The original documents are located in Box 36, folder "Uranium Enrichment (10)" of the James M. Cannon Files at the Gerald R. Ford Presidential Library.

NOTES ON MEETING WITH THE PRESIDENT
RE: Uranium Enrichment
Friday, October 3, 1975
10:30 a.m.
Oval Office

Conversation for Follow Up

The President and Seamans estimate the following timetable:

1. The GAO report will take about two weeks.

2. The JCAE will meet in about two weeks to study the report before they start hearings.

3. The hearings will take at least a week.

The President wants to get a firm commitment from Pastore on a definite date to start the hearings - hopefully no later than Monday, November 3rd.

The President wants to call Senator Pastore about setting a definite date, and wants me to suggest a time for the call after

a) GAO report is out

b) I have had a chance to talk to Senator Baker about what Senator Pastore is willing to do.

The President emphasized we should also keep in close touch with John Anderson about the hearings, our proposal, and the legislation.

On the question of when we should make some judgment as to the viability of the UEA plan, Seamans emphasized we should do this before the hearings began.

We would not make any public comment on UEA's viability but our witnesses could be guided by whether we think UEA can bring together partners and financing.

The President made these points:

1. We believe we have a viable plan for private enterprize to be bringing into commercial production, new forms of energy, and we have put that plan forward.

2. UEA believes they come under that umbrella.

3. Other groups producing energy also believe they come under that umbrella, e.g. with centrifuge.

4. If UEA cannot meet the standards we have set we have a responsibility, in terms of meeting energy needs, to go another route, i.e. the diffusion add-on at Portsmouth.

Seamans made two important points about UEA's potential foreign investors:

a) Iran wants assurances that they can have their own uranium enrichment plant - which we don't think Congress would in any sense accept.

b) Japan wants to buy enriched uranium from the United States, but is not committed to either UEA, centrifuge, or the United States Government's production.

[10/3/75]

10/3/75 DRAFT

DRAFT OF REPORT TO

JOINT COMMITTEE ON ATOMIC ENERGY

EVALUATION OF PROPOSAL FOR GOVERNMENT ASSISTANCE TO PRIVATE URANIUM ENRICHMENT GROUP

NOTICE -- THIS DRAFT RESTRICTED TO OFFICIAL USE

This document is a *draft* of a proposed report of the General Accounting Office. It is subject to revision and is being made available solely to those having responsibilities concerning the subjects discussed for their review and comment to the General Accounting Office.

Recipients of this draft must not show or release its contents for purposes other than official review and comment under any circumstances. At all times it must be safeguarded to prevent premature publication or similar improper disclosure of the information contained therein.

BY

THE COMPTROLLER GENERAL

OF THE UNITED STATES

GAO-333 (Rev. Feb. 70)

GPO 889-018

DRAFT

CONTENTS

ABBREVIATIONS

AEC	Atomic Energy Commission
ERDA	Energy Research and Development Administration
SWU	Separative Work Unit
TVA	Tennessee Valley Authority
UEA	Uranium Enrichment Associates

DRAFT

COMPTROLLER GENERAL'S REPORT TO THE JOINT COMMITTEE ON ATOMIC ENERGY

EVALUATION OF PROPOSALS FOR GOVERNMENT ASSISTANCE TO PRIVATE URANIUM ENRICHMENT GROUP

D I G E S T

Before uranium can be used in most nuclear powerplants, it must undergo a process called enrichment. All existing domestic uranium enrichment facilities are owned by the Energy Research and Development Administration. To meet the projected growth in nuclear powerplants, construction of new enrichment capacity must be started soon. (See p 5)

On June 26, 1975, the President proposed to Congress legislation to allow the Energy Research and Development Administration to assist private firms so they could build, own, and operate commercial uranium enrichment facilities to furnish this needed capacity. This assistance would include the technical and financial support necessary to insure that enrichment facilities built by private industry perform successfully. The legislation proposes that Government assistance be given to an unlimited number of private ventures but, in total, would be limited to a maximum of $8 billion. (See p 9)

The Energy Research and Development Administration and private firms interested in building enrichment plants say that this Government assistance is necessary to overcome some of the uncertainties associated with private firms providing enrichment capacity. These uncertainties are:

DRAFT

--the processes have not been shown operable in a commercial environment,

--the technology is classified,

--large capital requirements and long pay-back period are required,

--licensing uncertainties exist,

--threat of a nuclear moratorium exists,

--many domestic electrical utilities are in weak financial condition (see p 11)

On May 30, 1975, a private group made a proposal for Government assistance and assurances to help in building an enrichment plant in Alabama, estimated to cost $3.5 billion. This plant would use the technology the Government has used successfully in its plants for 30 years. The private group estimates that foreign countries will contribute about 60 percent of the $3.5 billion and will receive the same percentage of the plant's enriched product. (See p 15)

The private group's proposal requests the Government to, among other things

--guarantee the plant will work successfully,

--buy any excess enrichment products,

--supply enrichment services if the plant can't produce enough,

--buy the assets and assume the liability of all domestic groups involved if the plant fails. (See p 20)

At the same time, domestic equity holders in the plant essentially will receive a guaranteed 15 percent return on their investment.

The next plant is expected to be the last time the current enrichment technology is used in a new plant. Later plants are expected to utilize a more efficient process. (See p 7)

An alternative to private industry building the next enrichment capacity is the Government adding capacity to one of its plants.

Conclusions

GAO believes the private group's proposal should be rejected because

--it would use a technology that will not again be used

--it faces financing uncertainties which could cause the Government to take over plant ownership

--it guarantees the investors a rate of return in the long run, even though the Government assumes most, if not all, risks associated with building and operating the plant

--the group might have problems in getting the plant on line when it is needed

Instead, GAO believes the Government should add-on to its existing plant because

--it could be constructed for about $600 million less than the private group's plant

--it would more likely be ready when needed

--it could be built in two stages, thereby "buying" time until the more efficient process can be commercialized.

GAO believes management of the Government enrichment facilities could be more effectively accomplished by a corporation having a self-financing authority to borrow funds from the Treasury or the public. A self-financing proposal would free the corporation from the constraints of the budget processes. (See p 60)

GAO recognizes that Government assistance and assurances may be justified to encourage industries to build plants using these advanced processes. Accordingly, GAO feels that Government should continue its efforts to encourage private enrichers to build plants using the advanced processes. But, in these efforts, GAO feels the Government should seek to get a more reasonable and equitable sharing of risk by the private enrichers and the Government than is contained in the proposal made by the private group. (See p 62)

MATTERS FOR CONSIDERATION BY THE JOINT COMMITTEE ON ATOMIC ENERGY

The Joint Committee on Atomic Energy should consider

--Authorizing the Energy Research and Development Administration to construct the next increment of the enrichment capacity utilizing the proven enrichment process.

--Establishing a Government corporation with self-financing authority to manage the Government's uranium enrichment facilities.

--Developing legislation authorizing the Energy Research and Development Administration to enter into corporative agreements with private enrichers using advanced technologies.

CHAPTER 1

INTRODUCTION

The Federal Government through its Energy Research and Development Administration[1] (ERDA) owns all existing uranium enrichment capacity in the United States. Additional capacity must be built if enriched uranium is to be available to fuel nuclear power reactors which come on line in the early 1980's. Because at least 8 years will be required to build additional capacity, decisions regarding its development must be made soon.

Since 1971, the Executive Branch has followed policies and programs designed to encourage private industry development of uranium enrichment. In 1975 the President proposed to Congress legislation--called the Nuclear Fuel Assurance Act of 1975--that would enable ERDA to negotiate and enter into cooperative arrangements with private organizations that wish to build, own, and operate plants for enriching uranium. The legislation is intended to (1) provide needed enrichment capacity and (2) create a competitive uranium enrichment industry.

The Chairman of the Joint Committee on Atomic Energy asked us to review the legislative proposal and a related proposal made to ERDA by a private firm. That firm proposes to build the next increment of uranium enrichment capacity subject to receiving a number of Government assurances. This report summarizes the results of our review.

---

[1]The Energy Reorganization Act of 1974 (Public Law 93-438) abolished the Atomic Energy Commission (AEC) and established the Energy Research and Development Administration and the Nuclear Regulatory Commission on January 19, 1975. All of the AEC programs and activities discussed in this report are now carried out by the Energy Research and Development Administration.

Several basic questions must be considered in any evaluation of the factors bearing or development of additional uranium enrichment capacity.

--Since the Government could feasibly add-on to its existing uranium enrichment capacity, what are the advantages and disadvantages of having private industry involvement in terms of costs, competition, and other factors?

--Should the next increment of uranium enrichment capacity use the technology proven successful in Government plants, or should other promising, but untried, technologies be expedited?

--What type of competitive environment would exist for a private uranium enrichment firm operating under the proposal now before ERDA?

--What Government guarantees will be made to get private enterprise involved in uranium enrichment?

The following chapters of this report contain information bearing on each of these questions.

URANIUM ENRICHMENT--WHAT AND WHERE IT IS

Uranium enrichment involves separating the two principal isotopes of uranium found in nature--uranium 235 and uranium 238. Uranium in its natural state contains 0.711 weight percent uranium 235. The work done to separate these isotopes (or enriching the uranium 235 component), is called separative work and the product

achieved is called enriched uranium. The production capacity of enrichment plants is in terms of "separative work units." A separative work unit (SWU) is not a quantity of material but is a measure of the effort expended to separate a given quantity of uranium feed into two streams, one having a higher percentage uranium 235.

Most domestic and foreign commercial nuclear power reactors use slightly enriched uranium--between 2 and 4 percent by weight uranium 235--as fuel. Uranium products of higher enrichment (5 to 97 percent uranium 235) are used for weapons purposes, as fuel

for high temperature gas cooled reactors and for specialized reactors.

Uranium enrichment facilities in the United States consists of three plants located at Oak Ridge, Tennessee; near Paducah, Kentucky; and near Portsmouth, Ohio. These plants are owned by the Government and are operated by private firms under cost-plus-fixed-fee management contracts. Union Carbide Corporation, Nuclear Division operates the Oak Ridge and Paducah plants and Goodyear Atomic Corporation operates the Portsmouth plant.

ERDA's three enrichment plants are the major sources for enriching uranium in the world. Other nations and consortiums are operating and are planning to construct enrichment plants. These foreign initiatives appear to have accelerated in the last years when there has not been any new U.S. capacity. Information on the current status of existing, planned, and potential enrichment plants outside the United States is contained in Appendix I.

ERDA supplies enrichment services to both domestic and foreign customers under three major types of contracts: (1) requirements contracts under which ERDA agrees to supply all of the enriched uranium required to fuel a specific nuclear reactor; (2) long-term, fixed-commitment contracts under which ERDA agrees to provide fixed amounts of enriched uranium for a certain time period; and (3) conditional contracts under which ERDA agrees to provide enriched uranium if certain enriching capacity currently under

contract is freed. The table below shows the distribution of contracts as of August 30, 1975, among the three types of foreign and domestic customers.

Type of contract	Domestic	Foreign	Total
	(in thousands of megawatts)		
Requirements	77	26	103
Long-term, fixed commitment	131	81	212
Subtotal	208	107	315
Conditional	--	14	14
Total	208	121	329

The total commitment for enrichment services shown above represents ERDA's total enrichment capacity. Consequently, for the continued growth of nuclear power beyond the early 1980s, provisions must be made for additional enrichment capacity.

While the exact number and timing of additional enrichment plants will vary with the assumptions made regarding such things as the rate of nuclear power growth, any growth in nuclear power will require new enrichment capacity.

Considering the lead time required to either build new capacity or add-on to existing plants (about 8 years), a decision to provide for this capacity must be made soon. ERDA says that the next increment of enrichment capacity will be needed in about 1983.

Various ERDA actions are possible which could delay the time when additional capacity is needed, including (1) increase current enrichment output in ERDA's plants by adjusting the operating characteristics (in enrichment jargon--raising the plants' tails level) which would require more uranium feed, (2) cancel ERDA's enrichment contracts with foreign customers, (3) using more of the existing ERDA stockpile of enriched uranium to meet customer needs. ERDA believes that each of these actions would be drastic and unreasonable. We have not analyzed these actions in depth; on the surface, however, we cannot disagree with ERDA's belief.

URANIUM ENRICHMENT TECHNOLOGIES

Enrichment technologies that are or may be available to Government and industry are gaseous diffusion, gas centrifuge, and laser isotope separation.

Gaseous diffusion

The gaseous diffusion process depends on the small difference in mobility between the molecules of gaseous uranium 235 and uranium 238 hexafluoride. When contained within walls composed of a porous barrier (or membrane), the lighter uranium 235 molecules pass through the barrier more readily which results in a stream

slightly enriched in uranium 235. However, the degree of enrichment which can be achieved in a single diffusion through the porous barrier is very small. Thus, the diffusion process must be repeated a large number of times.

Because of the repetitive nature of the process, these plants are among the largest industrial facilities in the world. Process buildings at the three Government sites have a gross flow area of approximately 28 million square feet, or 1 square mile. A gaseous diffusion plant of about 9 million SWU requires about 2,500 megawatts of electricity--equivalent to roughly two dedicated electrical power plants. This large requirement for power is the major disadvantage of the process.

The Government's gaseous diffusion plants now have a total capacity of about 17 million SWU. An expansion program now underway will increase total capacity to about 27 million SWU. The plants can be further expanded in relatively small increments without economic penalty. A new plant, on the other hand, requires a minimum size of about a million SWU to operate economically.

Most ERDA And industry officials agree that because this technology has been working successfully (a 99.5 percent reliability rate for 30 years), it should be used for the next increment of capacity.

Gas centrifuge

Like gaseous diffusion, gas centrifuge process theory is based on the small differences in molecular weight between uranium 235 and uranium 238. This process was suggested for isotope separation as early as 1919 but mechanical problems prevented any measurable progress in this field until 1934. Since then a great deal of work has been done around the world to study and improve the centrifuge process.

Since 1960 ERDA has been carrying out an expanded research and development program to demonstrate the gas centrifuge process. The R&D on the centrifuge process has advanced to the point where it appears that an enrichment plant using the process can be built. The main question remaining is one of economics; that is, whether the centrifuge process can do the job at a cost as low as or lower than the gaseous diffusion process.

A pilot centrifuge plant has been constructed by ERDA and start up is expected in early 1976. The pilot plant will proof-test the design and operation of the entire production process system. It will provide plant design, construction, start up, and operating experience to aid in the process and equipment selection for new enrichment capacity. Such plant experience is needed for the centrifuge process. ERDA is also initiating conceptual engineering studies on production size plants.

The chief advantage of the centrifuge process is that its electrical demands may be less than 10 percent of those of the gaseous diffusion process. However, uncertainties exist as to the rate of machine replacement and repair costs. Due to the ultra-high speed at which the machine operates, centrifuge repairs may be relatively more frequent and more expensive than for conventional rotating machinery.

A centrifuge plant is expected to have the same capital cost

per SWU as a diffusion plant. But since centrifuge plants of 3 million or more SWU capacity are expected to be economic, capital required per plant will be about one-third that required for a diffusion plant. Because of this characteristic, ERDA expects that more private firms could enter the enrichment industry thereby increasing the potential for a competitive industry.

There is general agreement by ERDA and private firms that this process is promising and will work but because it has not been successfully demonstrated, should not be relied upon for the next increment of capacity.

Laser isotope separation

Two ERDA laboratories are doing research and development work on using lasers to enrich uranium. This process, called laser

isotope separation, is still in the research stage. If successfully developed, the process could impact considerably on the economics of enriching uranium. The ERDA laboratories have made preliminary estimates that the capital cost of a laser isotope separation plant would be about $90 million. ERDA headquarters officials stated, however, that a meaningful estimate of the capital cost cannot be prepared at this time.

Estimates of the annual electric power required for a laser plant range from 8 to 100 megawatts.

If successfully developed, the process is expected to be able to enrich uranium more efficiently than the gaseous diffusion and gas centrifuge processes.

EFFORTS TO ENCOURAGE PRIVATE ENRICHERS

The Atomic Energy Act of 1954 and the Private Ownership of Special Nuclear Materials Act of 1964 require ERDA to encourage the development of the civilian nuclear power industry. The industry has developed the capabilities to provide all the materials, equipment, and services needed in the generation of nuclear power, except uranium enrichment.

Since 1971, the Executive Branch has followed policies and programs to encourage private industry--rather than the Federal Government--to build the next increments of uranium enrichment capacity. To help private industry enter this market, a

classified information access program was initiated. Permits in this program allowing access to classified information on isotope separation are of two types. Subcategory A permits an initial level of access by making available to qualified companies information in summary form concerning the status and potential of the gaseous diffusion and gas centrifuge processes. The following organizations hold Subcategory A permits: Atlantic Richfield Co., Houston Lighting and Power Co., Texas Utilities

Services, Inc., Tennessee Valley Authority, TRW, Inc., Consumers Power Co., General Electric Co., and Sundstrand Corp.

Subcategory B permits are for a higher level of access. These permits grant access to more detailed information on any aspect of isotope separation by the gaseous diffusion or gas centrifuge processes including information on the design, construction, and operation of any plant, facility, or device capable of separating isotopes by either method. Subcategory B permits have been issued to Uranium Enrichment Associates, Electro-Nucleonics, Inc., Exxon Nuclear Co. Inc., Goodyear Aerospace Corp. (a subsidiary of Goodyear Tire and Rubber Company), United Technologies Corp., General Atomic Co., Boeing Co., and Garrett Corp.

To date, four private organizations have expressed interest in building uranium enrichment plants. The Uranium Enrichment Association (UEA) --currently consisting of Bechtel Corp. and Goodyear Tire and Rubber Co.--are interested in building a gaseous diffusion plant. Three groups are interested in building gas centrifuge plants --Garrett Corp., Exxon Nuclear Co., Inc., and Centar (Electro-Nucleonics Inc. and Atlantic Richfield Co.). Regardless of the technology employed, an enrichment facility requires a large amount of capital to construct and operate and would not generate profits for a considerable number of years. Therefore, substantial debt financing will be necessary. To attract the capital, all four organizations and ERDA have determined that some form of Government

cooperation and assurances is needed in view of major uncertainties associated with private industry providing enrichment capacity. The uncertainties include:

--the processes have never before operated in a commercial environment,

--the technology is classified,

--large capital requirements and long pay-back period are required,

--licensing uncertainties exist,

--there is a concern over the possibility of a nuclear moratorium,

--many domestic electrical utilities have weak financial conditions.

On June 26, 1975, the President proposed to Congress legislation--called the Nuclear Fuel Assurance Act of 1975--that would enable ERDA to negotiate and enter into cooperative arrangements with private organizations that wish to build, own, and operate plants for enriching uranium. The legislation is intended to (1) provide needed enrichment capacity and (2) create a competitive uranium enrichment industry.

The cooperative arrangements would be spelled out in detailed contracts between ERDA and the private participants and the basis for such arrangements would be subject to congressional review. These arrangements would give various forms of assistance to private firms wanting to build enrichment plants. ERDA envisions supporting several such plants for a transition period until they operate successfully. At that point the Government would step

out and, according to ERDA officials, leave a strong and competitive industry.

ERDA envisions that the next increment of enrichment capacity would utilize the gaseous diffusion process and that future increments would utilize the centrifuge and/or laser isotope separation technologies.

DESCRIPTION OF THE PROPOSED LEGISLATION

The proposed legislation would permit ERDA to enter into cooperative arrangements with as many firms as the ERDA Administrator believes necessary to develop a competitive private enrichment industry.

The Government, through ERDA, could provide substantial assistance to private enterprises entering into the arrangements. Forms and degree of assistance would be at the discretion of the ERDA Administrator. The proposed legislation includes, but is not limited to, such assistance and assurances as:

--furnishing technical assistance, information, inventions and discoveries, enriching services, materials, and equipment on the basis of recovery of costs. The Government would also receive royalties;

--guaranteeing the quality of Government-furnished equipment and materials;

--assuring that the facility will perform successfully;

--purchasing separative work units from the private enrichment plant;

--buying the assets or interests of any United States citizen, organization, owned or effectively controlled by United States citizens, in any enrichment plant, and assuming their obligations and liabilities, if private industry cannot finish or bring the plant into commercial operation; and

--modifying, completing, and operating the plant as a Government facility, or disposing of the plant.

The proposed legislation also would authorize ERDA to enter into an unlimited number of contracts with private firms. However, the proposed legislation imposes an $8 billion limit on the total potential cost to the Government in the event all private ventures covered by cooperative arrangements were to fail and the Government was required to assume assets and liabilities of the ventures, take over plant, and compensate domestic investors. Because of its technical participation in the project, ERDA does not expect that any of these funds would be expended but believes the legislation is necessary to assure customers and the financial community of the Federal Government's commitment.

Congressional review, via the Joint Committee on Atomic Energy, it also provided for in the proposed legislation. Before the ERDA

Administrator enters into any arrangement, or changes any agreed upon arrangement with private industry to develop a uranium enrichment facility, or decides to modify or complete, and operate, or dispose of any private enrichment facility, he must forward the basis for such arrangement, or amendment, to the Joint Committee. The Joint Committee shall have 45 days (excluding the days when either house is not in session because of adjournment for more than 3 days) to review the basis for the arrangement unless it waives this right.

The proposed legislation would also authorize ERDA to start construction planning and design activities for expanding one of the Government's existing enrichment facilities. This would be done as a contingency measure to assure that national enrichment capacity will be available in case the private industry ventures fail. As of October 1, 1975, no ERDA funds had been obligated for these contingency activities, but if the activities are still underway for the ensuing 12 months, ERDA expects it will have obligated about $40 million.

CHAPTER 2

ANALYSIS OF UEA'S PROPOSAL TO BUILD A GASEOUS DIFFUSION PLANT

On May 30, 1975, UEA submitted a proposal to ERDA to build a gaseous diffusion plant provided that ERDA give UEA certain forms of assistance and assurances. On July 8, 1975, ERDA entered into negotiations with UEA to develop a cooperative arrangement in anticipation of passage of the legislation. Our discussion and analysis of the UEA proposal are based on the May 30 proposal and information provided by ERDA officials concerning the ERDA-UEA negotiations that, according to ERDA officials, were still underway as of October 1, 1975. According to the ERDA Controller, these negotiations are a long way from a mutually agreeable proposal.

INFORMATION ON URANIUM ENRICHMENT ASSOCIATES

UEA is planning to build a gaseous diffusion plant in southeastern Alabama, near Dothan. The plant, which would employ the gaseous diffusion enrichment process, would be able to produce 9 million SWU each year which would service about 90 large, present-generation, nuclear power plants. Preliminary ERDA estimates are that the plant will cost about $3.5 billion (1976 dollars).[1] UEA estimates the plant will be initially operable in April 1981 with full scale commercial production scheduled for July 1983.

[1]Assuming inflation at an annual rate of 7 percent, the costs through 1983 are estimated to be about $6 billion.

The enrichment plant would require about 2,500 megawatts of electrical power, which is the amount generated by two large nuclear power plants. About 50 million construction manhours are estimated to be necessary to build the plant, and about 1,100 people would compose the permanent operating staff at the plant project.

UEA is to be a U.S.-based corporation consisting of both domestic and foreign interests. Approximately 40 percent of the capital now estimated to be necessary to build the project, or about $1.4 billion, is expected to be supplied by domestic organizations. UEA expects the remainder, $2.1 billion or about 60 percent, would be supplied by foreign countries. Sixty percent of UEA's enriched uranium output will be earmarked for the foreign owners with the remaining 40 percent earmarked for domestic customers. ERDA officials told us that the contract between ERDA and UEA would set 60 percent as the upper limit for foreign financial interest.

Ownership and control of the project

Bechtel Corporation, a major architect-engineering firm, and Goodyear Tire and Rubber Company are presently the only members of UEA. UEA expects another two to six U.S. companies to join in the project. These future participants are expected to be identified within the next few months. UEA officials told us that they have discussed the venture with more than 20 corporations.

Domestic partners will initially invest 15 percent of their share of the capital estimated to build the project. Eighty-five percent of their share will be borrowed by UEA.

Foreign countries will provide their share of capital from foreign sources. UEA officials expect foreign capital to be provided through an irrevocable letter of credit with payments made as construction of the project progresses.

Expected financing
of the project
(1976 dollars)

	Domestic	Foreign	Total
	(millions)		
Equity investment	$ 210	$ 315	$ 525
Debt	1,190	1,785	2,975

Under the Atomic Energy Act of 1954, as amended (Public Law 83-703) control of the project must remain in U.S. hands. UEA officials told us that it has established two new corporations--Uranium Enrichment Technology, Inc. and Uranium Enrichment Services, Inc. Uranium Enrichment Technology is to be wholly owned by UEA's domestic partners who must be cleared by ERDA to have access to classified enrichment technology. It will handle all the classified aspects of the venture. Uranium Enrichment Services will handle the business aspects of the project and is expected to be composed of 55 percent domestic participation and 45 percent foreign participation. UEA officials stated that the domestic participants would vote as a block so that control of the project remains in domestic hands. ERDA told us the contract between ERDA and UEA would include a provision to ensure this domestic control.

Both Goodyear Tire and Rubber Company and Bechtel Corporation are U.S. corporations with some international operations. Many prominent economists have stated that multinational corporations, which view the world rather than the United States as their operating theater, are not always inclined to bear loyalty to any single

country. This multinational aspect could be important in deciding whether domestic control over the UEA project will exist.

According to UEA, the foreign countries who would most likely participate in the project and their potential maximum financial participation are:

Country	Potential financial participation (percent)
France	10
Iran	20
Japan	20
West Germany	11
Others[1]	5
	66

UEA officials told us they contacted each of the above countries, and received an encouraging degree of interest but none had made strong commitments (such as letters of intent). Some of the difficulties that UEA is having in securing foreign participation may include:

--uncertainty regarding the U.S. Government position on the project;

--concern over the limitations on equity voting rights;

--concern over foreign access to U.S. enrichment technology.

SWU's sold abroad by UEA will not have to be "tied" to the operation of a particular nuclear powerplant in any foreign nation. Foreign customers will be allowed to resell any SWU's they obtain if they comply with restrictions established by the Atomic Energy Act of 1954, as amended, and agreements for cooperation.[2] These restrictions impose certain export controls and prohibit the export of enriched uranium to any nation not covered by an agreement for cooperation with the United States.

[1]Taiwan, Italy, Switzerland, Spain, Portugal, Australia, and possibly others.

[2]Agreements for cooperation contain among other things, a guaranty by the cooperating party that security safeguards and standards as set forth in the agreement will be maintained.

Domestic customers

As of the end of July 1975, domestic utilities had signed nine letters of intent with UEA for purchase of SWU's as shown below.

Domestic letters of intent

Company	Estimated Quantities (millions of SWU)
Alabama Power	9.5
Southern California Edison	5
Duke	3
Central Area Power Coordination Group	9
Gulf States Utilities	3
General Public Utilities	3
Public Service Electricity and Gas	9
Union Electric	5.5
Detroit Edison	6
Total	53.0

These letters of intent represent about two-thirds of needed domestic customers. UEA will supply enrichment services to domestic customers under 25-year contracts. According to UEA, each customer will be charged for its percentage of the total cost of operating the plant on a "take or pay" basis and will supply and retain title to the raw material needed for the enrichment process. These "take or pay" contracts will state that the purchaser of the enrichment service will be required to pay for the services irrespective of whether the purchaser actually takes the SWU's for which it contracted. ERDA now uses and other private enrichers are expected to use similar type contracts.

GOVERNMENT ASSISTANCE SOUGHT BY UEA

UEA says it requires substantial Federal assistance to assure its viability as a commercial venture. According to UEA, Federal backup support is essential to bolster investor confidence in this project which is lacking because a commercial history for this type of venture is nonexistent, uranium enrichment is a secret, Government process, and large capital investments and long pay-back period are required.

Plant components

UEA has requested ERDA to supply essential plant components that are now produced only by ERDA. Examples of these components include enrichment barriers and seals which ERDA produces under security conditions.

According to ERDA, the barriers to be produced for UEA will be comparable to those produced for Government gaseous diffusion operations. Other components such as the seals, will be somewhat different than what ERDA presently produces, and will require ERDA development and testing. UEA also expects to obtain design assistance from ERDA for components to be supplied by private industry.

ERDA plans to charge UEA for all costs ERDA incurs in supplying these components.

Process guarantee

The gaseous diffusion technology to be used in the UEA plant has been used successfully by AEC and ERDA since the 1940s.

According to ERDA officials and to UEA's financial advisors, however, the utility industry and the financial community are concerned as to how successful a secret technology will operate in a commercial environment. Therefore, UEA is seeking a performance assurance--an ERDA guarantee that the enrichment plant will operate successfully at full capacity--to protect domestic lenders and utility customers. ERDA's guarantee would last for 1 year after the plant demonstrates full-scale steady commercial operation.[1]

The Government's potential liability, according to ERDA, would be to (1) replace, at the Government's expense, any defective ERDA-supplied equipment and (2) if necessary, assist in redesign and replacement of the plant parts until the negotiated performance is attained. For the latter services, ERDA will require UEA to reimburse the Government for full costs.

ERDA would be given access to and approval of the manner in which the enrichment process is engineered, installed in the plant, and operated. ERDA would also help UEA design the plant and be reimbursed for its costs.

Technical assistance and knowhow

Included in the UEA proposal is a request that ERDA provide technical assistance and knowhow on the installation and operation of the gaseous diffusion process. UEA has told ERDA that it will need technical information, training, design assistance, aid in evaluation of potential suppliers, and testing of components.

[1]To be negotiated, but ERDA expects to period to start after physical capability is demonstrated, not when the first output is delivered.

ERDA has stated that up to 110 members of ERDA's and Union Carbide's (ERDA's contractor experienced in gaseous diffusion technology) staff could be employed in this effort. Assistance will primarily be scheduled to take place from 1975 through 1979. ERDA has estimated that this assistance will cost $38 million (fiscal year 1976 dollars). UEA will be required to reimburse ERDA for all of this assistance.

Access to ERDA stockpile

UEA has proposed that ERDA permit UEA to have access to the Government stockpile of enriched uranium. UEA wants 9 million SWU to be available to it during its start up period and first 5 years of operation. UEA believes this access agreement is necessary in case (1) its supply during the early years is less than its customers' needs and (2) it is unable to meet its commitments because of a delay in completing the plant, or a breakdown during its early operation.

For any SWU furnished by ERDA, ERDA says it would have the option to require UEA to replace the SWU or to reimburse ERDA for it. Under the replacement option, UEA would replace the SWU within 10 years or some other negotiated period. Under the reimbursement option, UEA would furnish the raw material as well as pay for the enrichment services at ERDA's price in effect at the time of transfer. In addition, because the UEA plant will--for the first year and a half of operation--be able to enrich uranium to a limited enrichment level (lower than design

level), UEA would require access to ERDA's stockpile for the possibility of exchanging its enriched material for Government material enriched to a higher level.

ERDA officials told us that UEA would be required to pay the Government for any and all costs associated with the stockpile (such as carrying charges) and with exchanges of material. Also, they said that UEA would not be permitted to purchase the Government SWU and to sell them at UEA's higher price.

Transfer of ownership

At UEA's request, the Government has the obligation to become the domestic owner of UEA's plant and also has the obligation to take over ownership of the plant if such action is in the national interests. This option would terminate 1 year after the plant demonstrates full-scale steady commercial operation.

If ownership transfers, the Government would have to assume all domestic liabilities. Beyond this, the Government's payment to UEA for ownership would depend on the reason for the transfer. The Government would return all of the domestic equity and a return on the equity in case of events caused by the Government or otherwise beyond UEA's control, such as

--Failure of warranted ERDA technology to operate so as to permit the plant to achieve commercial operation within the agreed upon time period and costs, despite reasonable efforts of both UEA and ERDA.

--Failure of Governmental licenses to be obtained in a timely manner or the application of law or regulation so as to prevent the plant from achieving commercial operation within the agreed upon time period and costs, despite reasonable efforts of both UEA and ERDA.

--Actions taken by ERDA for reasons of national interest in the matter of contractual relationships between UEA and previously approved customers to a degree which significantly threatens the economic viability of the project.

--The inability of UEA, because of lack of customer credit worthiness, to raise capital for construction or long-term financing despite reasonable efforts of UEA to do so.

--Such other events as may be mutually agreed upon.

In case of events involving gross mismanagement, negligence, or willful misconduct by UEA, the domestic investors would forfeit their rights for equity reimbursement. Prerequisites to a finding of gross mismanagement include (1) a formally written notice of deficiencies being transmitted to UEA by the Government and (2) failure by UEA to respond reasonably to the notice.

A partial return of equity could occur depending on UEA's compliance with its commitments, the efforts of UEA, and the degree

of fault. ERDA told us they are negotiating with UEA to define the situations which could result in a partial return of equity.

Foreign participants have more risk than domestic participants and lenders. Once foreign participants become committed to the project, their equity and debt cannot be purchased or assumed by the U.S. Government. On the other hand, all participants, including foreign participants, have the U.S. Government assurance that the project will work. Successful operation of the project will effectively protect all investments in the project.

In the event of substantial cost overrun and Government take-over of the plant, ERDA expects that foreign countries would continue to provide their pro-rated share of the funds to complete the plant.

ERDA officials told us that all customers will have another substantial assurance from the Government. If the project is not brought to commercialization and the Government assumes the domestic debt and equity, the Government would provide the enrichment services to customers that they would have received from UEA, subject to Government terms and conditions, including price.

If foreign countries do not provide their expected contribution, then they would lose their investment to date and any SWU's that ERDA would be obligated to provide.

Federal purchase of UEA's enrichment services

UEA has stated that some of its customers will not need enrichment services until a few years after the plant begins operations. Other customers will have irregular requirements before their nuclear powerplants reach full commercial operation. Accordingly, UEA has proposed that ERDA help smooth this supply-demand irregularity by agreeing to purchase up to 6 million SWU during the first 5 years of UEA's plant operation. Up to $1.2 billion might be necessary for ERDA to meet this commitment. However, ERDA says it will sell these SWU and recover the Government's costs.

Return on equity

UEA's contracts with its customers will state that the price for enrichment services must include a 15 percent return on equity[1] after all Federal, State, and local taxes have been paid. UEA's proposal, if accepted by its customers and ERDA, would constitute a Government assurance that UEA will have this rate of return.

[1]Defined as their original investments plus annual retained earnings, if any.

POTENTIAL FINANCIAL
COMMITMENT BY THE GOVERNMENT

According to ERDA, the maximum potential commitment of the Government if UEA is unable to complete the project is $2.65 billion (1976 dollars). This represents reimbursing $1.4 billion to domestic participants (assuming domestic participation is 40 percent) and $1.2 billion that the Government would need to purchase 6 million SWU from UEA. The following events would have to occur in sequence for this maximum to be realized.

1. The plant is completed and in operation.

2. The plant produces 6 million more SWU than its customers can purchase.

3. The Government purchases this excess SWU.

4. The Government takes over plant ownership.

Other potential Government commitments should be recognized. For example, the cost of the Government's contingency plan (see p.); i.e the design work that will continue while UEA is designing and building their facility has not been included. Also, in the event the project is ultimately inoperable, the cost of power from two nuclear powerplants dedicated to the UEA plant less any revenues that can be earned from the sale of power to other users, is a potential cost. Additional Government costs could be incurred in the event of a Government take-over after more than $1.4 billion (to cover overruns) had been financed by domestic partners. ERDA

says that any costs incurred by the Government in the UEA contract would eventually be recovered by the Government through sales of enrichment services.

In contrast to this considerable potential liability, UEA's domestic participants could forfeit their equity (estimated to be $210 million in 1976 dollars) in the event UEA does not correct certain gross mismanagement, negligence, or misconduct after formal written request by the Government. According to ERDA, foreign participants could lose their entire equity investment and debt if the plant is not completed by either UEA or the Government.

ASSUMPTION OF RISK

Factual information related to assurances contained in the proposed legislation and sought by UEA as well as some of the costs to be borne by the Government have been discussed in this chapter. The assurances envisioned and the potential costs borne by the Government assure that the UEA venture, if approved, would be essentially riskless. The following sections compare the risks associated with normal business operations and how firms minimize those risks with the means by which UEA proposes to minimize risk and the extent to which those risks are minimized.

Firms face four basic categories of uncertainty in their day-to-day operation. These include uncertainties associated with: variances in the supply of inputs; variances in the demand for output; the ability to obtain external funds and the costs associated with obtaining those funds; and competition from other producers.

Variations in supply

A continuous, assured supply of raw materials is necessary to minimize the costs associated with production interruptions and to maximize the probability of a smooth flow of goods through the production process. Minimization of this risk involves maintenance of raw materials inventories which in turn involves costs.

Under UEA's system, the responsibility for raw materials acquisition and inventorying belongs to the utilities that contract for enrichment services. Consequently the enrichers avoid the very costly maintenance of raw materials inventories.

Variations in demand

An adequate supply of finished goods must be on hand to offset variations in demand. Consequently, it is necessary to maintain a stock of finished goods which is augmented when demand declines and depleted when demand increases. This inventory is also necessary for interruptions which may occur in the production process--most notably, labor interruptions. There are obvious costs associated with maintenance of finished goods inventories. In UEA's case, the "take or pay" contracts minimize the variance in demand on the one hand, and the stockpile purchase agreements with ERDA serve to enhance the possibility that supply and demand are equated at full capacity. The Government not only maintains a 9 million SWU inventory for UEA but also agrees to purchase SWU when demand

declines. UEA's proposal would obtain a perfect hedge against risks associated with demand variation for as long as the Government guarantees are still in effect. After expiration of Government assistance, the costs associated with providing and maintaining a stock of finished goods will be borne by UEA's customers. To the extent the stockpile is inadequate, UEA could bear a financial loss.

Obtaining external funds

Variations in revenues create situations from time to time in which a firm cannot pay the interest on its long-term debt obligations or pay off its short-term liabilities. When such a situation arises, the firm's credit worthiness declines and the costs at which it is able to borrow rise substantially. In fact, when a firm fails to cover its debt servicing costs, it may not be able to borrow at all. The financial risks that a firm faces are directly related to the extent to which all other normal business risk has been hedged. In other words, a firm's ability to obtain financing at reasonable costs is dependent upon the probability of default which in turn is related to such operating characteristics as variability in demand, competition, etc. Financial risks are thus hedged through minimization of operating risks.

In UEA's proposal, not only would normal operating risks be hedged, but it is proposed that the Government guarantee domestic debt and equity against default in the event that the plant is not completed. Therefore, UEA should have no difficulty in obtaining external funds.

Competition

Firms also face risks associated with competition. The principal risk deriving from competition is that prices will be bid to a level so low that the rate of return to inefficient firms is insufficient to induce them to remain in the industry. Firms' rates of return are generally reduced through the entry of more efficient firms which because of reduced costs are able to underprice existing firms.

UEA has hedged against the risks associated with competition after the cessation of Government assurances through cost pass-through pricing and, perhaps more importantly, through 25-year "take or pay" contracts with utilities. Under arrangements where goods are priced on the basis of cost pass-through pricing, there is no incentive to reduce costs since price will always exceed costs by some amount. Under UEA's proposal, prices are to be set so as to provide a minimum 15 percent return on equity after coverage of production and debt servicing costs as well as taxes. In addition, there is no indication of intention to regulate this industry, including price.

Moreover, there is no stimulus for price change when new firms enter because of the "take or pay" contract method of sales. Were it not for "take or pay" contracts, entry of gas centrifuge and laser isotope separation technologies might pose a real competitive threat to UEA's gaseous diffusion process of enrichment. If cost efficiencies of centrifuge and laser technologies were sufficiently great, their entry might render gaseous diffusion obsolete. But,

because of "take or pay" contracts, UEA is effectively shielded from the effects of price competition resulting from technological change for 25 years. If UEA's costs and required rate of return imply a level of prices above that at which gas centrifuge producers operate, then UEA's prices will not fall to the lower level because there is no risk of loss of demand when prices are maintained at the higher level. Demand for UEA's services is completely inelastic under "take or pay" contracts.

DRAFT

Options for Government Takeover of Project

The UEA proposal contains options for a change in the ownership of the diffusion plant from UEA to the Government at the end of construction period. The options, under various conditions, provide assurances to the UEA lenders, UEA and the Government.

The debt financing during the construction phase of the plant will be provided by commercial banks in the form of construction loans. At the end of the construction phase, the intent of UEA is to issue long-term bonds and use these receipts to retire the bank debt. However, even though the intent of UEA is to repay the bank debt from the issuance of bond receipts, this may not be feasible if the capital markets are extremely tight or if the ratings of the utilities, which are UEA's customers and sources of funds, are low due to their economic circumstances. The banks would consequently grant such construction loans only if they were assured that UEA would have sufficient funds to retire the debt. For this reason, and others, UEA proposes that the contract contain an option that either the UEA, at its initiative only, could require that the Government purchase the plant from UEA with no penality (providing that UEA were not guilty of gross mismanagement) and with a 15 percent return on their invested equity or the Government at its option only, purchase the plant from UEA under similar conditions.

These options make the banks' construction loans essentially riskless. If UEA were unable to raise funds in any other way in order to retire the bank debt, the Government would take over the plant and repay the bank loans.

The options obviously protect UEA also. If at the end of the construction period, UEA did not deem the project to be commercially viable, as evidenced by their lack of ability to raise debt capital or for other reasons, UEA could turn over the project to the Government. Consequently, barring gross mismanagement, the project is riskless for UEA through the construction period and the first year of operation.

Alternatively, the options could serve to the disadvantage of UEA if UEA wished to continue the operation of the plant but the Government exercised its option to purchase the plant This possibility is regarded as unlikely in view of the Government's goal of maximizing the sale of private enterprise in the uranium enrichment industry, unless mismanagement was demonstrated.

Overall, these options remove the risk of the banks, remove the risk of UEA being a participant in an unattractive venture, and only slightly increase the risk of UEA's being involved in an attractive venture.

Risks borne by UEA

The Government take-over provision will expire about 1 year after successful commercial operation and UEA access to ERDA's stockpile of SWU expires after 5 years. With the expiration of these assurances, UEA will be assuming any risks involved in operating its plant. However, UEA's 25-year contracts and cost pass through pricing concept, as well as no envisioned price regulation, would act to minimize these risks.

It should also be noted that the greatest risks associated with a project of this nature are during the construction and initial operating period.

The proposed legislation provides that UEA risks losing its domestic equity to the Government in the event of gross management,

DRAFT

22c

negligence, or willful misconduct by UEA. The burden of proof will be on the Government. It is difficult for us to visualize any circumstances where the Government could prove gross mismanagement, negligence, or willful misconduct because the Government will be involved in providing UEA with technical assistance, design assistance, personnel training, review of the enrichment process, in evaluation of potential suppliers, and testing of components.

Influence of risk on return of investment

UEA is assured of a constant 15 percent rate of return. The median return on stockholder's equity (after taxes) of the 500 largest industrial corporations for 1973 and 1974 was 12.4 percent and 13.6 percent, respectively and the industry medians ranged from 8.2 percent for textile companies to 18.1 percent for pharmaceutical companies in 1973 and from 6.0 percent for textile companies to 23.2 percent for mining companies in 1974. The median return on equity for large chemical companies, which the enrichment process resembles, was 11.6 percent in 1973 and 15.6 percent in 1974. In view of the virtual elimination of risks to UEA, its rate of return is not compatible to the rates of companies that face normal business risks.

OTHER PROPOSALS

The Nuclear Fuel Assurance Act could apply to any organization that wishes to build, own, and operate uranium enrichment plants,

independent of the technology used. Our analysis has focused on the UEA proposal because of the advanced nature of the proposal and because it may provide the next increment of capacity.

ERDA has requested proposals by October 1, 1975, from organizations desiring to construct uranium enrichment plants using the gas centrifuge technology. ERDA expects to receive proposals from Centar, Garrett Corp., and Exxon Nuclear Co., and possibly others. ERDA believes these projects will proceed at the same pace and only slightly behind the UEA project. Our discussion with these potential centrifuge enrichers indicated that they desire the same type of Goverument assistance and assurance being requested by UEA.

Garrett Corporation

The Garrett Corporation is largely in the business of manufacturing equipment which generates, transforms, or controls energy. The Garrett Corporation participates in the uranium enrichment field as a research and development contractor to ERDA and as a potential commercial supplier of equipment and services.

The Garrett Corporation was selected by the former AEC as a research and development contractor in 1961 and has served continuously since that date in a program of centrifuge machine development. Through this research and development contract; Garrett has completed the installation of a pilot manufacturing line and is supporting the pilot centrifuge enrichment plant at Oak Ridge by supplying centrifuge machines and the necessary assembly and installation personnel.

The Garrett Corporation in a joint venture with two Texas utilities plans to respond to ERDA's request for proposals for centrifuge enrichment plants. They plan to build a 3 million SWU centrifuge plant. Initial production of about 350,000 SWU is planned for mid-1981 and expanding to the total 3 million SWU by 1987.

Garrett Corporation officials told us their proposal will be requesting Government assurance in the areas of (1) process guarantees, (2) completion guarantees, and (3) some early access to the Government SWU stockpile. Also, Garrett will be seeking foreign investment in its plant.

Centar Associates

Centar Associates is a joint venture of Electro-Nucleonics, Incorporated and Atlantic Richfield Company. Electro-Nucleonics

was founded in 1960 to engage in gas centrifuge research and development to establish a capability to produce gas centrifuge and related equipment to produce enriched uranium. In 1963 they entered into a joint venture with W. R. Grace and Company to build a small gas centrifuge pilot plant. This plant was operated from 1965 to 1967.

In March 1967, AEC determined that it was not in the national interest that privately supported centrifuge work be continued. However, Electro-Nucleonics was awarded an AEC contract to develop certain gas centrifuge components for the Government's gas centrifuge program.

Atlantic Richfield joined Electro-Nucleonics in 1974 and Centar Associates was formed. Centar plans to build a 3 million SWU centrifuge plant. Initial production of about 270,000 SWU is planned for 1980 and expanding to 3 million SWU by 1986. Centar plans to respond to ERDA's request for proposals for centrifuge enrichment plants.

Centar officials told us their proposal will be requesting many of the same types of assistance UEA is seeking. They will be requesting the Government to guarantee the technology, to provide completion guarantees if the project fails, and to provide SWU backup.

Centar is not seeking foreign investment in their initial plant, but are willing to sell their product to foreign nations.

Exxon Nuclear Company, Inc.

Exxon Nuclear Company, Inc., is the wholly-owned affiliate of Exxon Corporation responsible for the development and execution of Exxon's commercial nuclear fuel cycle products and services business.

Exxon Nuclear plans to respond to ERDA's request for proposals for centrifuge enrichment plants. Exxon plans to build a 3 million SWU centrifuge plant. The initial capacity of 1 million SWU would be operational in the 1981-1982 period, with full production in 1984.

Exxon Nuclear officials told us that for the private sector to become involved in uranium enrichment, the proper climate would have to be provided. This would include (1) certain Government assurances in the areas of process guarantees, (2) buying and selling SWUs, (3) access to the Government SWU stockpile, (4) completion guarantees, and (5) Government assurance to pick up defaulting utility obligations.

The Exxon Nuclear officials told us that for the first 1 million SWU increment they did not anticipate any foreign equity, but that they would seek both domestic and foreign customers.

CHAPTER 3

FACTORS IMPACTING ON WHETHER INDUSTRY OR GOVERNMENT SHOULD PROVIDE THE NEXT INCREMENT OF ENRICHMENT CAPACITY

This chapter contains an analysis of various factors impacting on whether the next increment of uranium enrichment capacity should be provided by private industry or by the Government:

--reasonable price for enriched uranium

--foreign implications

--safety safeguards and sabotage

--cash flow impact on the U.S. Treasury

--cost and timing of the next enrichment capacity.

REASONABLE PRICE

If the Government owned and operated the next increment of enrichment capacity, a reasonable price should be assured through congressional and Executive Branch oversight. If the next enrichment increment was privately owned, a reasonable price would depend on whether a viable competitive market would

result and, if not, whether methods of Government regulation or control could correct an otherwise unsatisfactory competitive balance.

UEA's price for enriched uranium will be based on a cost pass-through concept. Consequently, all of UEA's costs plus a 15 percent return on equity will be paid by UEA's customers. Also, UEA's "take or pay" contract would not permit its customers to terminate the contracts in favor of another enricher if UEA's price should rise.

ERDA feels that the proposed legislation will spur competition in the uranium enrichment industry and that price regulation will not be necessary. ERDA sees the UEA plant as a desirable step to full competition because it will demonstrate to the private sector that a privately owned plant, with Government assistance, can operate successfully. UEA officials told us they believe competition to their plant will come from foreign nations.

ERDA sees increased competition developing with the arrival of the gas centrifuge process. Because centrifuge process plants can be built on a smaller scale than gaseous diffusion plants, ERDA expects several firms to enter the uranium enrichment industry, thereby increasing competition.

The Edison Electric Institute, in its June 1974 report Uranium Enrichment Facilities commented on whether there will

be effective competition in the uranium enrichment industry or whether price regulation will be required.

> "The question of price regulation is not clear cut. On the one hand, the business of providing enrichment services on a commercial basis has several characteristics which could act to inhibit free competition among suppliers. For one, the magnitude of the capital investment entailed in entering this market, which derives from economy of scale considerations fundamental to the existing technologies, can be expected to restrict the number of competing enterprises. For another, the long-term nature of the contract commitments required, especially where the venturer must protect against technical obsolescense of facilities in which he is making a large and heavily debt-financed investment, act to 'lock in' customer accounts and thereby diminish opportunities for competition. For a third, the 'customer' is a public-service industry that is itself regulated. On the other hand, there are several factors which augur well for the evolution of a highly competitive supply industry. Most obvious of these is the indicated rapid growth in demand for enrichment services. Another is the indicated promise of the centrifuge process, the employment of which should facilitate competition among suppliers. Still another is the compactness of nuclear fuel, which by reducing transportation costs to a nominal consideration, facilitates the emergence of a competitive world market.

We believe that because of (1) the magnitude of capital investments required, (2) the long-term nature of enrichment contracts, and (3) the uncertainties regarding the growth of nuclear power, the likelihood of a highly competitive uranium enrichment industry is not great. This likelihood would increase, however, if an advanced process requiring much lower capital investment were available.

FOREIGN IMPLICATIONS

The Government is the primary world supplier of enrichment services and it is important to maintain as much of the foreign market as possible to (1) maximize our balance of payments position; (2) obtain the commitment of additional nations to accept international safeguards and the principal of nuclear non-proliferation; and (3) cooperate with other major oil consuming nations which are looking to nuclear power to help reduce their dependences on foreign oil imports. Several foreign countires are in the process of constructing enrichment capacity and the longer this country delays in constructing new capacity, the worse our position will be in competing for foreign customers. ERDA estimates that U.S. enrichment suppliers will capture about 30 percent of the foreign demand.

An analysis of the effect of Government versus private ownership on balance of payments would involve making a number of assumptions judgemental in nature. Capturing as much of the foreign market as possible ultimately will result in the greatest inflow of dollars to the United States regardless of ownership.

U.S. enrichment sales to foreign governments has been a factor in limiting the spread of nuclear weapons. For example, sales of enrichment services has been used as leverage to obtain safeguards and non-proliferation guarantees. Enrichment sales has also been an important factor in enlisting the support of other nations in using nuclear power as an alternative to oil.

Sabotage

According to ERDA, an act of sabotage at an enrichment facility would not result in a nuclear explosion. The objective of saboteurs would be to inflict as much damage as possible so aso to shut the plant down for a period of time (days to weeks, depending on the damage).

Every type of sabotage at the plant could not be prevented. A well-trained, well-armed terrorist group could damage the plant. It is anticipated that the major deterrents to acts of sabotage, a trained and armed security contingent, will be adequate. No unauthorized entrance to the plant will be allowed. An exclusion area surrounding the plant will be established, and protected by armed guards. The Nuclear Regulatory Commission, through its licensing process, will be responsible for determining whether safeguards will be adequate.

Theft of nuclear material

A person with the requisite technical expertise and the necessary resources could make a crude nuclear weapon from about 17 kilograms[1] of highly enriched uranium. The possibility that nuclear material can be stolen, lost, or diverted from authorized use increases as the number of facilities--such as enrichment facilities--having such material increases. Whether the facility is Government or privately owned should not influence the probability of theft.

[1]A kilogram is approximately 2.2 pounds.

It is a physical possibility for private enrichment plants to produce sufficiently enriched uranium for use in nuclear weapons. This would have to be done covertly as the Atomic Energy Act of 1954, as amended, expressly prohibits the production of uranium for weapons by any organization other than the Government. Because of economic penalties, licensing and safeguard requirements, however, it is not a practical alternative for a private plant.

UEA told us that for its proposed plant to produce weapons grade material, it would have to (a) add additional capacity at a cost of about $700 million and almost 2 years added to the construction schedule, or (b) send the product elsewhere for further enrichment, or (c) recycle the product at the plant causing tremendous fluctuations in power consumption, diversion of considerable amounts of inventory from its customers and be very costly. Actions of this magnitude should alert the Government to such clandestine activities.

Safeguarding nuclear material at enrichment facilities is subject to provisions of the Atomic Energy Act of 1954 (Public Law 93-438). The Nuclear Regulatory Commission is responsible for assuring that all special nuclear material, including the material produced by enrichment plants, is effectively safeguarded from unauthorized use. Privately owned enrichment plants will be subject to periodic inspections and enforcement by the Nuclear Regulatory Commission.

Nuclear proliferation and
international safeguards

Both the diffusion and centrifuge enrichment processes can enrich uranium so that it could be used in nuclear weapons. Therefore, it is necessary to prevent enrichment technology from falling into the control of nations or subnational groups that would construct and operate an enrichment plant to produce material for nuclear weapons. Other nations and consortiums of nations are operating and planning to constinct additional enrichment plan

The expansion of the enrichment capacity in the United States regardless of ownership increases the potential that classified enrichment technology could illegally or inadvertently be disclosed to countries or groups presently without an enrichment capability. An ERDA official told us that about 10 percent of the people employed at an enrichment facility would have access to classified enrichment information.

The security measures for protecting classified enrichment technology include physical protection, personnel clearances, apprehension and recovery of stolen materials, and possible fine and imprisonment for violation of relevant legislation. ERDA believes these measures are adequate, but can be increased if necessary.

On February 11, 1974, the Secretary of State opened the Washington Energy Conference by stating, in part, that the United States is prepared to examine the sharing of diffusion and centrifuge enrichment technology with other nations. ERDA's present policy is to permit domestic companies who have committed

to provide enrichment capacity in the United States to initiate unclassified discussions with foreign countries. Any proposed arrangement for these companies to share enrichment technology with foreign countries is subject to approval by the Government. The Government has told industry that it should not assume that the Government would approve a proposed arrangement that would result from commercial negotiations. The United States and the foreign country would have to enter into an agreement for cooperation before the United States would judge the acceptability of any proposal on the basis of

--compatibility with overall foreign policy objectives including effective international energy cooperation;

--assurance that international security interests would be protected;

--assurance of support of domestic U.S. interests including the surety of U.S. fuel supply needs being met by the establishment of a competitive private supply industry;

--reasonable compensation to the U.S. public for Government developed technology.

State Department officials told us that informal discussions have taken place with foreign countries but no applications have been made for sharing of enrichment technology.

CASH FLOW IMPACT ON THE U.S. TREASURY

If the Government builds the next increment of enrichment capacity and it is financed through the U.S. Treasury, in time a positive cash flow to the Treasury would result because revenues generated by the additional capacity will exceed the Government costs. ERDA estimates that by fiscal year 1990 revenues to the Government under this option would exceed costs by about $8.3 billion. In the short run, however, costs would exceed revenues and draw funds from the Treasury. According to ERDA, costs would exceed revenues through fiscal year 1980. If private industry provided the next increment, the Government would not incur any costs but would receive taxes and royalties from the private enrichers.

Projections of costs and revenues to the year 1990 necessarily involve predictions of future market conditions and are subject to much uncertainties. The credibility of such projections decrease as the period of time over which they are made increases. Thus while we do not place great importance on the absolute amount of revenues ERDA estimated will be generated by 1990, we do feel it important to note that costs incurred by the Government in providing the next increment of capacity would be recouped over a period of about 6 years.

COST AND TIMING OF
NEXT ENRICHMENT CAPACITY

Both UEA's schedule and the ERDA contingency plan call for additional capacity to be provided in 1983. UEA plans to have its entire 9 million SWU plant operating by July 1983. ERDA's contingency plan calls for building an add-on diffusion plant at Portsmouth. The add-on plant would have an initial capacity of 4.4 million SWU; however, capacity could be expanded to 8.8 million SWU without a major cost penalty if authorization for such expansion is received within 2 years after the first half-size plant is authorized. ERDA estimates that the construction cost of increasing the enrichment capacity of the Portsmouth plant by 8.8 million SWUs would be about $2.1 billion (1975 dollars). UEA's estimate to build a 9 million SWU enrichment plant is about $3.5 billion, which includes about $2.7 billion (1975 dollars) for construction. These figures show that an add-on plant is cheaper to construct than a stand alone plant.

Because an add-on plant initially could be built at half-size, it could minimize the amount of diffusion capacity constructed. That is, the half-size capacity could "buy time" until the more efficient centrifuge process is developed for commercial use.

UEA's schedule

According to UEA officials, its enrichment facility will be fully operable by July 1983. The following chart shows major milestones for bringing UEA's plant on line.

Apply to Nuclear Regulatory Commission for construction permit to build enrichment facility	April 1, 1976
Begin construction of two nuclear powerplants	January 1977
Receive limited work authorization[1] from Nuclear Regulatory Commission	July 1, 1977
Receive construction permit from Nuclear Regulatory Commission	January 1, 1979
Complete construction of powerplants	January 1981
Initial operation	April 1, 1981
Full production	July 1, 1983

Several factors indicate that UEA's schedule may be optimistic. According to ERDA and ERDA-contractor officials, UEA has made insufficient allowance for contingency factors and testing of certain components. These officials told us that the schedule, although possible to achieve, could be optimistic by as much as 1 to 2 years.

According to ERDA, Southern Company[2] will supply 2,400 megawatts of electric capacity to UEA's project through Alabama

[1]Allows preparation of the project site, but no major construction of the process building is permitted.

[2]A holding company whose operating affiliates are Alabama Power Company, Georgia Power Company, Gulf Power Company, and Mississippi Power Company.

Power Company, which will build and operate two large nuclear powerplants dedicated to the enrichment plant.

UEA officials told us that they anticipate having enough power when required because they will use much of the design work that has already been completed for two other nuclear reactors that had received construction permits but that have been postponed indefinitely because of lack of consumer demand and financing difficulties.

Nuclear Regulatory Commission officials told us that the powerplants will have to be relicensed and that they expect Alabama Power Company to petition the Nuclear Regulatory Commission to begin its licensing review as soon as the Government agrees to assist UEA in building the enrichment plant.

UEA's schedule is predicated on building the nuclear reactors in 48 months. During 1974, nuclear power plant construction periods were averaging 72 months. Estimates for 1975 and 1976 are 82 and 79 months, respectively. NRC officials told us that UEA's construction schedule is optimistic and that they doubt it will be achieved.

In the event the two powerplants are not able to produce enough power for the UEA plant, UEA will be required to obtain their power from other sources. In this case, it is questionable whether Alabama Power Company will be able to supply all 2,500 megawatts of electricity required in 1983 because they currently estimate having a reserve capacity of about 1,600 megawatts at that time.

Government's schedule

The Government's add-on plant schedule calls for initial operation in early 1983. To meet this schedule several actions must be taken in the next few months concerning plant design and securing a power supply.

Plant design

Plant design should begin by January 1, 1976, with the latest possible date to begin design in March 31, 1976. To meet the January 1 design start, an additional $6 million funding authorization over the current fiscal year 1976 budget is needed. ERDA's schedule called for receiving such authority by July 1976. However, ERDA has not submitted a request for authorization. The Joint Committee on Atomic Energy added $25 million to ERDA FY 1976 budget to cover such items as plant design and long lead time items associated with add-on. This budget has yet to pass Congress.

ERDA officials told us the request for proposals from architect-engineering firms are being prepared and will go out soon. They expect the contract can be awarded by January 1976.

Power supply

To assure power availability for the add-on plant, negotiations should start by January 1, 1976. A letter agreement with the power suppliers would be executed by October 1976, with the definitive contract completed by April 1977.

ERDA has contacted a power supplier in the Portsmouth area--The American Electric Power Company--to determine its interest in

providing the needed electricity. Coal-fired fossil plants would be used and the State of Ohio siting requirements would have to be met. This company told ERDA they would consider furnishing the needed power provided that a new subsidiary corporation be set up with the Government guaranteeing its securities. We think it is doubtful that the Government will guarantee a utility's securities.

CHAPTER 4

ALTERNATIVE FORMS OF GOVERNMENT OWNERSHIP

If the Government were to provide the next increment of enrichment capacity, there would be drawbacks to providing this capacity under ERDA's existing structure. The annual budget and appropriation process could prevent the business-like conduct of the enriching activity. The budget process has delayed implementing the Cascade Improvement Program and Cascade Upgrading Program.[1] Also under the existing structure, enrichment activities must compete for funds with other ERDA programs.

This chapter contains a description and analysis of various forms of Government ownership whereby more business-like operations should be possible.

--continued operation in ERDA with self-financing authority,

--a wholly owned Government corporation within ERDA,

--a wholly owned independent Government corporation,

--a Government corporation with substantial private participation.

---

[1]The Cascade Improvement Program will incorporate the latest technology into the existing plant equipment. The Cascade Power Uprating Program will permit effective use of larger amounts of electric power in the existing and improved equipment.

CONTINUED OPERATION WITHIN ERDA
WITH SELF-FINANCING AUTHORITY

Establishment of a self-financed uranium enrichment enterprise as a subdivision of ERDA is an alternative which could involve the least amount of change from the present organization. This alternative has also been referred to as a Directorate within ERDA. No change in management or operational personnel would be necessary and little, if any, change would be required in the organizational structure. This arrangement would also avoid the interfacing problems with ERDA that would have to be resolved if an independent corporation were to be established.

The operation of the enterprise could be financed by the reapplication of revenues for enriching services (for example, through a revolving fund), augmented by appropriations from the Federal Government through the conventional budget process whenever costs exceed revenues. Revenues in excess of needs would be repaid to the Treasury. Financing could also be provided by reapplying revenues and by borrowing from the public and/or the Treasury.

With authorization to reapply revenues and to borrow funds, the enterprise could operate within ERDA to provide additional capacity as needed without the lead times and other considerations associated with obtaining funds through the budgetary process, where the enrichment activities would have to compete for funds with all other Government programs and where judgments would be made on bases other than minimizing costs of an industrial-type activity.

Treasury borrowings are the least expensive debt funding. These borrowings are treated as part of the public debt and therefore are subject to the public debt ceiling. An example of a Government corporation having authority to borrow from the Treasury is the Tennessee Valley Authority (TVA).

Direct borrowings from the public could furnish some added flexibility in providing for improvements and expansions and in providing funding of operations without regard to the public debt ceiling. TVA has been granted this authority.

As to the possible disadvantages of this organizational arrangements, policies governing operation of the plants could be affected by other ERDA policies and programs rather than determined on a strictly business-like basis.

An example of a commercial-type enterprise operating within the Government with authority to reapply revenues, existing in the Government Printing Office. A revolving fund was established for the Government Printing Office; this fund is replenished by the excess of revenues from printing and binding work for the Congress and Federal agencies over operating expenses, including depreciation of equipment and building improvements. The net

The enterprise may either serve as a permanent form of Government organization, or as an intermediate step leading to the creation of a Government corporation.

This alternative was suggested several years ago by AEC but was abandoned because of strong adverse congressional reaction to the potential use of the enterprise as a vehicle for transferring ownership of AEC's existing enrichment plants from the public to the private sector. The enterprise can be established with provision that the existing Government plants not be transferred to the private sector. This enterprise is more implementable than a Government corporation.

Without borrowing authority, the enterprise would depend on appropriations through the conventional budget process whenever

costs exceed revenues. Costs are projected to exceed revenues for the next 4 or 5 years.

WHOLLY OWNED GOVERNMENT CORPORATION WITHIN ERDA

Establishment of a Government corporation within ERDA could permit operation of the enrichment plants on a business-like basis without requiring significant changes in the current organization. The corporation could be financed independently of ERDA's appropriations by reapplying revenues and by borrowing from the Treasury and/or the public. Organizationally, the corporation would be managed by the Administrator and a Board of Directors he designates.

The corporation's business-type budget would be transmitted to the Office of Management and Budget and the Congress. Because of the self-financing arrangement, funding for operations, long-range plant improvements, and construction programs would not be dependent upon the annual budgetary and appropriations procedures. The corporation would still be subject, to some extent, to Government policy constraints on expenditures and debt management, depending on legislative limitations placed on the corporation. For example, a debt ceiling can be imposed to control expansion.

This form of corporation is the simplest and most direct approach. This corporate structure would also result in minimum disruption of established organizational and operating arrangements. It would maintain a single focal point for all atomic energy policy and management and thereby provide consistency of uranium enrichment policy in relation to other atomic energy programs. This mode of Government operation could either continue indefinitely, or later revert to private organization.

The corporation would take longer to implement than a Directorate and would also require legislation. The continued interrelationship with ERDA could affect the operations of the corporation because of the influence of ERDA's policies and procedures which relate to ERDA's other responsibilities.

WHOLLY OWNED INDEPENDENT
GOVERNMENT CORPORATION

A wholly owned independent Government corporation with self-financing authority would enable the operation of the enrichment plants to be conducted as a business-type enterprise. The corporation could be managed by a board of directors whose members would be selected solely for their managerial ability without an attempt to gain representation of any particular segments of the industry or the Government.

Establishment of an independent Government enrichment corporation would (1) tend to eliminate any appearance of preferential treatment for Government activities and present less appearance of subsidy, (2) provide for direct representation of a broader range of interests through the inclusion of industry representatives on the board of directors, and (3) eliminate the possibility of conflict between ERDA and corporate interests in the utilization of staff.

It should be noted, however, that an independent corporation would (1) create the possibility of conflict between corporate policy and the actions and policies of ERDA and (2) essentially preclude utilization either by the corporation or by ERDA of the special skills and experience of certain key ERDA employees.

Of the existing Government corporations, the organization and financing of the TVA power program probably would most closely resemble those needed by an independent enrichment

corporation which must raise large amounts of money from borrowings and revenues for its power program's construction activities. TVA's non-poweractivities are financed through appropriations from the Congress. Management of TVA is vested in a three-member board of directors, appointed by the President for staggered 9-year terms, and a general manager. The TVA board is responsible to the President and is required by law to submit periodic reports to the Congress.

Another approach would be to establish a board of directors appointed by the President, which would consist of any number of persons but, presumably, a somewhat larger number than TVA's board, to provide representation for parties, such as the electric utilities, the nuclear industry, and the financial community. The board likely would serve on a part-time basis and would be responsible for decisions on broad policy matters and for general supervision of the corporation.

GOVERNMENT CORPORATION WITH JOINT GOVERNMENT AND PRIVATE OWNERSHIP

An independent Government corporation with partial private ownership would probably operate more like a private corporation than any of the alternatives discussed previously. The corporation would be self-financing from revenue and could obtain funds for improvement and construction programs from the sale of stock, bonds, and notes.

The capital structure of a mixed Government-industry corporation could consist of capital stock issued by the corporation, the majority of which would be retained, at least initially, by the Treasury and the remainder sold either to domestic and foreign enrichment services customers or to the public. A stock offering of this nature could serve as an important source of capital to the enrichment corporation, especially in the new few years when costs are projected to be substantially greater than revenues.

This mechanism could assist private industry entering the enrichment business by initial risk sharing. Additional capacity built under this mechanism could eventually be transferred to private industry. Also, through Government control of the board, responsiveness to Federal policies can be insured. Finally, it provides the opportunity for foreign participation in equity financing.

Drawbacks include possible management conflict due to differing objectives of Government and industry. Also the capital structure of this option would be more complex.

CHAPTER 5

CONCLUSIONS

The Nation must develop additional uranium enrichment capacity to meet the needs of domestic and foreign customers and to permit the future growth of nuclear power. The additional capacity is projected to be needed by the early 1980's and, because of the long lead times associated with the design and construction of enrichment facilities, a decision is needed soon on whether private industry or the Government should provide the next increment of uranium enrichment capacity.

The gaseous diffusion uranium enrichment process is the only proven enrichment technology available and seems to be the best alternative for the next increment of capacity. The Government's gaseous diffusion plants--operated by private firms--have been operating successfully for over 30 years. The next gaseous diffusion plant--whether Government or private--should be a last of a kind and future enrichment capacity will most likely use the gas centrifuge or other advanced enrichment processes.

It seems clear to us that some form of Government assurances will be required to involve private industry in the uranium enrichment field. Accordingly, the Nuclear Fuel Assurance Act of 1975 or similar legislation is needed to accomplish that objective.

ERDA's basic reasons for supporting the UEA proposal are that (1) the plant would demonstrate to the private sector that a privately owned plant--with Government assistance--can operate successfully and (2) private construction of the plant would have a favorable budgetary

impact since the Government would not incur any costs but would receive royalties and taxes. Building and operating the UEA plant with Government assistance would serve to demonstrate that the Government is committed to assisting private firms getting into the enrichment industry. Also it would demonstrate--in a technical and industrial sense--that a private group can build and operate a gaseous diffusion plant.

However, because the UEA plant would be a last of a kind, such a demonstration is not directly related to the interests of other private firms planning to build enrichment plants using more advanced processes. In addition, under the arrangements requrested by UEA, its plant would operate in essentially a riskless, non-competitive environment.

While private industry building an enrichment plant would reduce the Federal budget, so would other forms of Government ownership, having self-financing authority and the ability to borrow funds from the public.

UEA may encounter problems obtaining long-term financing because of anticipated shortages of capital in this country. Also, UEA does not have firm commitments with the foreign countries it expects to help finance about 60 percent of the project. In our view, these financing uncertainties tend to increase the likelihood that the Government may have to take over ownership of the plant.

Further, the UEA proposal, in effect, results in the Government assuming most, if not all, risks associated with a new enrichment facility while permitting UEA investors in the long run to receive a guaranteed return on their investment. It seems reasonable that any proposals from private enrichers based on the gaseous diffusion technology will seek assurances similar to those UEA desires.

An alternative to their UEA plant is the Government building an add-on to an existing enrichment plant. The estimated cost to construct an add-on is about $600 million less than the cost of UEA's stand alone plant. Also, if the timing of the next enrichment increment is as critical as ERDA says, the UEA plant schedule, which may be optimistic could be a problem, whereas an add-on schedule seems to be more attainable. Another advantage of the add-on--which would be built in two steps--is that it could minimize the amount of diffusion capacity that is constructed because more time would be permitted to commercialize the more efficient centrifuge process.

We believe that ERDA should reject UEA's proposal and build the next increment with an add-on to an existing plant. Moreover, in our view management of the Government enrichment facilities could be more effectively accomplished by a corporation having a self-financing authority to borrow funds from the Treasury or the public. Such a corporation could operate on a business-like basis and not be subject to possible conflicts with other programs in ERDA for funds and management attention. A self-financing proposal would free the corporation from the constraints of the budget processes.

Research and development efforts in advanced enrichment technologies such as gas centrifuge and laser isotope separation offer potential for more efficient enrichment of uranium. Gas centrifuge also offers the potential for a competitive industry although a highly competitive industry is difficult to visulaize. We believe that both ERDA and private industry should continue their efforts in these areas. In this connection, we recognize that some form of Government assistance and assurances may

be justified to encourage industries to build plants using these advanced processes. But, in these efforts, we feel the Government should seek to get a more equitable sharing of risk by the private enrichers and the Government than is contained in the UEA proposal.

MATTERS FOR CONSIDERATION BY THE JOINT COMMITTEE ON ATOMIC ENERGY

The Joint Committee on Atomic Energy should consider

--Authorizing ERDA to construct the next increment of the enrichment capacity utilizing the proven enrichment process.

--Establishing a Government corporation with self-financing authority to manage the Government's uranium enrichment facilities.

--Developing legislation authorizing ERDA to enter into corporative agreements with private enrichers using advanced technologies.

CHAPTER 6

SCOPE OF REVIEW

Our review was primarily made at ERDA Headquarters in Germantown, Maryland and was directed toward analyzing (1) the proposed Nuclear Fuel Assurance Act of 1975 (S. 2035), (2) the May 30, 1975 proposal by UEA to build the first privately-owned enrichment facility, and (3) the attendent issues that emerged from these two proposals. We obtained the information in this report by reviewing documents, reports, correspondence, and other records, and by interviewing responsible officials.

In addition to disucssing these matters at ERDA Headquarters, we met with officials of the following organizations:

--ERDA's Oak Ridge Operations Office, Oak Ridge, Tennessee

--Nuclear Regulatory Commission, Bethesda, Maryland

--Union Carbide Nuclear Division, Oak Ridge, Tennessee

--Uranium Enrichment Associates, San Francisco, California

--Garrett Corporation, Torrance, California

--Exxon Nuclear Inc., Bellevue, Washington

--Electro-Nucleonics, Washington, D.C.

--Good Year Tire and Rubber Company, Akron, Ohio

--Solomon Brothers, New York, New York

--Kirkn, Loeb, and Company, New York, New York

APPENDIX I

FOREIGN ENRICHMENT CAPACITY

The largest enrichment capacity outside the United States is in the U.S.S.R. and private sources have reported that they have a total capacity of about 7 or 8 million SWUs per year. However, their total sales in 1974 to non-Communist-bloc countries is estimated at about /500,000 SWUs. This number is expected to increase to about 4 million SWUs in 1980. The U.S.S.R. offers contracts for spot sales as well as long-term agreements. The charge per SWU under past Soviet contracts has been about 5 percent less than the ERDA charge but is expected to approximate ERDA's from now until the 1980s.

The British and French each have a 400,000 SWU/year diffusion plant currently in operation but they are soon to be shut down. The Eurodif consortium, in which France has a 52 percent interest, Italy 24 percent, Spain 12 percent, and Belgium 12 percent, is currently building a gaseous diffusion plant. It is planned to have a capacity of 3.1 million SWU/year in 1979, 6.5 million in 1980, and 10.8 million in 1982. Eurodif contracts require only a 6-year lead time as compared to ERDA's 8-years but Eurodif charges a relatively higher price per SWU. Eurodif has also planned a second diffusion plant which would have an estimated capacity of 3 million SWU per year in 1983 and 8.5 million in 1985 and increasing to 10.0 million SWU after 1986.

Another consortium, Urenco, was established on March 4, 1970. This is a joint venture by the Netherlands, the United Kingdom,

and the Federal Republic of Germany to build a gas centrifuge enrichment plant. Urenco has completed pilot plants at Almelo, Netherlands, and Capenhurst, United Kingdom, and is building demonstration plants at the same sites to be completed by 1978. They expect to have an operating capacity of about 1.4 million SWUs per year by 1980 and a capacity of 10 million by 1985. Urenco's contracts require a shorter lead time than ERDA's (only 4-5 years) but their charge per SWU is now about $100.

Other countries have planned enrichment plants for the more distant future but have not made firm commitments. For example, Japan plans to have a pilot centrifuge plant with a capacity of 25,000 SWU/year completed by 1978. They expect to have a fully operational plant by 1980 at an annual capacity of about 300,000 SWUs which will be increased to 1 million SWUs/year by 1985. South Africa has completed a pilot plant using a "secret" technology (probably an aerodynamic method of isotope separation) and plans to have a 5 million SWU/year capacity by 1986. The Federal Republic of Germany is planning an enrichment plant using a jet nozzle method of isotope separation but has made no specific plans.

Several other nations and consortiums are considering building enrichment plants but have made no definite decisions. Australia would like to have a gas centrifuge plant to enrich

their large supply of uranium resources to sell to Western Europe and Japan. However, Australia's prospective customers must first obtain the necessary financing and Australia must obtain the technology to build and operate the plant. Canadif is a French and Canadian joint venture to study the feasibility of a potential gaseous diffusion plant to be located in Canada. They would like to have a 9 million SWU per year plant on line by 1985 based on U.S. or European technology and outside financing. Brinco is another Canadian-based consortium considering building an enrichment plant also based on U.S. or European technology (diffusion or centrifuge) and outside financing. Brazil would like to build an enrichment plant using the jet nozzle technology and Zaire has expressed interest in some type of enrichment plant but information on either countries' plans is not available.

APPENDIX II

COMPARISON OF CURRENT AND FORMER UEA PROPOSALS

On December 23, 1974, UEA submitted its first proposal to AEC for Government assistance to build an enrichment facility. The current, May 30, 1975, proposal retains many of the same requests, such as:

--supplying essential components to UEA;

--providing technical assistance and knowhow on the installation and operation of the gaseous diffusion process;

--assuring that the plant will operate successfully; and

--assuring domestic partners that the Government will assume all liabilities and obligations, if UEA cannot successfully complete the plant.

There are some major differences. According to ERDA, the first proposal could have exposed the Government as much as $12.4 billion, while the current proposal will expose the Government to a maximum $2.6 billion. The difference, $9.5 billion, was mainly attributable to the proposition that ERDA would assume obligations defaulted by U.S. utilities. ERDA's obligation was to have continued for the remaining period of the utilities' 25-year contract, until the enrichment services were sold to the other customers, or the domestic portion of UEA's debt had been retired, whichever was earlier.

Another request that is no longer in the current proposal was that the Government arrange to terminate enough long-term contracts with utilities to assure UEA that it would effectively sell all of its product. ERDA has stated it will accept a customer's request for termination of their contract at no cost if the customer makes a firm commitment to a domestic supplier for those services. This would be done to the extent that the commitments so terminated are beyond those which ERDA can sustain at desirable future operating conditions.

The original request also proposed that the Government obligate itself, by either guaranteeing bonds or providing direct funds to UEA, to guarantee the completion of the project. This would have occurred when a substantial cost overrun took place, and UEA was unable to obtain additional funds from participants or lenders. This has been replaced by the transfer of ownership assurance.

The following table summarizes the differences in the two proposals.

COMPARISON OF THE TWO UEA PROPOSALS FOR GOVERNMENT ASSISTANCE

December 1974	May 1975
1. Supply components at reasonable charges	1. Supply components at Government's cost
2. Provide technical assistance at reasonable charges	2. Provide technical assistance at cost
3. Guarantee that ERDA manufactured items and process will operate as expected	3. No change
4. ERDA obligation to complete plant without reference to time of obligation	4. Transfer of ownership
5. UEA access to ERDA stockpile during the early years of 11 million SWU	5. UEA access to ERDA stockpile up to 9 million SWU, decreasing to 0 after 5 years
6. Purchase of 5 to 10 million SWU from UEA over the first 3 to 5 years	6. Purchase up to 6 million SWU from UEA during first 5 years
7. Termination of ERDA enrichment contracts	7. Withdrawn
8. Assumption of defaulting utility obligations	8. Withdrawn

APPENDIX II

THE WHITE HOUSE

WASHINGTON INFORMATION

October 15, 1975

MEMORANDUM FOR: PHIL BUCHEN
JIM CONNOR
MAX FRIEDERSDORF
ALAN GREENSPAN
JIM LYNN
JACK MARSH
ROGERS C.B. MORTON
BRENT SCOWCROFT
BILL SEIDMAN
FRANK ZARB

FROM: JIM CANNON

SUBJECT: ADMINISTRATION Comments on GAO's Draft Report on Uranium Enrichment

Attached for your information is a copy of the final version of the letter that Dr. Seamans sent to the Comptroller General on October 14.

The final letter incorporates a few changes from the version that I sent to you on October 13. The substance of the letter remains the same.

Attachment

THE WHITE HOUSE

WASHINGTON

INFORMATION

October 13, 1975

MEMORANDUM FOR: JIM CONNOR
MAX FRIEDERSDORF
JIM LYNN
JACK MARSH
BRENT SCOWCROFT
FRANK ZARB

FROM: JIM CANNON

SUBJECT: Administration Comments on GAO's Draft Report on Uranium Enrichment

BACKGROUND

In mid-July the Joint Committee on Atomic Energy referred the President's June 26 uranium enrichment proposal to GAO for an "exhaustive review." GAO promised to deliver a report to the JCAE by September 30. On October 3, GAO provided its draft report to ERDA and the Domestic Council for Administration review and comment. The report is negative in its conclusions and very poor in quality. Briefly, it recommends that:

(a) ERDA reject the private industry proposal for building a diffusion plant;
(b) that ERDA build another government plant; and
(c) a government corporation should be created to take over the enrichment plants.

RESPONSE TO GAO

The attached letter was prepared over the weekend by ERDA, OMB, FEA, and Domestic Council staff. It consists of a four-page cover letter which summarizes 11 major problems with the report, an attachment which elaborates on each problem, and a second attachment which gives a page-by-page comment on the draft report.

The letter was developed with (a) the hope that GAO would correct and improve its report, and (b) the expectation that the letter may have little impact with GAO but could be made public as a rebuttal to the report.

Our current expectation is that the letter will be signed and delivered to GAO tomorrow (Tuesday). The earliest possible response is important, because (a) further delay on our part could lead to more delay by GAO and the Congress, and (b) the report apparently is already in the hands of JCAE staff.

We should consider early Tuesday whether additional letters should be sent to the Comptroller General by Administration officials, such as Jim Lynn and Frank Zarb.

Attachment

cc: Bob Seamans
Alan Greenspan
Bill Seidman
Phil Buchen
Rogers Morton

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

The Honorable Elmer B. Staats
The Comptroller General
of the United States
Washington, D.C. 20548

Dear Mr. Staats:

Thank you for the opportunity to review and comment on your draft report on the expansion of uranium enrichment capacity in the United States. As indicated in the President's June 26, 1975, message to Congress, this matter is of great importance to the Nation.

The President's proposal was designed to:

- Make clear immediately our National commitment to provide the needed increase in U.S. capacity to produce enriched uranium for domestic and foreign nuclear power plants.
- Retain U.S. leadership as a supplier of services and technology for peaceful uses of nuclear energy.
- Assure early creation of a private competitive uranium enrichment industry -- ending the Government monopoly.
- Accomplish the above with little or no cost to taxpayers and with all necessary controls and safeguards.

In contrast to the President's proposal, the GAO draft report concludes that (a) ERDA should reject the proposal received from the private firm that wishes to build a gaseous diffusion plant, (b) the Government should build and own the next increment of needed capacity, and (c) that a Government Corporation should be created to take over existing and the next new capacity.

We believe the most complete, accurate and objective possible analysis and presentation of the problems, issues, and alternatives is necessary to increase public understanding of the President's proposal and to provide the basis for early Congressional action on that proposal. However, as detailed below, the presentation, analysis and evaluation in your draft report is not sufficiently complete, accurate or objective to sustain its conclusions.

We believe the report should be improved substantially because it:

- Does not address fully the President's proposal.
- Contains factual inaccuracies or misinterpretations.
- Omits important considerations which, if taken into account, would lead to different conclusions.
- Reflects philosophic preferences (e.g., for a Government Corporation) rather than an objective evaluation of the many considerations involved.

Briefly, our major substantive reservations about the report are summarized below. Each of these points is discussed further in Attachment A and detailed page-by-page comments on the draft report are included in Attachment B.

- The draft report is almost exclusively limited to a discussion of a proposal (still under negotiation) from one industrial group -- Uranium Enrichment Associates -- UEA, almost to the exclusion of an evaluation of the President's total program which would cover a number of cooperative agreements with firms that wish to build plants using diffusion and centrifuge technology in the transition to a private competitive industry.

- The draft report does not reflect a clear understanding of the remaining uncertainties in centrifuge technology or the role that both technologies can play in sequence in achieving a private competitive industry.

- The report does not seem to recognize that following its conclusions may prevent ever achieving a private competitive uranium enrichment industry -- even though it professes to support that objective.

- The report (a) understates the risks to be assumed by private firms that are contemplated in the President's proposal, (b) understates the risks to UEA in its proposal, and (c) overstates the potential risks and costs to the Government.

- The report does not analyze objectively its strong recommendation that a Government corporation be created to provide uranium enrichment services -- which corporation would have many of the same drawbacks as direct government financing.

- The discussion of cash flow and Government financing is inaccurate and misleading in that it (a) does not make clear the large budget outlays that would result over the next few years if the Government builds new capacity; (b) incorrectly implies that costs of a new add-on Government plant would be recouped in about 6 years; and (c) confuses revenue from existing plants and eventual revenue from a new add-on Government plant. The revenue from existing plants is largely a repayment to the Treasury for past and current costs to taxpayers for building and operating these plants.

- The conclusion that a Government-owned capacity could be added at a cost of $600 million less than that of a similar sized privately-owned plant is open to question and ignores the broader benefits of private financing and ownership of uranium enrichment plants.

- While an early decision on the approach to expansion of U.S. capacity is essential, ERDA does not believe that a delay of one year or more -- beyond the UEA planned date for having a plant on line -- would present the serious problem assumed in the draft report. Furthermore, a Government-owned add-on plant could not be brought on line until at least 18 months after the date planned by UEA.

- The criticism in the draft report of private ventures' plans to obtain long-term "take-or-pay" contracts for enrichment services suggests that GAO may not recognize that such contracts are now used by ERDA in selling services from existing plants and are often used in industry -- for example by utilities in purchasing coal.

- The criticism of private ventures' slowness in signing up foreign customers suggests a lack of understanding of the impact of the uncertainty while Congressional action is awaited, and the positive effect that early Congressional approval would have.

- The report is correct in concluding that the safeguarding of nuclear materials and protection of classified technology is not an issue in the debate over Government vs. private ownership of a plant. However, we believe the report should emphasize that prompt action toward expanding the Nation's uranium enrichment capacity would be a major contribution to continued U.S. technological leadership and to non-proliferation objectives.

We urge strongly that the General Accounting Office proceed promptly with the correction and completion of its report so that it will not contribute further to delay in Congressional action on the President's proposal. We believe it is essential that a National decision on the means for expanding U.S. capacity to enrich uranium be reached without further delay.

We are prepared to cooperate fully in providing any additional information and assistance that you might need in completing your report.

Sincerely,

Robert C. Seamans, Jr.
Administrator

Attachments
As indicated

ATTACHMENT A

DETAILED DISCUSSION OF PROBLEMS SUMMARIZED
IN THE LETTER TO MR. STAATS

1. The draft report is almost exclusively limited to a discussion of a proposal -- still under negotiation -- from one industry group, almost to the exclusion of an evaluation of the President's total proposal. Thus, it does not address the main issue which is the appropriateness and adequacy of the President's plan.

   . The President's legislative proposal provides the basis for negotiating cooperative agreements with a number of private firms that propose to finance, build, own, and operate uranium enrichment plants -- both diffusion and centrifuge -- so that the Nation may move toward a private competitive industry.

   . The context for this proposal is important:

   . The Atomic Energy Act requires that "The development, use and control of atomic energy shall be directed so as to . . . strengthen free competition in private enterprise."

   . A program was undertaken to provide industry with access to enrichment technology so that firms could decide whether to enter the field.

   . One firm, Uranium Enrichment Associates (UEA), has proposed to build a plant utilizing the proven gaseous diffusion process to satisfy the need for the next increment of capacity. Three firms have now proposed plants using centrifuge technology for succeeding increments.

   . The draft report focuses narrowly on the proposal submitted by UEA. This proposal is important because it is the only one that deals with the next increment of needed capacity. However, it must be viewed in its proper context, i.e., as the starting point for negotiating a cooperative agreement under the proposed legislation and as a necessary first step in private financing and ownership of all future increments of capacity.

. Contrary to the implications of the draft report, the terms in the UEA proposal are still under negotiation and have not been accepted by the Government.

2. The draft report does not reflect a clear understanding of the remaining uncertainties in centrifuge technology or the role that both diffusion and centrifuge technology play in sequence in moving toward a private competitive uranium enrichment industry.

. Misunderstandings are reflected in the report's:

. Prompt dismissal of diffusion as being unimportant in moving toward private involvement, and the jump to centrifuge as an easier -- rather than more difficult -- solution without private financing and ownership of a diffusion plant as a first step.

. Conclusion that UEA's choice of diffusion technology is one valid reason for rejecting its proposal.

. Repeated reference to centrifuge as the "more efficient technology" -- without recognizing the uncertainties associated with it.

. Suggestion that centrifuge ventures should accept more risk when centrifuge involves greater risks.

. There is general agreement that the next increment of capacity should utilize diffusion technology. There is also substantial agreement that succeeding increments should utilize centrifuge technology -- but this is not assured. Substantial economic uncertainties remain and the diffusion process may still be competitive for future increments.

. U.S. centrifuge technology is well ahead of other nations and a pilot production plant is scheduled to be completed in 1976. But, we do not yet know the economics and reliability, for example, of mass production of the required large number of centrifuge units, or the operating, maintenance and replacement costs of such mass produced units.

. Because of greater uncertainties, private firms wishing to use the centrifuge process may need more assistance and be able to assume less risk -- directly contrary to the report's conclusions.

- A successful private diffusion venture would -- contrary to the draft report -- have a direct relationship to the success of private centrifuge ventures. For example, it could demonstrate:

  - The end of uncertainty -- rather than continued delay -- as to whether the Government is serious about establishing a private competitive industry and ending its monopoly.

  - That private industry can raise capital for building enrichment plants and establish satisfactory relationships with customers, both domestic and foreign.

  - That private industry financing and ownership is possible while maintaining all necessary controls and safeguards.

3. The draft report does not seem to recognize that following its conclusions may prevent ever achieving a private competitive uranium enrichment industry in the U.S. The report indicates support for the objective of a private uranium enrichment industry but recommends (a) summarily rejecting the private industry proposal for building a diffusion plant -- rather than pursuing negotiations toward a cooperative agreement, (b) building additional Government-owned capacity, and (c) creating a Government Corporation.

   - Ending a Government monopoly is extremely difficult at best. The current need to commit to major new plants offers an excellent opportunity. The progress that has been made thus far in moving toward a private competitive industry -- including the proposals now before ERDA -- is the result of (a) the statutory requirement cited earlier, (b) a strong policy position taken in 1971, and (c) a vigorous effort by industry to respond to the Government's actions, and (d) a concerted effort by the Government to define conditions under which such involvement can occur with all necessary controls and safeguards.

- To decide now to build more government-owned capacity (after a period of many years without constructing new plants) could not help but cast doubts -- among potential private industry participants and customers, domestic and foreign -- about current or future assertions that the Government is serious in its efforts to involve industry and end its monopoly.

- Contrary to implications in the report, there is no strong reason to suggest that it would be easier or more effective to begin the transition to a competitive industry with centrifuge technology. Not only would the same types of Government cooperation and temporary assurances be required -- and possibly more because of the larger uncertainties -- but the creation of a Government corporation at this time would undercut the whole concept of a private industry in the field.

4. The draft report (a) understates the risks to be assumed by private firms contemplated in the President's proposal, (b) particularly understates the risk to UEA in its proposal, and (c) overstates the potential risk to the Government.

- The report fails to recognize the risks that private firms would have in dealing with multi-billion dollar projects involving classified technology which has not yet been proven in a commercial setting. Without exception, potential entrants in the enriching industry and representatives of the U.S. financial community viewed this activity as presenting abnormal business risk -- according to their testimony before the JCAE in 1974 hearings.

- The report does not recognize adequately that, under the President's proposal, Government assurances would last only for a limited transition period and then terminate automatically, leaving the plant owner with many business risks for at least the 20-25 year period of plant operation.

- The report recommends getting "more equitable sharing of risks" when centrifuge technology is ready, but gives no clear indication of what, specifically, would constitute "more equitable sharing of risks" or how this goal might be achieved. There seems no recognition that centrifuge technology, in the near term, involves more risk than diffusion technology.

- In the case of the UEA proposal, the report (a) erroneously states or implies in several contexts that UEA would receive a guaranteed 15% return on equity, and (b) fails to grasp that, while complete loss of private equity in the project is perhaps remote, there is a substantial risk of partial loss of private equity. Thus, the report gives an erroneous and distorted view of the UEA proposal. It is particularly important that the question of risk be completely and fairly treated since "inadequate risk" is central to the GAO thesis that the proposal be rejected.

- The report implies that there are substantial financial risks to the Government, e.g., the implication at the outset that the Government probably would spend $8 billion to implement its proposed program -- when the plan virtually assures that this will not happen.

- The report fails to note that even under the most severe consequences (need for Government to take over a project) -- let alone the more likely circumstances, Government funds would not be at risk. Government funds would all be recovered, normally from the private project but, in any case, from the sale of uranium enrichment services.

- The argument that risks would be unduly shifted to the Federal Government overlooks the fact that if the Federal Government finances and owns additional capacity it bears all the risks for the entire life of plants.

5. The draft report does not analyze objectively its strong recommendation that a Government corporation be created to provide uranium enrichment services. For example:

- The assertion that management by a Government corporation would be "more effective" is not backed up by reasons -- other than freedom from the budget and appropriations process which may be undesirable.

- The report seems to conclude that a Government corporation is somehow substantially different from the present ERDA-run operation when, in fact, it still amounts essentially to continuation of a Government monopoly.

- Many disadvantages of a Government corporation -- which also apply in most cases to the present operations -- are not mentioned, including:

  - Uranium enrichment is not an activity that can be performed well only by the Federal Government. It is essentially a commercial/industrial activity.

  - Uranium enrichment service capacity must expand rapidly over the next few years and that expansion could occur in the private sector -- rather than swell the Federal sector.

  - Borrowing from the Treasury by a Government corporation -- as in the case of ERDA building added capacity -- would add to the total of the national debt and net outlays would add to the Federal budget deficit.

  - As the Nation's reliance on nuclear power grows, maintaining a Federal monopoly would lead to an unprecedented degree of Federal control over the Nation's electrical energy supply and ending that monopoly could become even more difficult with an entrenched Government corporation.

  - The Nation would forego the advantages of private competition which can provide incentives over the long run for lower costs, improved efficiences and technological advancement -- as well as a more diverse base for utilities to obtain their fuel.

- The argument in the report that UEA may encounter problems in obtaining long-term debt financing because of anticipated shortages of capital in the U.S. would apply equally to borrowing by a Government Corporation.

- The possibility of setting up a Government Corporation -- to take over existing plants and finance, build and operate new capacity -- in time to meet the U.S. needs for additional capacity is open to serious question.

6. The discussion of cash flow and Government financing is inaccurate and misleading in that it (a) does not make clear the large budget outlays that would result over the next few years if the Government builds new capacity; (b) incorrectly implies that costs of a new add-on Government plant would be recouped in about 6 years; and (c) confuses revenue from existing plants and eventual revenue from a new add-on Government plant.

- Construction of additional Government enriching facilities would have a significant near term budget impact. The initial increment of a Government add-on plant would involve budget outlays in the period of FY 1976 to FY 1983 of about $1.6 billion (1976 dollars). A Government-owned plant comparable in size to the UEA plant would require nearly $2.5 billion (in 1976 dollars) in outlays between FY 1976 and FY 1983.

- These outlays represent a significant additional financing requirement from domestic funds, particularly over the next few years. The UEA proposal submitted in May and now the subject of negotiations contemplates using significant amounts of foreign capital -- but with firm U.S. control of the venture -- thus minimizing the impact of financing requirements on domestic capital markets.

- An add-on plant would not produce enough revenue to recoup costs until after 1990 rather than in 6 years as the draft report implies.

- Revenues from existing uranium enriching plants represent a repayment to the Treasury for costs borne by the taxpayers. These revenues are counted on to offset the costs of existing plants and other Federal programs and, if not available for this purpose, would have to be replaced by higher taxes or deficits. These revenues should not be confused with the eventual revenues from building new Government capacity.

7. The conclusion that a Government-owned capacity could be added at a cost of $600 million less than that of a similar sized privately-owned plant is open to question and ignores the broader benefits of private financing and ownership of uranium enrichment plants.

   . There undoubtedly would be some savings in building an add-on Government facility -- through use of common support facilities and from tying in with an existing plant's production process.

   However, it must be recognized that this differential (a) ignores the substantial advantages of moving toward a private competitive industry, and (b) ignores the expected potential of drawing on foreign sources of financing (but with U.S. control) if private industry is involved. The UEA proposal contemplates attracting some $2 billion in foreign capital which, if it can be attained, would result in domestic capital financing of some $1 billion less than for a Government plant.

   . A number of the benefits of private financing and ownership are summarized under point 5, above.

8. While an early decision on the approach to expansion of U.S. capacity is essential to maintain the credibility of the U.S. as a reliable supply source, a delay of a year or more beyond UEA's planned dates for actually having a plant on the line would not present serious problems.

   . The draft report reflects concern about potential slippage in the date when UEA would have a plant on line. UEA's proposal contemplates initial production in 1981 with full production in mid-1983.

   . If the Government were to add on a "half-size" plant to an existing plant, initial production would not begin until 1983, with full production in 1984. If the add-on plant was equivalent in capacity to that of the UEA-proposed plant, initial production would commence in 1983 with full production at the beginning of 1985.

- In any case, the cancellations in nuclear power plant orders and slippages in plant on-line dates here and abroad -- combined with the ability of the U.S. Government to use its stockpile of enriched uranium -- would allow flexibility to accommodate some slippage in the on-line date proposed by UEA.

- Whether or not there would be a delay is still a matter of conjecture. Some believe UEA could not meet its proposed schedule; others point out that privately-managed construction projects could move more quickly than those undertaken for the Government.

9. The criticism of private ventures' plans to obtain long-term "take-or-pay" contracts for enrichment services, and implied criticism for not providing the uranium to be enriched, suggests a lack of understanding of current, widely-accepted practices.

- Long-term "take-or-pay" contracts are now used by ERDA for enrichment services from Government-owned plants and foreign sources. Also, ERDA contracts require a substantial customer down payment. Moreover, firms planning to employ centrifuge technology will most likely employ long-term "take-or-pay" contracts.

- Long-term "take-or-pay" contracts are common in industry, particularly between utilities and firms in the coal industry. Such contracts are used as security for obtaining long-term debt financing when large capital investments are required, as in opening new coal mines.

- Uranium feed materials are not conventionally supplied by any uranium enricher.

10. The criticism of private ventures' slowness in signing up foreign customers suggests a lack of understanding of the impact of the uncertainty while Congressional action is awaited.

- The need for Congressional action on the President's legislative proposal is well recognized by potential domestic and foreign customers and investors.

- The preference in some quarters for continuing the Government monopoly through building added capacity by ERDA or a Government Corporation is also well known.

- Both factors contribute, quite understandably, to the uncertainty as to U.S. plans and thus to some delay in signing up customers and investors.

11. The report is correct in concluding that the safeguarding of nuclear materials and protection of classified technology is not an issue in the debate over Government vs. private ownership of a plant. However, the report should emphasize that prompt action toward expanding the Nation's uranium enrichment capacity would be a major contribution to continued US technological leadership and to non-proliferation objectives.

    . The fact that foreign customers were not able for many months to sign firm long-term contracts with a US source of uranium enrichment services damaged the credibility of the Nation as a supplier and has increased pressure in other nations for development of enrichment technology and construction of plants.

    . There is increasing evidence that other nations are turning to potential suppliers outside the US, thus increasing the pressure for construction of more enrichment plants abroad.

Draft - Some changes being made

ATTACHMENT B

Comments on GAO Report

Report Reference Digest	Comments
Page i, Para. 2	Erroneous implication that Government will expend $8 billion, when plan virtually assures that this will not happen. Moreover, any Government expenditures will be recovered by Government through UEA reimbursement of cost of assistance or in event of takeover from revenues received from Government sales of enriching services.
Page ii, next to last point	Factually incorrect in that Government purchase of UEA SWU's is not unlimited, rather being specifically limited as to amount, time and circumstance.
Page ii, last point	Factually incorrect in that UEA access to Government SWU's not unlimited, rather being specifically limited as to amount, time, and purpose.
Page iii, first 2 lines	Erroneous implication that the Government will reimburse domestic equity in UEA in all circumstances if UEA plant fails. Depending upon circumstances, UEA domestic equity could be partially or totally forfeited.
Page iii, Para.1	Factually incorrect in that UEA domestic equity will not receive an essentially guaranteed return on their investment. In event of takeover domestic equity may lose part or all of its investment. Further after the transition period, UEA will risk losing not only return on equity, but also the potential of loss of some of its equity if it fails to produce product to meet commitments to their customers.
Page iii, Para.2	While probably correct, this statement does not appear to be relevant to an evaluation of the proposed Nuclear Fuel Assurance Act of 1975. Furthermore, we do not believe that use of gaseous diffusion technology is appropriate as a reason for recommended rejection of the UEA proposal since many of the values produced are independent of the technology employed and it is generally agreed that the next plant should use this process. Additionally, it is not at all clear at this time that plants using gaseous diffusion will not compete with gas centrifuge plants for future increments of capacity.

Report Reference Digest	Comments
Page iii, last three points under Conclusions	Factually incorrect in that investors are not guaranteed a rate of return. Furthermore, with the exception of the first conclusion (treated above) the observations made could apply equally well to private efforts employing the centrifuge process. Conclusions used as a basis for recommending rejection of the UEA proposal should, in our judgment be considered in the context of the total proposed program and the implications of a proposed action upon that program. Any "financing uncertainties" are largely the result of the uncertainty over the present position of the Government and can be expected to be resolved by passage of the Nuclear Fuel Assurance Act. There is no reason for believing that the UEA plant would be on line any later than a similar sized Government plant. In sum we believe that the basis for GAO conclusions that the UEA project should be rejected are not relevant.
Page iii, next to last point	Factually incorrect in that Government add-on plant schedules 4.5 million SWU in 1983, 9 million by 1985, about 1 1/2 years behind UEA proposed schedule for a plant of the same size - so even a substantial slip in UEA schedule would not put it behind the Government schedule. Moreover, Government operations are also, like private efforts, vulnerable to interruptions, uncertainties and delays.
Page iv, middle para.	Erroneous implication that private centrifuge enrichers are likely to be willing to assume more total risk with a less advanced technology when all evidence points in the contrary direction.
Page v, 2nd point	There is no basis for this recommendation which is developed in the report; nothing in the report indicates any basis for concluding that the proposed Nuclear Fuel Assurance Act of 1975 is inadequate or undesirable legislation for assisting private employment of advanced enriching technologies.
Page 7, last sentence, first para.	Factually incorrect in that a new plant to operate economically employing (a) gaseous diffusion process requires approximately 9 million SWU or (b) gas centrifuge process capacity somewhere in the range of 1 to 3 million, as yet undetermined.

Report Reference	Comments
Page 9, first sentence	Incomplete, thus misleading. Text should indicate that ERDA officials stressed that the process has not yet been determined to be technically or economically feasible, thus that production plant extrapolations at this time are meaningless.
Page 10, second para.	Misleading and incomplete in that no mention is made of the fact that several years of intensive work and sizeable commitment of resources have been made by a substantial number of private firms in developing their present positions, and, in the case of the four groups cited, in developing extensive plans for participation in private enrichment. Very extensive marketing efforts have been undertaken, particularly by UEA.
Page 11, last para.	Seriously erroneous implication in that needed assistance and assurance to private projects is expected to be on a basis which provides such support at the expense of the private project, whereas the context implies that this would be at Government expense.
Page 14, last sentence	Misleading, implies no efforts underway on hedge plan; approximately $4,100,000 has been expended to date on conceptual design of an add-on gaseous diffusion plant.
Page 17, 5th sentence	Erroneous implication that participation will be 55% domestic, 45% foreign. Participation contemplated is 40% domestic with 55% of voting right and 60% foreign with 45% voting rights.
Page 22, 2nd sentence under Access to ERDA stockpile	Factually incorrect in that 9 million SWU are not available throughout the 5 year period, but on a declining basis to zero over the five year period.
Page 23, 3rd para. within 3rd sentence	Erroneously implies that the Government would be required to pay return on equity in the cases noted. UEA in such cases proposes (May 30 letter) "return of their original investment and additional compensation, as determined by USG, to reflect

Report Reference	Comments
Page 24, last word at end of first para.	Factually incorrect - should read "gross negligence". This is important because single negligence is cause for partial loss of equity.
Page 25, last para.	Seriously incomplete and potentially misleading; context unclear; may depend upon whether UEA or ERDA complete the project; should be expanded extensively or deleted.
Page 26, last sentence	Factually incorrect - it does not constitute a Government guarantee of this rate of return - see earlier comment on page iii of Digest.
Page 27, first para.	Seriously erroneous implication that the $1.4 billion maximum "takeover" commitment and $1.2 billion SWU purchase commitment (which might be required if 6 million SWU were purchased) are additive. In any credible situation SWU purchase would only occur if the plant were operable by UEA in a production sense, hence "takeover" had not occurred or could not then occur.
Page 28, first para. within first sentence	Factually incorrect; should read "gross negligence or willful misconduct."
Page 28, 2nd para. 2nd sentence	Factually incorrect; UEA risks loss of part or all of domestic equity during transition period, thereafter risks loss of revenues and loss of return on equity due to failure to produce product, strikes, etc. Furthermore if the project proceeds satisfactorily as is implied by the term "essentially riskless" then there would be no cost "borne by the Government" except for any SWU purchased which are, of course, resaleable.
Page 29, 3rd sentence	Erroneous implication that "normal business operations" (see page 28) associated with businesses performing services always cover risk of supplying materials being processed (millers do not supply grains being milled). The normal business operations of supplying enriching services does not involve supplying the feed material. Neither ERDA nor foreign enrichers undertake this risk. Therefore the implication that UEA is proposing a novel system is factually incorrect.

Report Reference	Comments
Page 30a, first sentence	Erroneous implication that all "normal" operating risks are hedged - not so - after transition period UEA has risks of strikes, mismanagement, etc., causing loss of revenue and return on equity through failure to produce produc , factually incorrect in that the Government does not guarantee equity if plant not completed - UEA may lose all or a portion of equity during the transition period, thereafter it may lose a portion of equity or return on equity due to inability to produce product to meet commitments.
Page 31, 2nd para.	Erroneously implies that long term take or pay contracts with cost pass through pricing are abnormal for enriching services industry. This is the practice of ERDA and may well be the practice of those employing the centrifuge process.
Page 31, 2nd para. last sentence	Erroneous implication that industry will not be regulated should the need arise. Moreover, the relevance of the point is questionable if customers have no objection to 15% return, cost-pass-through, long term take or pay contracts. Unless customers do subscribe to the project, it cannot proceed. The industry will be subject to NRC regulation.
Page 31, last para. 2nd sentence thru end of para.	Erroneous implication that advanced technologies do not offer competition to UEA. They will do so with respect to uncommitted portions of UEA's initial plant capacity and to any potential future additions of capacity. The same comment could apply equally well to a Government add-on plant.
Page 32a, 2nd para. portion of last line	Factually incorrect; under no circumstances is UEA guaranteed a 15% return on investment equity in a takeover situation.
Page 32b, last sentence first para.	Factually incorrect; in the event of takeover during this period for reasons other than gross mismanagement, gross negligence, or willful misconduct UEA risks losing both a return on equity investment and a portion of its equity investment. It could be pointed out that inability of UEA to roll over construction loans at the end of the construction period could trigger a Government takeover but would also presumeably permit the Government to be the owner of an operable plant.

Report Reference	Comments
Page 32c, first para. portion of last sentence	Relevance of absence of price regulation is questionable. In fact, price regulation could operate to remove risk of competition.
Page 33, the word negligence in the first and fourth sentence	Factually incorrect and strongly misleading; implies only risk to equity is in extreme conditions cited which would be difficult to prove. In fact equity is at risk up to 100% in all other situations. Report fails to recognize extremely important point potential for partial loss of equity.
Page 33, first sentence under first major heading	Factually incorrect, UEA is not assured of a constant 15% rate of return.
Page 33, first para. end to last sentence	Erroneous implication; while the gaseous diffusion process could be considered as a chemical process, the enriching services industry does not resemble the chemical industry - no single chemical product or service involves a capital investment of $3.5 billion and long term pay out - a more nearly comparable industry in these respects (but not in degree of business risk) is the electric utility industry. The failure to recognize this distinction is a major flaw.
Page 33, first para. last sentence	Seriously erroneous implication that entry into enrichment industry presents only the normal business risks - overlooks unusual difficulties in licensing nuclear activities, possibilities of nuclear moratoriums in various states and the unprecendented risk of investing 3.5 billion dollars in a single venture as yet unproven commercially based on secret technology. It should be noted that without exception potential entrants into the enrichment industry and the U.S. financial community during hearings before the JCAE view this activity as presenting abnormal business risks.

Report Reference	Comments
Page 44-45 Beginning last sentence page 44	Factually incorrect; should read "ERDA's present policy is to permit domestic companies who expect to provide enrichment capacity in the United States to initiate unclassified discussions with foreign entities within the confines of the Atomic Energy Act and the requirements of Title 10 of the Code of Federal Regulations, Part 110 Rules and Procedures."
last sentence, first para.	Incomplete. Should add statement that "The Government would have to assure that the proposed arrangement would be beneficial to the U.S." Also should revise next sentence as follows: "Any arrangement would be subject to an appropriate Agreement for Cooperation between the U.S. and the country or countries of the foreign entity. The Government findings as to the acceptability of such proposals would be judged on the basis of:"
Page 46, 2nd and third sentences	Incomplete. Should note ERDA estimates of revenues based on attainment of proposed legislation permitting establishment of commercial charge presently estimated at $76 per SWU.
Page 61, 1st para. first sentence	Incomplete in that the UEA plant, which may be the last of its kind, if more advanced processes prove economical in time, is in fact related to the interests of other potential entrants. Early action by the Government to support UEA would enable other private entrants to secure foreign and domestic customers by virture of this demonstration of serious intention of the GOvernment to rely on private enterprise to supply needed enrichment capacity.
Page 61, 1st para. second sentence	Factually incorrect. See earlier comments in regard to facts of UEA's risks. Moreover, as to competition, UEA is already encountering competition from the centrifuge because several large potential customers (TVA, Consumers Power, two Texas utilities and others) appear to have passed up UEA as a supplier and are already dealing with potenial centrifuge enrichment suppliers.

Report Reference	Comments
Page 61, 2nd para.	Incomplete in that borrowing from the Treasury under Government ownership would swell the total of the national debt and in such case net outlays would add to the budget deficit.
Page 61, third para. first sentence	Erroneous implication that this potential difficulty of obtaining long term financing is peculiar to UEA and not equally applicable to other potential entrants. Moreover, all private industry will experience these difficulties if more and more new Government agencies (such as the proposed government enrichment corporation proposed by GAO) are enabled to borrow in the money markets. The more the public sector of the economy is expanded, the greater the difficulties which will be experienced by private firms.
Page 61, third para. 2nd sentence	Erroneous implication that this is an inherent problem when it probably would be overcome immediately (for UEA and other private projects) if the Congress passes the Nuclear Fuel Assurance Act, thus serving clear notice of U.S. GOvernment support forprivate entry.
Page 61, third para.	Factually incorrect; UEA investors will not receive a guaranteed return.
Page 62, first para. third sentence	Erroneous implication; Government schedule is end of 1983 for 4.5 million SWU and the first part of 1985 for 9 million SWU whereas if UEA schedule slips 1 1/2 years they will have 9 million SWU by the first part of 1985. It should be observed that Government schedules also might slip
Page 62, 2nd para. 2nd sentence	We would disagree. Separate corporate management of enrichment facilities, due to time required to obtain necessary legislation and dispersion of experienced personnel between ERDA and the corporation, might well preclude timely implementation of Government's hedge plan should such action become necessary. Moreover, establishment of such a corporation might reduce confidence in Government's intentions to transfer enrichment to the private sector.

Report Reference	Comments
Page 62, 2nd para. last sentence	Erroneous implication. It is not at all clear that a Government corporation would be freed from budget constraints. This would be contrary to the spirit, if not the letter, of the "Budget Reform Act" of 1974.
Page 63,	Erroneous implication that private centrifuge enrichers are likely to be willing to assume more total risk with a less advanced technology when all evidence points in a contrary direction.
Page 63, last point	No basis is established in the report for this recommendation, i.e., the report does not indicate where the proposed Nuclear Fuel Assurance Act of 1975 is inadequate, or an undesirable mechanism, for assisting development of a competitive uranium enrichment industry.
Appendix I Page 65, 2nd para. 2nd sentence	Factually erroneous. The statement should read: "The Eurodif consortium, in which France has a 42 percent interest, Italy 24 percent, Spain 12 percent, Belgium 12 percent, and Iran 10 percent,"
Page 66, first para. last sentence	Factually incomplete. The following should be inserted: "Brazil has recently made an agreement with the Federal Republic of Germany under which Germany will not only sell power reactors to Brazil but also establish in Brazil the complete nuclear fuel cycle, including an enrichment plant using the jet nozzle technology."
Page 67, last sentence	Incomplete. In lieu of the last sentence, the following could be used: "Zaire has expressed interest in some type of enrichment plant to utilize excess hydropower but so far no one has come forward to finance, build and operate a plant there."

THE WHITE HOUSE
WASHINGTON

October 15, 1975

MEMO TO : JIM CANNON

FROM : JIM CAVANAUGH

All of Brent's updates were resolved to their satisfaction and were in the final letter that Seamans signed last night.

MEMORANDUM

THE WHITE HOUSE

WASHINGTON

~~CONFIDENTIAL~~

October 15, 1975

MEMORANDUM FOR: JIM CANNON

FROM: BRENT SCOWCROFT

SUBJECT: Response to GAO's Report on Uranium Enrichment

Regarding the GAO report on uranium enrichment and the draft response, as you know our major concern is to stem, as speedily as possible, the uncertainty that has characterized the US commitment to providing new enrichment services to the rest of the world. Because of the uncertainty, the US has lost a great deal of influence in international nuclear affairs, several billion dollars in enrichment contracts and reactor sales have gone elsewhere, and the risk of proliferation has grown as other countries find it in their interest to develop independent nuclear capabilities. Saturday's announcement of Iran's investment in an unsafeguarded South African enrichment facility is a recent example of the developments which are the source of our concern.

Neither the GAO draft report nor the Administration's response makes sufficient point of the necessity for immediate action. It should be noted that there are eight countries holding conditional contracts for fueling 15 reactors (worth $3 billion over the life of the contract) which might well be lost to a new French plant if we cannot convert these contracts to a firm status. We can also expect even greater losses for foreign reactors now being planned for operation after 1983.

In addition to the above general comment, I would like to note three specific concerns with Attachment A of the draft response to the GAO report.

-- Under item 1, it is stated that the negotiation between UEA and the government regarding the support package has not been completed. This may provide a ready excuse for Congress to delay considering the legislation until the UEA package is better defined.

-- In commenting negatively, under item 5, on the budget and financial impact of a government enrichment corporation, we should be careful not to contradict some of the concepts and assurances connected with the President's proposal for a $100 billion government corporation (EIA) to invest in energy development. (Also, to avoid loss of time, we do want EIA and the support of uranium enrichment to get intertwined.)

~~CONFIDENTIAL~~

-- Under items 6 and 7, it is implied that only a private venture could receive foreign investment. Foreign investment participation has not been ruled out in a next plant even if it were government owned. Major customers, such as Japan and Iran, are interested in the surety of supply that would accompany part ownership of a plant, and we do not want to foreclose that possibility.

Dave Elliott of my staff will be working today with the group who drafted the response to the GAO report, and I hope that changes can be found to accommodate our concerns indicated above.

THE WHITE HOUSE

WASHINGTON

October 16, 1975

Pat -
for next weekly report to the President.
Jim

MEMORANDUM FOR: THE HONORABLE RUSSELL E. TRAIN
ADMINISTRATOR
ENVIRONMENTAL PROTECTION AGENCY

FROM: GLEN R. SCHLEEDE

SUBJECT: Electrical Power for Add-On Uranium Enrichment Plant

May we have your help.

As you know, the President forwarded to the Congress on June 26, 1975 a comprehensive plan for expanding the Nation's uranium enrichment capacity and beginning the transition to a private competitive uranium enrichment industry.

Briefly, the legislative proposal would allow ERDA to enter into cooperative agreements with private firms that wish to build uranium enrichment plants -- to provide Government cooperation and temporary assurances, during a transition period.

The proposal also contemplated a back-up or "hedge" plan, in the event the Congress wouldn't go along or if private firms couldn't make it. The "hedge" plan would involve Government financed construction of a major addition to the existing ERDA enrichment plant near Portsmouth, Ohio.

If the Government builds an add-on plant, it will need electrical power. ERDA's Oak Ridge Operations Office (which is in charge of developing the "hedge" plant) has been exploring possibilities for the electrical power that would be required.

ERDA received from Mr. Donald Cook of American Electrical Power Company the letter at Tab A. Briefly, the letter indicates that electric power plants could be built to supply the needed electrical power, subject to two conditions:

1. Government guaranteed securities to cover the capitalization of the power plants and transmission lines.

2. A plan for meeting air quality requirements spelled out on page 2 which, briefly, seems to involve using (a) a blend of high and low sulfur coal, (b) tall stacks, and (c) intermittent controls -- but no scrubbers.

The Request

Would you please let Dr. Seamans, FEA, and us know whether the AEP plan for meeting air quality requirements would meet Federal and State of Ohio requirements.

I understand from ERDA that this matter has been discussed with some people in the lower levels of EPA but that a definitive answer has not yet been obtained.

We would appreciate a prompt response because:

- Should the answer be negative, some alternative will need to be explored.

- We expect hearings soon on the package and the question of power supply for an add-on plant at Portsmouth could be an important issue.

Thanks very much for your help.

Attachment

cc: Dr. Robert Seamans
Mr. James Cannon
Mr. Frank Zarb

Tab A

AMERICAN ELECTRIC POWER Company, Inc.

AEP

2 Broadway, New York, N. Y. 10004
(212) 422-4800

NALD C. COOK
rman of the Board
and
ef Executive Officer

May 23, 1975

Mr. Robert Hart, Manager
Oak Ridge Operations
U. S. Energy Research
and Development Administration
Oak Ridge, Tennessee

Dear Bob:

This is in further regard to our recent telephone conversation, during which you asked whether there were any circumstances under which the American Electric Power System would be interested in furnishing some 1,000,000 kilowatts of generating capacity for an approximately half-size gaseous diffusion plant now under consideration for location in the general vicinity of Portsmouth, Ohio.

This will confirm my reply, to the effect that American Electric Power would be very happy to consider furnishing such generating capacity on the following basis:

> AEP would organize and own a new subsidiary corporation having an OVEC-type capitalization, the securities comprising the same being guaranteed by the United States.
>
> AEP would engineer, design, and be responsible for the construction of the power plant, which would contain at least one 1,300-mw unit together with one or more additional units, of an appropriate size, all as required for the project.
>
> The necessary associated transmission would also be provided as a part of the project.
>
> Following the completion of construction, the AEP System would be responsible, on a fee basis, for the operation of the plant, including the continuing procurement of fuel, and for the provision of such backup power as might be required.

With respect to the fuel supply, it would be our intention to blend Eastern low-sulfur coal (most likely coming from West Virginia and eastern Kentucky) with Ohio higher-sulfur coal in such amounts as to comply with the then Ohio and the Federal environmental requirements. We would not contemplate the utilization of scrubbers because of the primitive state of the technology, the inevitable resulting land pollution, and the inferior economics. A tall stack, coupled with a real-time monitoring system, would also be utilized so as to achieve optimum dispersion and close control. Cooling towers would also be used.

Although compliance with the Ohio Siting Law would, of course, be necessary, we would not anticipate any difficulty in meeting its requirements.

I trust the foregoing will be adequate for your present requirements. If you desire to pursue the matter further, please let me know.

Best regards.

Sincerely yours,

Donald C. Cook
Chairman

DCC:lm