating life.
- Investment totals do not include costs of such auxiliary developments as coal mines, roads, pipelines, etc., which, if they occur, could be accommodated by the Contingency Reserve.
- Loan guaranty statistics refer to the gross Federal commitment. The cost of an actual default will be less depending on the number of defaults if any, the timing of the default and the amount of recoverable assets.
- The contingency amount for loan guaranties and construction grants provides for construction delays, extraordinary inflation, different plant mixes, increased incentives, etc.
- The price guaranty statistics were calculated assuming that the market price for shale oil rises at 7% per year from a 1976 base of \$7 per barrel, and for utility/industrial fuels, the price rises from a base of \$9 per barrel. The statistics further assume that no revenues accrue to the government even if market prices exceed the guaranty level.

Synthetic Fuels Commercialization Program Budget

Exhibit 2 - Individual Project Statistics 1/

<u>Plant Type</u>	<u>Size (bbl/d)</u>	<u>Investment 2/</u>	<u>Loan 3/ Guaranty</u>	<u>Construction Grant</u>	<u>Price 4/ Guaranty</u>
Shale Oil	50,000	1000	500	-	450
High-Btu Gas	40,000	870	650	-	-
Utility/Industrial Fuel					
Regulated	25,000	460	-	230	-
Unregulated	25,000	610	300	-	1800
Biomass	6,000	230	170	-	-

1/ Data are rounded and a detailed cost analysis is available in the Synthetic Fuels Commercialization Task Force Report, Volume III.

2/ The 7% annual inflation rate is included, and the projects are all assumed to start in 1976.

3/ Presumes recommended incentives of 50% loan guaranty for unregulated utility/industrial fuel, and oil shale plants; 75% loan guaranty for biomass and high-Btu gas plants; and price guaranties for shale oil and unregulated utility/industrial fuel.

4/ Contingent costs for price guaranties were estimated assuming that the price of shale oil rises at 7% per year from a 1976 base of \$7/bbl and for utility/industrial fuels, the price rises from a base of \$9/bbl; and further assuming that no revenues accrue to the government even if market prices exceed the guaranty level.

Synthetic Fuels Commercialization Program Budget

Exhibit 3 - Possible Outlay Schedule for Price Guaranty Payments <sup>1/</sup>

(\$ millions)

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>Total Payments Thru 2005</u>
Payments to Unregulated Utility/Industrial Fuel Plants <sup>2/</sup>										
\$9 Oil Scenario:	50	109	166	233	229	225	220	215	209	3600
\$11 Oil Scenario:	34	71	106	144	134	123	111	98	84	1100
Payments to Oil Shale Plants										
\$7 Oil Scenario: <sup>3/</sup>	167	153	137	120	102	83	63	41	18	900
\$9 Oil Scenario:	58	35	12	-	-	-	-	-	-	105
\$11 Oil Scenario:	-	-	-	-	-	-	-	-	-	0



<sup>1/</sup> Calculations assume 7% per year inflation in capital and variable operating costs; projects start according to the schedule of Exhibit I.

<sup>2/</sup> No payments are assumed to accrue to the government even if oil and gas prices exceed the synthetic fuel price guaranty level.

<sup>3/</sup> Oil and gas prices are presumed to rise at 7% per year from a 1976 base of \$7 per barrel for oil and \$1.65 per MMBtu for gas. The \$9 and \$11 scenario have proportionately higher bases, but same inflation rate.

Synthetic Fuels Commercialization Program Budget

Exhibit 4: Five-year Budget Projections for the 350,000 bbl/day Program 1/  
(annual outlays, \$ million)

	<u>FY 1976</u>	<u>T.Q.</u>	<u>FY 1977</u>	<u>FY 1978</u>	<u>FY 1979</u>	<u>FY 1980</u>	<u>FY 1981</u>
Loan Guarantee <u>2/</u>	-	-	-	-	-	-	-
Price Guarantee <u>2/</u>	-	-	-	-	-	-	-
Administration	2.5	1.5	10	15	15	15	15
Construction Grant <u>3/</u> Project #1	-	-	7	15	25	42	67
Construction Grant Project #2	-	-	-	8	17	29	48
Total Outlays	2.5	1.5	17	38	57	86	130
Loan Guarantee Fees	(1)	-	(5)	(12)	(20)	(31)	(39)
Net Total Outlays	<u>1.5</u>	<u>1.5</u>	<u>12</u>	<u>26</u>	<u>37</u>	<u>55</u>	<u>91</u>

1/ Budget authority appropriations are needed in FY 1976 of \$600 million for construction grants, and subsequent appropriations, \$15 million per year, may be necessary to fund administrative expenses.

2/ Neither payments for loan guarantee defaults nor price guarantees are anticipated during this period.

3/ Construction grants of 50% are expected to be given to regulated utility/industrial fuel producers.

Exhibit 5  
 Anticipated Total Cost to Government (FY 76 thru 2005)  
 350,000 bbl/day Program  
 (\$ million)

Financial Incentive	Fiscal Years '76-'81	Fiscal Years 1982 - 2005	Total Cost of Program FY 76 - 2005
Loan Guarantees			
- Defaults (2 plants) <sup>/1</sup>	-	\$ 1000	\$ 1000
- Fee collected by Government (Revenue) (1% annually-debt outstanding) <sup>/2</sup>	\$ (108)	(720)	(828)
Price Guarantees (assumes \$11 oil scenario)	-	1,100	1,100
Construction grants	258	242	500
Administrative (assumes \$10-\$15 million annually) <sup>/3</sup>	<u>74</u>	<u>240</u>	<u>314</u>
<b>TOTAL COST TO GOVERNMENT <sup>/4</sup></b>	<b>\$ 224</b>	<b>\$ 1862</b>	<b>\$ 2086</b>

<sup>/1</sup> From Exhibit 1, 12 plants require \$6 billion in loan guarantees. If two plants default then, at most, \$1 billion would be lost.

<sup>/2</sup> See Exhibit 4 for Fiscal Years '76-'81. Calculation for 1982-2005 assumes average annual outstanding debt over the 24 years of \$3 billion.

<sup>/3</sup> FY 76-81 statistic from Exhibit 4, and FY 1982-2005 assumes \$10 million/year for 24 years.

<sup>/4</sup> Fees are subtracted from outlays.



Solar Energy: Fuels From Biomass Program

	<u>FY 1975</u>	<u>FY 1976</u>	<u>Orig. Req. ERDA</u>	<u>Rev. ERDA</u>	<u>ERDA Ceiling Case</u>	<u>OMB Rec.</u>	<u>FY 1978</u>
BA	0.6	5.8	9.6	8.1	8.1	5.5	5.5
0	0.1	2.7	7.4	5.9	5.7	3.6	3.6

ERDA Request. The fuels from Biomass Program involves the conversion of organic matter (biomass) into useful clean fuels. Biomass sources being considered include crops produced from agricultural and forestry operations, marine crops derived from man-made kelp beds, and agricultural, animal and forestry wastes. ERDA believes that biomass technologies can offer a broad range of energy products (i.e., liquid, solid, and gaseous fuels, as well as electricity), and that the program could result in the reproduction of 0.5 Quads by 1985, and 3 Quads by the year 2000.

OMB Recommendation. OMB recognizes the potential of biomass as a long-term energy sources and its potential versatility in providing different fuel forms. However, there remain significant technological and environmental uncertainties (such as land-use constraints) which must be resolved before this program can be significantly expanded. The OMB staff recommendation allows for continued applied research experiments, but places greater emphasis on the identification and resolution of environmental constraints.





## Solar Energy: Agricultural and Industrial Process Heat Application

	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>				<u>FY 1978</u>
			<u>Orig. ERDA Req.</u>	<u>Rev. ERDA</u>	<u>ERDA Ceiling Case</u>	<u>OMB rec.</u>	
BA	0.5	2.0	6.7	6.7	6.7	3.5	6.5
0	0.2	1.5	5.9	5.1	5.1	2.6	4.6

ERDA Request: The Agricultural and Industrial Process Heat program explores the potential of solar energy for agricultural applications such as green houses and crop drying and industrial heat processes such as food processing, pulp and paper, chemicals, lumber and plastics. The agricultural applications will be implemented in conjunction with USDA. ERDA estimates that this program could produce 0.05 Quads of energy by 1985, and 1.0 Quad by the year 2000.

OMB Recommendation: This program could produce a useful contribution by the year 2000, but only a negligible contribution by 1985. Hence, continued funding is recommended but at a lower level more commensurate with the program's payoff relative to other higher priority solar programs (e.g., solar thermal electric and photovoltaics).



Solar Energy: Technology Support and Utilization

	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>				<u>FY 1978</u>
			<u>Orig. ERDA Req.</u>	<u>Rev. ERDA</u>	<u>ERDA Ceiling Case</u>	<u>OMB rec.</u>	
BA	1.4	4.0	14.8	10.2	10.2	9.8	9.8
0	1.0	2.4	2.6	7.6	7.6	5.8	5.8

ERDA Request: The Technology Support and Utilization program supports the other technical solar programs. This program has three elements: (a) solar energy resource assessment, which uses the existing capabilities of other Federal agencies to collect, analyze and disseminate information on the resource base for solar technologies, (b) start-up costs for the Solar Energy Research Institute (program costs are contained in the technical solar programs), and (c) technology utilization and information dissemination, which collects, analyzes and disseminates technical and economic data for the solar programs and provides for solar energy workshops, conferences, and seminars. Approximately one-half of the request is for resource assessment, one-third is for information services, and the remainder is for the Solar Energy Research Institute.

OMB Recommendation: OMB staff believes that uncertainties concerning the accessible and recoverable resource base for wind, ocean thermal, and biomass technologies require an expanded program for resource assessment. However, further growth in information services is not appropriate until significant results from the solar energy research, development, and demonstration programs are available.



ENVIRONMENTAL CONTROL TECHNOLOGY

	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>				<u>FY 1978</u>
			<u>Orig. ERDA Req.</u>	<u>Rev. ERDA</u>	<u>ERDA Ceiling Case</u>	<u>OMB Rec.</u>	
BA	8.3	10.5	40.9	17.3	17.3	17.4	18.0
0	7.2	9.8	33.0	15.0	15.0	15.2	16.0

ERDA Request. The revised ERDA request would provide for an expanded high priority program of environmental control technology assessments in the non-nuclear energy area. In addition, the ERDA proposal would provide for continuing efforts in the development of long-range nuclear waste control options such as sea-bed disposal. Another element of ERDA's program is to continue the decommissioning of ERDA facilities which have been contaminated by radioactivity at the FY 76 level of \$6.1M (outlays).

OMB Recommendation. The Division recommendation would support ERDA's decision to continue the decommissioning of contaminated facilities at the FY 1975 level. The recommendation would provide for a reduction of \$1.2M (to \$2.8M outlays) for environmental control technology studies in non-nuclear energy systems. The Division feels that this will be adequate if ERDA follows OMB guidance, (given in last year's Budget Review and in the Spring Planning Review), and does not engage in hardware or technology development. This program is to be limited to the conduct of paper and measurement studies along with maintaining an oversight role. Environmental control technology development is to be left to the other ERDA division's having direct responsibility for energy systems development.

The Division also recommends that an ERDA Military Applications Division request to investigate the feasibility of using very deep (20,000 to 30,000 feet) cavities created by using Peaceful Nuclear Explosives (PNE) for perpetual storage of nuclear fuel reprocessing wastes be included in the Environmental Control Division's Technology budget. This is recommended because:

- The Environmental control Technology Division is carrying out research into other long-term options for perpetual storage of nuclear fuel wastes and the proposed application of PNE's can be evaluated and tested in coordination with the ongoing effort to develop a number of long range perpetual storage options.

The objective of this program is to monitor the development of energy technologies and assess the need for the development environmental controls for these technologies. In meeting this objective ERDA's Division of Environmental Control Technology will coordinate with EPA to determine what EPA standards will be applicable to ERDA's technologies and to determine what environmental controls will be required to meet these standards.



## FUSION POWER

The next two issues cover ERDA's Fusion Power program which supports two, fundamentally different, approaches to the production of fusion power. These two are:

- Magnetic Confinement
- Laser Fusion

Support for both of these approaches has grown rapidly since FY 1975. (See attached issue papers).

The Magnetic confinement approach to achieving fusion power involves the heating of hydrogen or deuterium-tritium gases to extremely high temperatures (between 100,000,000 - 500,000,000 °k). At these temperatures, the gases, which have become plasmas (highly ionized gases) will sustain fusion reactions and thereby release neutrons.

The problems of this approach to achieving fusion involve: 1) confining the plasma at the needed temperature for a long enough time to achieve the fusion reaction; 2) finding ways to make use of the neutrons which are released to produce power.

ERDA's Magnetic Confinement Fusion Program is planned to: demonstrate scientific feasibility between 1977-1979; operate an experimental electrical power reactor by 1985 and to demonstrate a near commercial power reactor by 1995-1997.

This program is dependent upon the development and use of increasingly larger and more complex devices. Each device will require the solution of difficult engineering and scientific problems.

Laser approach to Fusion Power production has been developed within the Military Applications Division. The approach involves the bombardment of a small pellet containing an appropriate thermonuclear fuel with high powered laser beams. The implosion (a rapid compression) of the pellet causes a fusion reaction to occur thereby releasing neutrons.



The Laser approach has important applications for military weapons or for industrial uses. Additionally, the Laser Fusion reaction can be used directly to build a power reactor. Also the neutrons released can be used to "breed" fissile material for other reactors.

The Laser Fusion Program is, at this time, not as tightly planned as is the magnetic confinement program. Scientific breakeven (energy output equal to energy input) is expected in FY 1981-82. And, at this time the program is forecasting a Demonstration Power Plant for the Mid 1990's.

Although the use of fusion reactions to produce power is highly attractive, there are very significant scientific and technical problems which must be solved before it can be counted onto supply energy to the economy in an economic way. Moreover, there is considerable concern within the scientific community that both approaches are being "pushed too fast" and, that important scientific problems should be solved before ERDA commits itself to the solution of the engineering problems which must be solved before power reactors can be produced.

The Division's recommendations as discussed in the following pages:

- recognize the necessity of supporting these two approaches to fusion because:
  - no assured path to fusion power exists for any fusion concept
  - fusion is a very attractive long-term energy option.
- provide for a relative slowing of both fusion programs. The effect of this slow-down will be to: defer commitment to the development of larger scale fusion devices; and defer efforts for the immediate solution of currently understood engineering and technical problems.



CONTROLLED THERMONUCLEAR FUSION

	FY 1975	FY 1976	FY 1977				FY 1978
			Orig. ERDA Req.	Rev. ERDA	ERDA Ceiling Case	OMB Rec.	
BA	125.3	176.4	383.8	320.6	307.6	288.6	307
0	95.5	146.0	272.9	235.0	214.0	214.0	306

ERDA Request. The Controlled Thermonuclear Fusion (CTR) program is aimed at developing and demonstrating the production of energy using the magnetic confinement approach to nuclear fusion. The program is very tightly planned and the major milestones in the program are designed to achieve operation of a near-commercial demonstration reactor in the mid-late 1990's. Intermediate steps in the program plan include the production of near reactor level hydrogen plasma in the late 1970's, the production of substantial quantities of thermal energy in the first fusion test reactor in 1981 and the production of electrical energy in mid-late 1980's. Three approaches to magnetic confinement fusion are supported by the program: low-density closed systems (Tokamak devices); high-density closed systems and open systems (magnetic mirrors).

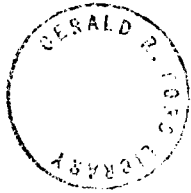
This program has grown rapidly since FY 1974 when outlays were \$56M. The program has evolved from a major physics research program into an advanced research and development effort requiring larger and larger experimental devices: for example, the Princeton Large Torus (the largest Tokamak device in the United States) is scheduled to go into operation in December 1975 at a total cost of \$13M; by comparison the Tokamak Fusion Test Reactor (the next major step in the development of fusion reactors) which was authorized in the FY 1976 budget is scheduled to go into operation in 1981 at a total estimated cost of \$215M. The program will, according to the program plan, begin a major engineering effort designed to solve the technical problems associated with the development of fusion reactors (e.g. super-conducting magnets, materials development, power supply development). This engineering program is expected to grow rapidly both in absolute size and relative to the overall CTR program. (FY 1976 outlays \$31.1M, FY 1977 \$68M.)

The ERDA ceiling case request would: (1) delay the start-up of the super-conducting magnet program for one year; (2) delay the start-up of the Tokamak Fusion Test Reactor (TFTR) by three months; (3) cause the delay in the start-up of a major experimental device (PDX) by about one year. ERDA contends that the overall effect of the ceiling case request would be to slip the schedule for the demonstration of fusion power by two to three years. Thus, the Experimental Power Reactor demonstration would slip to the late 1980's (from the mid-1980's) and the demonstration of the near-commercial reactor would slip to the late 1990's (from the mid-1990's).

OMB Recommendation. The Division recommends accepting the ERDA ceiling case levels for outlays (\$214M) but recommends reducing budget authority by \$19M below ERDA's ceiling case (to \$288.6M) for the following reasons:

1. Scientific feasibility of the fusion process has not yet been demonstrated. The recommended levels will permit large scale scientific experiments to continue while delaying the start-up of the major engineering support program until more is known about the fusion process. Serious questions have been raised in the scientific community about the rapid rate at which the fusion program is being moved into a major engineering effort. The delays caused by the reduced budget levels will permit more scientific knowledge to be developed before committing large amounts of resources to solving engineering problems.
2. Experience will be gained from the start-up and operation of the Princeton Large Torus device (PLT) which can be used in the final design of the Tokamak Fusion Test Reactor (TFTR).
3. The delays caused by the recommended budget levels are relatively minimal in light of the long development and lead times expected before the experimental power reactor and the near-commercial demonstration reactor are available. (Experimental Power Reactor delays from 1985 to 1987; Near-Commercial Demonstration Reactor delayed from 1995 to 1997.)





LASER FUSION

	FY 1975	FY 1976	FY 1977				FY 1978
			Orig. ERDA Req.	Rev. ERDA	ERDA Ceiling Case	OMB Rec.	
BA	64.4	91.4	126.6	109.7	99.5	94.8	101
0	55.9	83.6	112.8	98.8	89.8	87.9	94

ERDA Request. The objectives of ERDA's laser-induced fusion programs are to demonstrate the applications of this technology for military (e.g. nuclear weapons research) as well as civilian use (e.g. creation of a laser-fusion electric power reactors). Another objective of this program is to explore the possible use of electron beams as alternative means of inducing fusion.

The revised ERDA budget request would provide a \$15M increase in outlays over the FY 76 level. The program would be directed toward expansion of ongoing work in alternative laser system development, the start-up of a large CO<sub>2</sub> laser facility at Los Alamos Scientific Laboratory (LASL), and expansion of support for non ERDA contractors in: the industrial sector (KMS-Fusion, Inc.) (2) universities (principally University of Rochester); and (3) non-profit research organizations.

OMB Recommendation. The OMB recommendation would force a stretchout of the major CO<sub>2</sub> laser facility to be built at Los Alamos Scientific Laboratory. In addition, the effect of this recommendation would be to reduce support for outside contractors and to slow growth at the National laboratories.

The Division recommendation is \$4.0M in BA and \$1.8M less in outlays than ERDA's recommended approach to reach the OMB revised planning ceiling. The difference is found in the reductions made to stretchout the development of the CO<sub>2</sub> laser device. The total estimated cost of this device has increased by \$31.9M to \$54.5M since its initial design. Because this facility can be built sequentially, and because of the scientific and technical problems encountered by ERDA in attempting to develop this system within estimated costs, the Division recommendation is to: (1) permit construction to begin on needed support facilities; (2) require that ERDA re-study the proposed laser system in order to establish and cost-out a development program which will allow the phased procurement of the laser modules to be used in attaining the desired high laser power output (100 kilojoules).

The effect of the recommended level will be to slow the rate of growth of this program which has grown rapidly since FY 75. This slowdown is acceptable, however, in the Division's view because of: (1) the many technical uncertainties associated with the laser approach to achieving fusion; (2) the program is not expected to achieve



significant net energy gains before the mid-1980's. The Division also recommends that ERDA be required to analyze the alternatives available to it in developing a wider base of external research support for this program (i.e., the use of universities or industries). Such alternatives include, for example, the building of two or three large scale national user facilities as compared to following the present policy of supporting a multitude of smaller facilities at universities and in industry, as well as in Government laboratories.



LIQUID METAL FAST BREEDER REACTOR (LMFBR) PROGRAM

	FY 1975	FY 1976	FY 1977				FY 1978
			Orig. ERDA Req.	REV. ERDA	ERDA Ceiling Case	OMB Rec.	
BA	487.8	489.9	705.7	677.0	668.0	655.3	682.0
0	461.7	429.4	609.1	584.8	577.4	575.3	643.0

ERDA Request. The ERDA request is broken down as follows (outlays):

LMFBR technology.....		372.4	438.1	413.8	406.4	404.3	418.6
Clinch River Breeder Reactor (CRBR) demon- stration project.....		<u>57.0</u>	<u>171.0</u>	<u>171.0</u>	<u>171.0</u>	<u>171.0</u>	<u>224.4</u>
Total		429.4	609.1	584.8	577.4	575.3	643.0

The LMFBR program has been the largest single U.S. energy R&D effort. It has the objective of developing a reactor which will greatly extend our uranium fuel resources. Commercial operations will probably begin in the 1990's. The ERDA request assigns high priority to increasing the momentum of the LMFBR development program by proceeding with the construction of the Clinch River Breeder Reactor demonstration plant for completion by 1983. The CRBR will demonstrate licensability, maintainability, and operability of LMFBRs. The CRBR is currently estimated to have a total cost of \$1.950B, of which the utilities will pay \$250M. In addition, the ERDA request provides for support of an extensive technology program on LMFBR fuels, physics, safety and components.

OMB Recommendation. OMB staff essentially agrees with the high priority of the LMFBR program and has made only relatively minor reductions to the technology programs where the rate of growth over FY 1976 appears excessive. Concerning the CRBR project, OMB staff recommends proceeding with the construction phase at the pace requested by ERDA. The CRBR has had a major cost overrun and will not make much progress on demonstrating the economics of LMFBRs (because of the relatively small size). However, the CRBR will provide a focus for the LMFBR technology program and will begin the process of commercialization. In addition, ERDA has made a major effort to improve the management of the CRBR project by establishing a management team on-site in Oak Ridge.

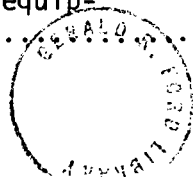


OTHER FISSION REACTOR R&D

	FY 1975	FY 1976	FY 1977				FY 1978
			Orig. ERDA Req.	Rev. ERDA	ERDA Ceiling Case	OMB Rec.	
BA	87.2	123.9	195.0	188.2	158.3	118.6	100.0
0	76.5	94.9	167.7	163.0	128.0	107.8	105.0

ERDA Request. ERDA is supporting several backup concepts (i.e. LWBR, MSBR, GCFBR) which could possibly be developed in case the LMFBR encounters serious problems. In addition, ERDA is conducting R&D on the HTGR (particularly on fuel recycle) which, until recently, was viewed as a prospective near-term commercial alternative to current light water reactors. However, all commercial contracts have now been terminated and the prospects for commercial support are very uncertain. The ERDA request is broken down as follows (outlays):

Light Water Breeder Reactor (LWBR).....	37.9	42.6	42.6	42.6	36.6	35.0
Molten Salt Breeder Reactor (MSBR).....	4.1	4.9	4.9	4.9	3.9	4.0
Gas Cooled Reactors (GCFBR/HTGR).....	26.8	30.2	30.2	30.2	29.2	27.0
Light Water Reactor Technology.....	5.3	40.2	40.2	20.2	8.0	10.0
Supporting activities (e.g. dry cooling towers, desalting studies).....	17.3	27.1	24.3	21.3	21.3	23.0
Other capital equip- ment.....	3.4	22.8	20.8	8.8	8.8	6.0



OMB Recommendation.

LWBR - Complete the demonstration of Admiral Rickover's LWBR concept in the Shippingport reactor (initial operations 1976). Hold the development of advanced LWBR concepts to the FY 1976 level because the economics are doubtful and commercial interest minimal.

MSBR - Continue as a low-level technology effort which addresses the resolution of key technical problems. The MSBR is a very marginal backup to the LMFBR at this level of funding. If could be considered for termination.

Gas Cooled Reactors - Hold to the FY 1976 level of activity until the commercial future (if any) of the High Temperature Gas Reactor (HTGR) is better known. Unless solid commercial interest (i.e. contracts for construction of power plants) can be rekindled within the next six months, Government support of the HTGR and the Gas-cooled Fast Breeder Reactor (GCFBR) should probably be terminated at that time. Although the HTGR has potential advantages over light water reactors (use of thorium fuel, less thermal pollution, process heat applications), these advantages will not be realized unless significant reactor capacity is built before the introduction of breeder reactors. Without firm indications of commercial support, the Government should not proceed with the very expensive (\$1B) task of developing and demonstrating difficult HTGR fuel reprocessing and waste management technology.

Light Water Reactor Technology - Covered in Issue #8.

Other - Hold to ERDA revised ceiling case which maintains a reasonable level of effort.

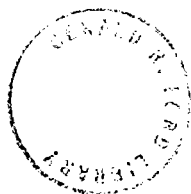


HTGR and LMFBR Fuel Cycle Research and Development

	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>				<u>FY 1978</u>
			<u>Orig. ERDA Req.</u>	<u>Rev. ERDA</u>	<u>ERDA Ceiling Case</u>	<u>OMB Rec.</u>	
HTGR BA	15	17	28	28	28	18	20
0	12	16	24	24	24	17	18
LMFBR BA	5	5	8	8	8	8	10
0	4	4	7	7	7	7	9

ERDA Request. The increase in funding for HTGR fuel cycle research and development is to initiate design studies for an HTGR Recycle Demonstration Facility and to increase hot cell testing of full and laboratory scale components for this facility. The LMFBR recycle funds provide for the establishment of objectives, goals and schedules for the development of a commercial LMFBR reprocessing and recycle industry. The increase in FY 77 is to complete a program management plan and initiate a facilities requirements study.

OMB Recommendation. Considering the recent cancellation of all orders for HTGR power plants the initiation of design of a large fuel recycle facility is unjustified at this time and may never be justified unless the HTGR becomes a commercial success. The LMFBR funds requested by ERDA are required to assure the orderly development of LMFBR reprocessing and recycle technology essential if there is to be widescale use of LMFBR's at the turn of the century.

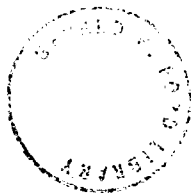


REACTOR SAFETY FACILITIES

	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>				<u>FY 1978</u>
			<u>Orig. ERDA Req.</u>	<u>Rev. ERDA</u>	<u>ERDA Ceiling Case</u>	<u>OMB Rec.</u>	
BA	--	--	34.6	33.3	33.3	33.3	5.0
0	--	--	25.7	24.7	24.7	24.7	7.4

ERDA Request. Pursuant to the Energy Reorganization Act of 1974, ERDA and NRC have signed a memorandum of understanding which provides that ERDA will fund the completion of two reactor safety facilities being constructed at ERDA's Idaho test site. NRC will fund the experimental program for the two facilities. The facilities in question are the Loss of Fluid Test (LOFT) facility and the Plenum Fill Experiment. Both of these facilities will conduct experiments relating to loss of reactor coolant accidents which involve the critical safety issue for current generation light water reactors.

OMB Recommendation. The two facilities in question will conduct experiments which are of urgent importance to NRC's light water reactor safety program. We recommend approval of the revised ERDA request.



NUCLEAR SAFEGUARDS RESEARCH AND DEVELOPMENT

	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>				<u>FY 1978</u>
			<u>Orig. ERDA Req.</u>	<u>Rev. ERDA</u>	<u>ERDA Ceiling Case</u>	<u>OMB Rec.</u>	
BA	7.5	19.6	33.7	33.7	33.7	25.5	25.5
0	6.9	14.7	31.3	31.3	30.8	25.3	25.5

ERDA Request. This program, which represents less than 20% of ERDA's safeguards spending,<sup>1/</sup> should be rapidly expanded for the following reasons:

- This program is ready to move from a study, analytical phase to a demonstration, test, and evaluation phase (with respect to methods of safeguarding plutonium and other special nuclear materials (SNM) from theft and sabotage).
- Safeguards problems must be solved in coordination with breeder reactor and plutonium recycle development to demonstrate effective, economical solutions.

Continuation of 1976 levels of effort are programmed for the following reasons:

- Analysis of potential safeguard threats
- Development of physical protection measures for special nuclear materials (SNM) which involves:
  - establishing standards for protection, and
  - developing technology for meeting standards.
- Development of SNM control and accountability systems.
- Development of secure SNM transportation systems.



A \$10M increase is requested for demonstration of safeguards measures at the following types of facilities:

- <sup>1/</sup> The balance of ERDA's safeguards program involves improving safeguards at ERDA facilities, improving ERDA transportation safeguards, and improving safeguards systems on nuclear weapons.

- Sandia Research Reactor \$1.4M.
- Plutonium Handling and Storage (Hanford) \$1.0M.
- Plutonium Processing and Recovery (Los Alamos Scientific Laboratory) \$4.4M.
- Power Reactor (to be determined) \$3.2M.

OMB Recommendation. We agree with ERDA's assessment of the importance of the problems in this area. However, we do not recommend that full amount requested by ERDA. We recommend a level of \$24.8M. Our recommended reductions are as follows:

- Development and demonstration of further physical protection measures (such as Intrusion Detectors, Entry, Control Systems, and remotely operated barriers) (-\$5M).
- Related capital equipment (-\$1M).

Our reasons for the above reductions are as follows:

- The need for accelerated R&D in physical protection is doubtful in view of the following:
  - ERDA just reduced its estimate of the expected physical threat from terrorist groups.
  - Physical protection measures are now well developed and much work in other fields is applicable to SNM physical material protection.
- Savings can be realized by improved coordination between ERDA and NRC.
  - Part of ERDA's demonstration program may be wasted because NRC expects to issue its regulations in advance of ERDA's related planned demonstrations.
  - ERDA and NRC has not signed either an interagency agreement or a memorandum of understanding. They have not even exchanged budgets. (We will request ERDA and NRC to produce an interagency agreement for our review--prior to Congressional budget hearings if practicable.)





- Of the four demonstrations proposed by ERDA only two are high priority. The research reactor can demonstrate reactor safeguards. The LASL facility can demonstrate fuel reprocessing safeguards. Any power reactor demonstration should be coordinated with NRC, be in the private sector, and include cost-sharing. NRC believes that complete demonstrations are not required and that demonstrations should focus on problem areas.

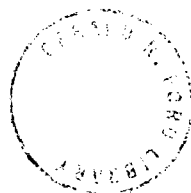


LASER ISOTOPIC SEPARATION

	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>				<u>FY 1978</u>
			<u>Orig. ERDA Req.</u>	<u>Rev. ERDA</u>	<u>ERDA Ceiling Case</u>	<u>OMB Rec.</u>	
BA	22.4	33.5	53.1	43.8	43.8	43.8	40.0
0	18.6	28.2	46.7	39.7	39.2	39.2	40.0

ERDA Request. ERDA believes that it should accelerate the development of technology for using lasers perform uranium enrichment and to recover plutonium. Compared to other uranium enrichment techniques, laser isotopic separation facilities offer the potential of (a) being smaller and less expensive; (b) consuming less electrical power, and (c) utilizing uranium resources more effectively. ERDA's program has the objective of proving technical feasibility by FY 1978, constructing a pilot plant in the late 1970's, and constructing a production plant by the late 1980's.

OMB Recommendation. We believe that laser isotopic separation is a very promising concept with high potential benefits in the form of reduced cost for uranium enrichment and more efficient use of uranium fuel resources. We therefore recommend approval of the revised ERDA request.





OTHER URANIUM ENRICHMENT R&D

	FY 1975	FY 1976	FY 1977				FY 1978
			Orig. ERDA Req.	Rev. ERDA	ERDA Ceiling Case	OMB Rec.	
BA	53.2	59.8	113.7	113.7	113.7	93.2	82.0
0	62.0	59.0	77.7	77.7	77.7	66.4	77.0

ERDA Request. The ERDA request is broken down as follows (outlays):

Process Development R&D.....	47.3	68.8	68.8	68.8	68.8	66.4	59.0
Facilities							
Centrifuge Demonstration Facility (Total est. cost \$100M; FY 1977 BA \$38M).....	--	6.7	6.7	6.7	6.7	5.4	18.0
Prior year projects.....	11.7	2.2	2.2	2.2	2.2	2.2	--

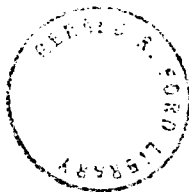
Process Development R&D. ERDA requests a major increase to accelerate the development of advanced centrifuges, process systems manufacturing methods and plant operating procedures to assure that all aspects of the centrifuge technology are ready for use by the private centrifuge corporations now finalizing plans to own, build and operate centrifuge enrichment plants on a production level.

Centrifuge Demonstration Facility. ERDA requests this facility, TEC=\$100M (a) to provide the first production cascade (TEC=\$50M) to use the Set III advanced design centrifuge machines and (b) to provide a test bed, (TEC=\$30M) for the design and initial testing of the next generation, Model IV, machines and (c) to retool the existing manufacturing lines (TEC=\$20M) at Oak Ridge to be able to produce the Set III machines required in the first production cascade. The production cascade will be completed in the middle of 1981 and the Model IV machine test bed completed in late 1981.

OMB Recommendation.

Process Development R&D: An increase in R&D on centrifuges is required to prepare the technology for the imminent use by the private sector but the 32% increase requested is not warranted considering the fact that part of ERDA's plan for privatizing this technology calls for the private sector to begin to do R&D of their own at some point in time. OMB recommends reducing the ERDA requested increase of \$18.7M to \$10M.

Centrifuge Demonstration Facility: Set III centrifuges may be used by some of the first private sector enrichment plants scheduled for operation between 1982-1986, and a cascade process demonstration would reduce the risks (mostly absorbed by the Government) associated with machine failures in large plants so OMB recommends approving the First Production Cascade and the Retooling of the existing Set III machine manufacturing lines. Model IV performance testing should not be started now but can wait until the private enrichers develop this more advanced machine themselves. Thus, we recommend approval of \$50M out of the requested \$100M facility project.



## Biomedical and Environmental Effects



	FY 1975	FY 1976	FY 1977				FY 1978
			Orig. ERDA Req.	Rev. ERDA	ERDA Ceiling Case	OMB Rec.	
BA	163.8	193.3	281.3	223.7	223.2	190.8	191
0	148.6	173.3	241.3	209.8	209.7	189.9	190

ERDA Request. ERDA's Biomedical and Environmental Effects program is composed of six elements: Health Studies, Biological Studies, Environmental Studies, Physical and Technological Studies, Analysis and Assessment and Education and Training. This program conducts basic and applied biomedical and environmental research to support all of ERDA's technology development programs. The program has experienced rapid growth since FY 1974 (FY 1974 outlays, \$116M) when the program was almost entirely directed toward research on nuclear-related problems. The fifty percent growth in outlays from FY 1974 to FY 1976 is due, in large measure, to the need to undertake research into non-nuclear energy related health and environmental problems (e.g. problems associated with new and improved technology for coal use and conversion, oil shale use).

ERDA's FY 1977 budget request (ceiling case) would provide for large increases in outlays for all the program elements: in nuclear (14% increase in outlays), non-nuclear (83% increase in outlays), and supporting research (20% increase in outlays). ERDA justifies the proposed increases on (1) the need to answer unresolved questions regarding the effects of nuclear energy on man and the environment (especially plutonium); (2) the need to quickly determine the nature of the threat represented by the hazardous elements associated with the use of non-nuclear energy sources. ERDA's proposed FY 1977 budget would also provide for a large scale-up of its environmental studies program with particular emphasis on marine and atmospheric effects of energy production and use.

OMB Recommendation. The OMB recommendation provides for a \$13M increase in outlays for this program for FY 1977. This increase will allow needed high priority research on non-nuclear energy-related biomedical and environmental questions to expand. The recommended level will hold nuclear research relatively level. New initiatives can be undertaken, however, within the recommended level if ERDA further reprograms funds in its long-term nuclear research programs away from lower priority nuclear studies and into higher priority areas such as nuclear fuel cycle environmental problems.

The Division feels the recommended level is adequate to support ERDA's needs in this area because:

- The program has grown rapidly in fiscal years 1975 and 1976. Moreover, this growth has been in high priority non-nuclear areas. The nuclear program, already large in FY 1974, has grown as well. The FY 1977 recommendation would carry forward this large program.
- There is considerable flexibility within ERDA's budget to reprogram out of lower priority nuclear-related areas into high priority areas. For example, long term animal experiments can be expanded by adding new pollutants. Other shorter term experiments, can be easily ended and effort reprogrammed into high priority areas.
- There are apparent overlaps between ERDA's proposed programs and other agencies for example: NIH in the health research; EPA in health effects and environmental effects; the Department of Interior in environmental effects, NOAA in environmental effects. The effect of this mark will be to force ERDA to eliminate lower priority work duplicative of other agencies.



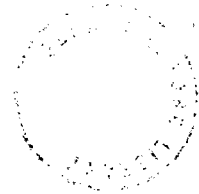
BASIC ENERGY SCIENCES

	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>				<u>FY 1978</u>
			<u>Orig. ERDA Req.</u>	<u>Rev. ERDA</u>	<u>ERDA Ceiling Case</u>	<u>OMB Rec.</u>	
BA	184.9	206.7	290.8	237.5	234.6	224.0	233.0
0	168.5	184.7	256.8	214.5	213.5	201.6	220.0

ERDA Request - ERDA's program in basic energy sciences is aimed at improving the understanding of fundamental physical phenomenon underlying advancement in all areas of energy technology. ERDA has requested major increases in the areas of Material Sciences and Molecular, Mathematical, and Geosciences while requesting only minor increases for Nuclear Science. ERDA believes its request represents a balanced basic research program capable of supporting all other ERDA energy R&D program areas. Achievement of better balance over the next several years between nuclear and non-nuclear basic research is given high priority by ERDA.

OMB Recommendation - ERDA's desire to achieve an overall balance in the Basic Energy Sciences Program was reviewed and found to be essential in order to advance from the rather narrow mission orientation inherited from AEC to the broader mission orientation of ERDA. In order to move toward such a balance while maintaining the desired fiscal constraints, the OMB recommendation includes a reduction in the Nuclear Science area to partially offset a small expansion of the Materials Sciences and Molecular, Mathematical, and Geosciences areas. The overall recommended increase over FY 1976 is 9% which maintains the overall program activity at about the FY 1976 level considering the effect of inflation. The OMB recommendation also includes a \$5 million addition to the Bates Linac, a \$13 million natural gas to coal steam plant conversion at Holifield National Laboratory and a \$2-1/2 million modification to the High Flux Beam Reactor at Brookhaven to increase the neutron flux.

## Production of Enriched Uranium



	FY 1975	FY 1976	FY 1977				FY 1978
			Orig. ERDA Req.	Rev. ERDA	ERDA Ceiling Case	OMB Rec.	
BA	593.2	981.4	1335.6	1307.6	1234.6	1335.6	1058.0
0	535.7	891.6	1230.6	1202.6	1128.3	1230.6	1260.0
Related Revenues * ....	-562.5	-591.5	- 579.9	- 579.9	- 629.9	- 629.9	- 943.0

ERDA Request. The ERDA request is broken down as follows (outlays):

Electric power for production plants....	532.3	704.0	676.0	606.0	704.0	768.0	
Other uranium production costs.....	123.6	137.5	137.5	136.6	137.5	116.5	
<b>Facilities</b>							
Capacity expansion program (Total estimated cost \$1.4B).....	205.3	352.3	352.3	352.3	352.3	321.7	
Other facilities.....	30.4	36.8	36.8	33.4	36.8	53.8	

\*Offset both BA and Outlays

ERDA has suggested a reduction of \$98 million in their uranium production costs in order to meet their FY 77 outlays ceiling. In order to achieve this reduction in uranium enrichment production, the power level to ERDA's enrichment facilities would be cut by 1000 megawatts (MW) from 5,610 MW to 4,610 MW.

This proposed reduction in enrichment production would result in a production loss in FY 77 and, therefore, a reduction in ERDA's enrichment stockpile of 2.5 million separative work units, SWUs. This stockpile provides an insurance that ERDA will be able to meet its contracted future enrichment deliveries against the temporary breakdown of, or power reductions to, the enrichment plants. This stockpile will be used as an inventory to support the start



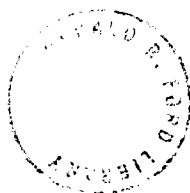
up of the anticipated private enrichment plants if the President's Nuclear Fuel Assurance Act passes the Congress. ERDA maintains that the 2.5M SWU stockpile loss will be made up by the recent slip in nuclear power plant orders and the consequent slip in enrichment delivery schedules.

The 1000 MW power reduction will require a payment to the utilities supplying ERDA with power of \$30 million in contract demand charges for power not delivered. The future revenues lost for the \$98 million reduction in FY 77 is the market value of the SWUs lost, about \$190 million at \$76/SWU.

ERDA also adds \$50 million to the uranium enrichment revenues in FY 77 in order to reach its ceiling. This will be accomplished by an 8% increase in ERDA's toll enrichment charge. If the legislation to increase the present charge for fixed commitment contract holders to \$76/SWU passes the Congress it should not be difficult to raise this to \$82/SWU in FY 77 which would be necessary to achieve the \$50 million revenue increase.

OMB Recommendation. ERDA's suggested increase in FY 77 enrichment revenues can be achieved and should be accepted. However, the reduction in uranium enrichment production will result in a permanent decrease in the enrichment stockpile of 2.5M SWUs and should be rejected. This stockpile loss cannot be regained by the slippage in nuclear power plant orders alone. This is due to the fact that the need for enrichment will increase due to the delay in the approval of plutonium recycle by an amount equivalent to the decrease in this need resulting from power plant slippage. This stockpile loss reduces the assurances of continuous enrichment supply from ERDA's plants which will contribute to the total level of uncertainty now existant in the nuclear industry which is significantly slowing its development. This stockpile loss will also reduce the ability of private enrichment plants to mee their early contracts and may thus deter utilities from ordering from them and jeopardize the President's proposal to create a private enrichment industry. For these reasons, OMB recommends no reduction in ERDA's uranium enrichment production for FY 77.

Since the uranium enrichment capacity expansion programs are essential to meeting future enrichment requirements already committed to by ERDA as well as to developing a reasonable stockpile of SWUs, OMB and ERDA agree that this expansion should go forward as planned, despite the cost growth.



WEAPONS MATERIALS PRODUCTION (AND RELATED WASTE MANAGEMENT)

	FY 1977							FY 1978
	FY 1975	FY 1976	Orig. ERDA Req.	Rev. ERDA	ERDA Ceiling Case	OMB Rec.		
BA	298.3	381.1	565.3	565.3	488.5	526.8	423.5	
0	276.2	341.2	465.2	460.2	399.2	428.9	493.6	

ERDA Request. This program produces special nuclear materials (SNM) for the weapons program, for reactor programs, for the space programs, and for various other applications including medicine and research. This program also manages wastes from the production of SNM. Increases are requested to:

- startup Richland Chemical separations plant to reprocess N-Reactor fuel,
- increase efforts in reprocessing non-production fuels,
- expand research in radioactive waste processing and disposal,
- maintain operations in view of expected inflation of 9.6%
- construct radioactive waste management facilities.

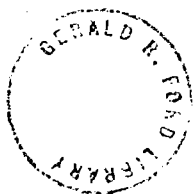
The ERDA revised request does not change, except for a \$5.0M stretchout of a waste calcining facility now under construction, reflecting the high priority ERDA assigns to this program. The ERDA ceiling solution identifies the following further reductions:

- Production:
  - Close N-power reactor (See Issue # 9) - \$36M (partially offset by a loss of \$27M of revenues)
  - Reduce Capital equipment purchases - 5M
  - Reduce supporting services (construction design, environmental impacts, etc.) - 6M
- Waste Management
  - Research and development - 14M

OMB Recommendation. We recommend acceptance of all reduction identified by ERDA for production, except for closing N-Reactor (see Issue #11), because the reductions do not seriously affect program objectives. We also recommend accepting the reduction to Waste Management R&D. ERDA waste presents a serious long-term problem, but in our view a solution to this problem is not urgently required now because ERDA waste is well contained for the present. Also, waste management solutions identified under the expanded commercial waste management program will be available to help solve the problem of ERDA waste.

Finally, we recommend additional reductions in these programs for repricing to allow a 7.5% inflation factor rather than 9.6%.

- Production	\$-4M
- Waste Management	-2M



URANIUM RESOURCE ASSESSMENT

	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>			<u>OMB Rec.</u>	<u>FY 1978</u>
			<u>Orig. ERDA Req.</u>	<u>Rev. ERDA</u>	<u>ERDA Ceiling Case</u>		
BA	8.1	18.8	46.3	46.3	46.3	36.3	40.0
0	6.8	14.8	38.0	38.0	37.5	30.0	40.0

ERDA Request. ERDA has requested a substantial increase in its program to evaluate the extent and availability of domestic uranium resources. The first comprehensive ERDA report will be completed by 1980, with an initial evaluation report in 1976. The ERDA program is important in order (a) to identify likely sources of uranium for current nuclear power plants and (b) to assist planning for the pace of development of fast breeder reactors. The funding increase provides for expanded geologic drilling and implementation of a nationwide aerial and stream sediment survey.

OMB Recommendation. Although OMB staff supports the objectives of this program, we are concerned at the size of the funding increase requested. We have recommended an \$8M reduction which will result in a slight slowdown in the program's pace.



Peaceful Nuclear Explosives (PNE's)

		FY 1977							
		FY 1975	FY 1976	Orig. ERDA Req.	Rev. ERDA	ERDA Ceiling Case	OMB Rec.	FY 1978	
Fossil	BA	2.7	1.1	1.3	1.3	1.3	--	--	
	0	2.7	1.1	1.3	1.3	1.3	--	--	
Nuclear Explosives Applications	BA	--	--	4.0	2.3	--	--	--	
	0	--	--	3.0	1.7	--	--	--	
Control Technology	BA	--	--	--	--	--	1.3	1.3	
	0	--	--	--	--	--	1.0	1.0	
Total	BA	2.7	1.1	5.3	3.6	1.3	1.3	1.3	
	0	2.7	1.1	4.3	3.0	1.3	1.0	1.0	

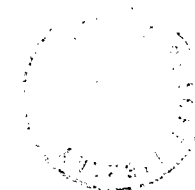
ERDA Request. ERDA has requested \$1.3M under the fossil program to further evaluate the 1974 Rio Blanco gas stimulation PNE test. Further study would involve systems studies concerning rock mechanics and void formation. This work would be useful to a future gas stimulation PNE Program.

ERDA has requested 3.0M in outlays to reinstate a PNE program for the following purposes:

1. To respond to requests from other countries for aid in using PNE technology. ERDA considers this a treaty obligation under the nuclear non-proliferation treaty, because the treaty requires them to make the "benefits" of PNE technology generally available.
2. To reduce asymmetry in PNE technology with the USSR.
3. To "keep open all options with respect to energy and resource problems solutions."

This program would:

- investigate the feasibility of storing hydrocarbon liquids in cavities created by nuclear explosives.



- investigate the feasibility of utilization of very deep (20,000 to 30,000 feet), PNE produced cavities for permanent disposal of nuclear fuel reprocessing wastes.
- develop a better understanding of the explosion effects and migration of radioactivity, and
- provide for support of U.S. role in international PNE affairs.

ERDA's revised request continues Rio Blanco evaluation and a slightly lower level of effort on PNE development.

The National Security Council supports at least part of ERDA's request.

OMB Recommendation. We recommend no funds for the fossil program. We recommend that approximately \$1M be budgeted in the waste management program for deep rock technology.

Our reasons are as follows:

1. The highest priority evaluations of Rio Blanco have been completed. This technology is not viable at this time and will not be viable until economic, technical and public acceptance problems are solved. The proposed research will not contribute significantly to solving these problems.
2. We do not agree that the U.S. has a treaty obligation to develop PNE technology except where we expect net benefits for us or for other countries. We agree that the U.S. should participate with other countries in evaluating feasibility for specific applications. However, we feel that ERDA weapons labs now have a sufficient technological base and that ERDA's international program can handle this.
3. The ERDA weapons program is sufficiently large to assure an adequate technological base for future PNE initiatives. A PNE verification program is budgeted for separately.
4. We would prefer not to see a separate PNE program because its sponsors would serve as an advocate for PNE technology within ERDA. There would be little incentive to evaluate this technology competitively with other technologies available to accomplish program objectives. We would prefer to see PNE technology as a resource to be drawn on by (for example) the fossil program and the waste management program; therefore, we recommend that PNE funds be budgeted by using divisions.



HIGH ENERGY PHYSICS

	<u>FY 1975</u>	<u>FY 1976</u>	FY 1977				<u>FY 1978</u>
			<u>Orig. ERDA Req.</u>	<u>Rev. ERDA</u>	<u>ERDA Ceiling Case</u>	<u>OMB Rec.</u>	
BA	149.9	176.9	250.3	240.9	240.3	200.0	231.0
0	171.9	177.6	215.0	201.0	194.5	191.4	195.4

ERDA Request - ERDA has requested authorization of a major construction project (PEP - a 15 GeV x 15 GeV positron-electron colliding beam facility costing an estimated \$78 million) and small operating increases across the board to maintain a constant level of research in the High Energy Physics Program. Construction of PEP has been given the highest priority of several new facilities recommended by the High Energy Physics Advisory Panel. Dr. H. G. Stever, the President's Science Advisor, has also given a high priority to the construction of this new research facility.

OMB Recommendation - The construction of PEP would provide the facility necessary to followup several major discoveries that have been achieved in the past year while minimizing the outlay usually required for a facility of this type by utilizing the existing facilities associated with the Stanford Linear Accelerator. Nevertheless, in our view, initiation of this project can be postponed until 1978 in view of OMB overall guidance covering new construction starts in the present fiscal climate. (This facility will be included in the 1978 authorization bill which will go forward in February.) Our recommendation agrees with last year's Director's Review decision on this issue which allowed the facility in 1978 and also provided for shutdown of the ZGS facility at Argonne National Laboratory in 1979. Congress has recommended additional funds in FY 1977 to initiate the PEP project. OMB recommends that these additional FY 1977 funds be deferred to FY 1978 if enacted. Part of the large BA increase is due to \$5.5 million computer for Fermilab, which OMB staff feels is justified.



## Space Nuclear Systems

	FY 1975	FY 1976	FY 1977				FY 1978
			Orig. ERDA Req.	Rev. ERDA	ERDA Ceiling Case	OMB Rec.	
BA	29.4	39.3	50.4	40.0	38.7	34.2	33.0
0	34.4	37.2	44.9	36.0	35.0	32.3	34.0

ERDA Request. ERDA's revised request provides for the following reductions (Outlays - \$ in millions)

Unmanned free swimming submersible.....	-3.8
Fuel Form Fabricating capabilities.....	-2.4
North American Air Surveillance Network (DEW Line).....	-1.3
Thermionic Conversion.....	-1.5
Capital equipment.....	-1.0
Total reduction.....	-10.0

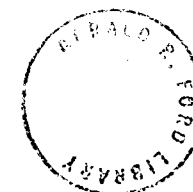
OMB Recommendation. We recommend acceptance of ERDA's reductions. Their impacts are as follows:

- The impact of the reductions to the UFSS program and to fuel form fabrication capabilities will postpone delivery of an isotopic power supply for the unmanned research submarine for two years. However, related work will continue and an improved technology should be available at that time. The postponement will not affect the program objective, but will require operation for two years with a conventional power source.
- The impact of the reductions on the Air Force DEW Line program is to postpone by one year a study of the use of isotopic power supplies for possible unmanned DEW line stations. This will not have a serious impact because DEW Line improvements are not imminent.
- The impact of the reductions to the thermionic program is to postpone demonstration of the technology for one year.

In addition to the reductions provided by ERDA, we recommend the following:

Radioactive Waste Utilization.....	-1.2
Conversion technology.....	-1.5

- 2.7





The impact of the radioactive waste utilization reduction would be to eliminate ERDA's program to use radioactive wastes for such purposes as sewage sterilization and self-luminescent light sources. This program is of low priority because of uncertain economics and political and public acceptance problems.

The impact of the thermionic conversion technology reduction would be to continue this program at the \$1M program level, funding only thermionics. This would postpone ERDA's plan for demonstration of thermionic technology. In our view, this technology, which could enhance the efficiency of fossil fuel generation, is not ready for a demonstration. When this program is ready for demonstration it should be transferred to another ERDA division so it can compete with other energy systems. Two other initiatives in this category are not recommended. A Zirconium hydride technology initiative is not recommended because this system does not appear ready for commercial application. A thermo electric materials initiative should be funded under advanced research.





PROGRAM SUPPORT

		<u>FY 1977</u>							
		<u>FY 1975</u>	<u>FY 1976</u>	<u>Orig. ERDA Req.</u>	<u>Rev. ERDA</u>	<u>ERDA Ceiling Case</u>	<u>OMB Rec.</u>	<u>FY 1978</u>	
Program Direction	BA	155.0	190.9	220.9	210.0	210.0	199.1	203.0	
	0	155.1	183.7	220.7	209.6	204.1	199.0	203.4	
Supporting Activities	BA	31.3	52.0	176.3	115.0	86.2	49.9	49.5	
	0	30.8	48.3	89.1	67.4	61.7	48.5	50.9	

ERDA Request/OMB Recommendation.

Program Direction. The ERDA request provides for the following increases (Millions of \$):

<u>Activity</u>	<u>Budget Authority</u>			<u>ERDA Request</u>	<u>OMB Recommendation</u>
	<u>FY 76</u>	<u>FY 77 Req.</u>	<u>FY 77 Rec.</u>		
Personnel	137.0	152.9	150.3	- See Issue #9.	-See Issue #9.
Travel	7.0	8.2	7.7	-Personnel increases and management improvements.	-Reflects personnel increases.
Contractual Services	35.7	38.9	36.9	-Personnel increases and management improvements.	-Reflects personnel increases.
Other	11.2	10.0	4.2	-Completion of phase-funded building improvement. New computer.	-Disallows computer as not needed before 1978. Deletes headquarters improvement funds
Total	190.9	210.0	199.1		

Supporting Activities. ERDA feels strongly about the manpower initiatives and the general purpose laboratory facility initiatives below and may be expected to challenge our recommendation for no new funds in these areas. ERDA may also appeal our reduction to the requested growth rate in the public awareness program. The ERDA request provides for the following new initiatives and program accelerations (Millions of \$):

<u>Program</u>	<u>Budget Authority</u>			<u>ERDA Request</u>	<u>OMB Recommendation</u>
	<u>FY 76</u>	<u>FY 77 Req.</u>	<u>FY 77 Rec.</u>		
Community operations	7.6	7.5	6.4	-Support payments for Roane and Anderson Counties are added (+0.8). -Support levels for Los Alamos and Oak Ridge are increased in accordance with contractual commitments (+0.8). -Contingency funding related to possible impacted aid shortfalls is deleted (-1.7).	-Not allowed since special need not demonstrated. -Increase allowed less \$.3 for expected state aid increases in New Mexico. -Accept reduction.
Security investigations	12.3	10.0	10.0	-Downward change in personnel clearance standards. (-2.3)	-Agree with change. No further reduction recommended (for safeguards reasons).
Information Services					
-Public awareness	2.9	5.3	3.2	-Expanded public awareness program (+2.4)	-Moderate increase allowed for price increases.
-Technical information	7.4	8.9	8.4	-Expanded technical information program (+1.5)	-Part of program growth recognized for new energy data.
General systems studies (planning function)	10.8	12.0	10.0	-Additional studies (+1.2)	-Reduction recommended. Studies should be redirected to higher priority areas.
General Technology Transfer	1.8	2.0	2.0	-Continue Commercialization methods study.	-No change
Manpower development	--	3.2	0.7	-New manpower information evaluation program (+0.7). -New technical training program for ERDA contractor employees (+2.5M)	-Allowed. ERDA needs to monitor and use this data. -Not allowed. Necessary technical training should be funded through programs.
EEO Assigned facilities	2.0	2.3	2.0	-More frequent inspections (0.3).	-Not allowed per cross-cutting Director's Review on contract compliance.



<u>Program</u>	<u>Budget Authority</u>			<u>ERDA Request</u>	<u>OMB Recommendation</u>
	<u>FY 76</u>	<u>FY 77 Req.</u>	<u>FY 77 Rec.</u>		
Construction Planning and Design	7.2	10.0	7.2	-Increase required because of planned extensive building programs.	-Reflects reductions to building program throughout budget.
General Purpose Laboratory Facilities	--	53.8		-Construction to upgrade Govern- ment owned research laboratories and production facilities. -Los Alamos 16.0 -Brookhaven 11.5 -Berkeley 8.0 -Livermore 9.3 -Oak Ridge 5.0 -Richland 4.0	-Not allowed on grounds of low priority and because of OMB's overall policy of con- straint on new con- struction. Also, we recommend such improve- ments be funded in programs, so that they can compete with pro- gram objectives for funds.
<b>Total</b>	<b>52.0</b>	<b>115.0</b>	<b>49.9</b>		



## OPERATIONAL SAFETY

	<u>FY 1975</u>	<u>FY 1976</u>	<u>FY 1977</u>				<u>FY 1978</u>
			<u>Orig. ERDA Req.</u>	<u>Rev. ERDA</u>	<u>ERDA Ceiling Case</u>	<u>OMB Rec.</u>	
BA	4.4	6.5	10.2	10.8	10.8	8.6	6.0
0	3.8	6.0	9.7	7.6	7.6	6.0	7.0

ERDA Request. The ERDA Operational Safety Program: Conducts safety studies and develops safety, health and environmental regulations for ERDA facilities; conducts an aerial radiological monitoring program, and has responsibility for administering the financial assistance program to limit radiation exposure resulting from the widespread use of uranium mill tailings for construction purposes in Grand Junction, Colorado. Under Title II of P.L. 92-314, ERDA is authorized to pay 75% of these costs.

The revised ERDA request provides for an expansion of its safety studies (to bring all ERDA facilities into compliance with applicable health, environmental and safety studies) and aerial radiological monitoring program. In addition, ERDA has requested an additional \$3M of Budget Authority for the Uranium Mill Tailings program.

OMB Recommendation. The Division recommends supporting the safety studies and aerial monitoring programs at the FY 76 level. This will allow ERDA to conduct necessary safety studies by shifting to high priority facilities which ERDA has recently absorbed from other agencies.

The Division also supports the request for an increase in BA (\$3M) and outlays (\$600M) for the Uranium Mill Tailings program.



## F. Major Programmatic Issues

Based on the OMB critique of ERDA's energy R&D strategy and priorities, and considering the merits of individual programs, the major energy R&D issues between ERDA and OMB arise from:

- . ERDA's excessive emphasis on lower potential payoff technological options such as solar heating and cooling, geothermal and certain solar electric options such as wind energy and ocean thermal power. (See Issues #3 and #4.)
- . ERDA's emphasis on Federal involvement in new conservation technologies particularly improvements in end-use technologies which are, to a large extent, stimulated through the price mechanism. (See Issue #5.)
- . ERDA's recommended acceleration of development of the longer-range payoff technologies of solar electric and fusion considering that they are well behind in the development cycle of their chief competitor, the LMFBR. (See Issue #3.)
- . ERDA's call for a substantial Federal role in developing technology related to advanced oil and gas recovery, on which the petroleum industry is spending upwards of \$100 million annually. (See Issue #1.)
- . ERDA's proposal for a substantial Federal role in developing technology related to improving the reliability of conventional nuclear reactors. (See Issue #8.)
- . The proper Federal role in assuring the development and commercialization of technologies needed to complete the nuclear fuel cycle, i.e., fuel reprocessing, waste management. (See Issues #6 and #7.)



As noted above, there is a continuing issue regarding the proper Federal role in development and demonstrations. ERDA continually presses for a larger Federal involvement than OMB staff consider justified. In part, this is due to heavy Congressional pressure for large aggressive Federal programs, e.g., solar heating and cooling; conservation. ERDA has not been in a position to resist these pressures, because they have failed to conduct adequate agency-wide resource allocation and planning that would demonstrate conclusively the marginal payoff of certain popular technological approaches.

G. Summary of Federal Energy R&D Funding

- The attached tables summarize the direct energy R&D funding in the major R&D agencies: ERDA, NRC, DOI, EPA, NSF, and NASA.
- The tables make it clear that the formation of ERDA effectively consolidated energy R&D activities with about 90% now taking place in ERDA.
- The figures in the following sections summarize ERDA's R&D by major program area and activity.



Table 5  
Summary of Federal Energy R&D Funding<sup>1/</sup>  
Budget Authority  
(\$ Millions)

Program Area		FY 1975	FY 1976	(OMB Rec.) FY 1977	FY 1978
<u>Direct Energy R&amp;D:</u>					
Non-nuclear R&D:		(619)	(795)	(910)	(1155)
Fossil Energy	TOTAL	393	505	538	737
	ERDA	335	435	473	672
	DOI	52	65	65	65
	NSF	5	4	--	--
	NASA	1	1	--	--
Solar	TOTAL	51	94	126	147
	ERDA	40	89	126	147
	NSF	10	3	--	--
	NASA	1	2	--	--
Geothermal	TOTAL	34	34	49	50
	ERDA	28	31	49	50
	NSF	6	3	--	--
Conservation	TOTAL	48	78	99	120
	ERDA	31	71	99	120
	NSF	14	4	--	--
	NASA	3	3	--	--
Environmental Control	TOTAL	93	84	98	101
	ERDA	8	10	18	18
	EPA	82	58	59	61
	NRC	3	16	21	22
Nuclear R&D:		( 937 )	(1147)	(1617)	(1690)
Fission	TOTAL	748	880	1233	1282
	ERDA	691	781	1116	1160
	NRC	57	99	117	122
Fusion	TOTAL	189	267	384	408
	ERDA	189	267	384	408
DIRECT ENERGY R&D TOTAL		1556	1942	2527	2845
ERDA TOTAL		(1322)	(1684)	(2265)	(2575)
Non-ERDA TOTAL		( 234 )	( 258 )	( 262 )	( 270 )
<u>Supporting R&amp;D:</u>					
Environmental Effects	TOTAL	232	250	245	247
	ERDA	164	193	191	191
	EPA	49	38	34	36
	NSF	19	19	20	20
Basic Research	TOTAL	304	330	364	379
	ERDA	185	207	224	233
	NSF	119	123	140	146
SUPPORTING R&D TOTAL		536	580	609	626
ERDA TOTAL		(349)	(400)	(415)	(424)
Non-ERDA TOTAL		(187)	(180)	(194)	(202)



<sup>1/</sup> This summary is restricted to major R&D agency programs: ERDA, NRC, DOI, EPA, NSF, and NASA. Programs in such agencies as DOD, DOC, DOA, and DOT have negligible energy R&D funding.



TABLE 6  
Summary of Federal Energy R&D Funding  
Outlays  
(\$ Millions)

Program Area		FY 1975	FY 1976	FY 1977	FY 1978
<b>Direct Energy R&amp;D:</b>					
Non-nuclear R&D:		( 281 )	( 680 )	( 835 )	( 989 )
Fossil Energy	<u>TOTAL</u>	<u>172</u>	<u>408</u>	<u>510</u>	<u>627</u>
	ERDA	148	352	444	563
	DOI	19	52	64	64
	NSF	4	3	2	--
	NASA	1	1	--	--
Solar	<u>TOTAL</u>	<u>31</u>	<u>67</u>	<u>94</u>	<u>124</u>
	ERDA	15	65	91	123
	NSF	15	1	2	--
	NASA	1	1	1	1
Geothermal	<u>TOTAL</u>	<u>24</u>	<u>33</u>	<u>43</u>	<u>45</u>
	ERDA	20	32	42	45
	NSF	4	1	1	--
Conservation	<u>TOTAL</u>	<u>26</u>	<u>62</u>	<u>81</u>	<u>91</u>
	ERDA	17	55	78	90
	NSF	6	4	2	--
	NASA	3	3	1	1
Environmental Control	<u>TOTAL</u>	<u>28</u>	<u>110</u>	<u>107</u>	<u>102</u>
	ERDA	7	10	16	16
	EPA	19	87	75	65
	NRC	2	13	16	21
Nuclear R&D:		( 859 )	( 984 )	( 1360 )	( 1555 )
Fission	<u>TOTAL</u>	<u>708</u>	<u>754</u>	<u>1058</u>	<u>1155</u>
	ERDA	654	673	958	1043
	NRC	54	81	100	112
Fusion	<u>TOTAL</u>	<u>151</u>	<u>230</u>	<u>302</u>	<u>400</u>
	ERDA	151	230	302	400
<b>DIRECT ENERGY R&amp;D TOTAL</b>		<u>1140</u>	<u>1664</u>	<u>2195</u>	<u>2544</u>
ERDA TOTAL		(1012)	(1417)	(1931)	(2280)
Non-ERDA TOTAL		( 128 )	( 247 )	( 264 )	( 264 )
<b>Supporting R&amp;D:</b>					
Environmental Effects	<u>TOTAL</u>	<u>163</u>	<u>230</u>	<u>254</u>	<u>248</u>
	ERDA	149	178	190	190
	EPA	4	40	47	38
	NSF	10	12	17	20
Basic Research	<u>TOTAL</u>	<u>246</u>	<u>266</u>	<u>324</u>	<u>366</u>
	ERDA	168	185	202	220
	NSF	78	81	122	146
<b>SUPPORTING R&amp;D TOTAL</b>		<u>409</u>	<u>496</u>	<u>578</u>	<u>614</u>
ERDA TOTAL		( 317 )	( 363 )	( 392 )	( 410 )
Non-ERDA TOTAL		( 92 )	( 133 )	( 186 )	( 204 )

