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REPORT TO THE JOINT COMMITTEE
ON ATOMIC ENERGY
CONGRESS OF THE UNITED STATES



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RELEASED

Price Increase And
Change In Criteria For
Uranium Enrichment Services

B-159687

Atomic Energy Commission

BY THE COMPTROLLER GENERAL
OF THE UNITED STATES

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FEB. 9, 1971



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

B-159687

Dear Mr. Chairman:

The General Accounting Office has made a review of the price increase and change in criteria for uranium enrichment services, Atomic Energy Commission. The review was made in accordance with a request dated December 21, 1970, by the Chairman, Joint Committee on Atomic Energy.

A copy of this report is being sent to the Vice Chairman of your Committee. As agreed to by your Committee, copies of the report are being made available to the Atomic Energy Commission. Comments of the Commission have been incorporated in the report.

We plan to make no further distribution of this report unless copies are specifically requested, and then we shall make distribution only after your agreement has been obtained or public announcement has been made by you concerning the contents of the report.

Sincerely yours,

A handwritten signature in cursive script that reads "James B. Peacts".

Comptroller General
of the United States

The Honorable John O. Pastore, Chairman
Joint Committee on Atomic Energy
Congress of the United States

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ABBREVIATIONS

AEC	Atomic Energy Commission
CIP	Cascade Improvement Program
CUP	Cascade Power Upgrading Program
GAO	General Accounting Office
MWe	megawatt of electricity

D I G E S T

WHY THE REVIEW WAS MADE

On December 21, 1970, the Joint Committee on Atomic Energy requested the General Accounting Office (GAO) to review the Atomic Energy Commission's (AEC's) proposed revision to the Uranium Enrichment Services Criteria and the proposed increase in the price for enrichment services.

The revision was proposed as a result of an amendment (contained in Public Law 91-560 approved December 19, 1970) to the Atomic Energy Act of 1954, which provided that the prices for enrichment services "shall be on a basis of recovery of the Government's costs over a reasonable period of time."

Prior to the amendment, the act, in subsection 161v, provided that prices be established on a basis providing reasonable compensation to the Government.

In August 1970, AEC amended its original Uranium Enrichment Services Criteria to change the basis for computing the price from a cost-recovery basis to a commercial-enterprise basis. Because these commercial criteria are not consistent with the amendment to subsection 161v, AEC has proposed a further revision to the criteria.

AEC has proposed also an increase in the price for enrichment services to \$32 a unit of separative work. This is an increase of \$6 over the \$26 price currently in effect and \$3.30 over the price of \$28.70 scheduled to become effective February 22, 1971. (See pp. 4 to 8.)

FINDINGS AND CONCLUSIONS

The proposed revised criteria are identical to the original criteria except for certain language modifications made to conform to the wording of the amendment to subsection 161v. GAO believes that the provisions of the criteria having an effect on pricing provide an adequate basis for recovering, over a reasonable period of time, appropriate Government costs of furnishing enrichment services. (See p. 9.)

The Joint Committee has requested GAO to examine into AEC's legal basis for implementing the \$28.70 price which was established on the basis

of commercial criteria. In GAO's opinion, for the \$28.70 price to be valid, it must be justifiable on the basis of the original criteria. AEC stated, in response to a question from GAO, that the \$28.70 price could have been justified under the original criteria at the time the price was established. GAO has no reason to question AEC's statement and sees no legal basis to question AEC's decision to implement the \$28.70 price. (See pp. 9 to 11.)

Production of separative work has been substantially lower than anticipated at the time the \$26 price was established, but there has not been a comparable reduction in operating costs. This situation is attributable primarily to an overestimate of the production efficiency of the diffusion plants at low power levels. (See pp. 12 and 13.)

AEC's estimated costs for each unit of separative work have increased substantially since the \$26 price was established; a major part of this increase has occurred since development of the \$28.70 price. Increases have occurred in estimates of

- power costs,
- other operating costs,
- cascade improvement and power uprating program costs,
- interest costs. (See pp. 14 to 17.)

The proposed price is based on many assumptions as to events expected to take place over extended periods of time. The uncertainties involved in several of these assumptions and the effects of variations are discussed beginning on page 18.

AEC's projected costs from fiscal year 1971 through fiscal year 1980--the campaign period on which the \$32 price is based--are stated in current-year dollars. The \$32 price, however, includes a 15-percent contingency factor--or \$4.15 a unit. GAO believes that the provision of a contingency factor represents a reasonable method of providing for variances between projected and actual unit costs of production. (See p. 25.)

GAO believes that the proposed \$32 price is consistent with the pricing provisions of the revised criteria and the provisions of subsection 161v of the Atomic Energy Act of 1954, as amended. (See p. 25.)

The Joint Committee has suggested that AEC reassess the enrichment services price at fixed intervals. AEC has taken steps toward preparation of financial statements showing the results of operations

of the enrichment activity and has advised GAO that it intends to use such statements in its periodic reassessment of the price. (See pp. 25 and 26.)

RECOMMENDATIONS OR SUGGESTIONS

GAO suggested that the financial statements which AEC intends to prepare be published annually. GAO suggested also that AEC periodically prepare information showing current projections of costs and revenues over a period of several years. Such information would provide AEC and the Joint Committee with an indication of the extent to which the established price is meeting the objective of recovering the Government's costs over a reasonable period of time. (See p. 26.)

AGENCY ACTIONS AND UNRESOLVED ISSUES

AEC agreed to accept GAO's suggestions.

CHAPTER 1

INTRODUCTION

The General Accounting Office has reviewed the Atomic Energy Commission's proposed revision to the Uranium Enrichment Services Criteria and the proposed increase in the price for enrichment services. The review was made in response to a request dated December 21, 1970, by the Chairman, Joint Committee on Atomic Energy, Congress of the United States. A copy of the Joint Committee's request is included as appendix I. The scope of our review is described in chapter 4.

The criteria set forth the terms and conditions under which AEC offers, subject to available capability, to provide uranium enrichment services.¹ The proposed revision, announced by AEC in a letter to the Joint Committee dated December 21, 1970, (see app. II) was made as a result of an amendment to subsection 161v of the Atomic Energy Act of 1954, as amended. The amendment was contained in Public Law 91-560 approved December 19, 1970. This amendment provides that the prices for enrichment services "shall be on a basis of recovery of the Government's costs over a reasonable period of time." Prior to the amendment, subsection 161v provided that such prices be established on a basis which would provide reasonable compensation to the Government.

On December 21, 1970, AEC announced that the price for each unit of separative work based on the revised criteria would be \$32--an increase of \$6 from the existing price of \$26 and an increase of \$3.30 from the \$28.70 price which is scheduled to become effective on February 22, 1971.

Since this report discusses three different sets of criteria, we have labeled the criteria as (1) the original criteria, (2) the commercial criteria, and (3) the revised criteria to avoid confusion as to the criteria being

¹The work devoted to separating a quantity of uranium (feed material) into two fractions--one a product fraction containing a higher concentration of the isotope U-235 than the feed and the other a tails fraction containing a lower concentration of U-235.

discussed at any particular point in the report. The revised criteria and the proposed \$32 price for each unit of separative work are the primary subjects of this report; however, to facilitate the understanding of the reasoning behind, and the necessity for, the revised criteria, a discussion of the original and commercial criteria as well as the revised criteria follows.

ORIGINAL CRITERIA

The original Uranium Enrichment Services Criteria represented an implementation of the Private Ownership of Special Nuclear Materials Act (Pub. L. 88-489) which provided for (1) the termination of mandatory Government ownership of special nuclear materials and (2) the eventual private ownership of power reactor fuels. Private ownership avoids the necessity for a major buildup of the Government's investment in nuclear fuel inventories for commercial power reactors. AEC estimated that, if mandatory Government ownership of nuclear fuel had continued, the Government's investment in nuclear fuels in the possession of private firms for civilian power applications could possibly have reached \$3 billion to \$4 billion by 1980.

Subsection 161v of the Atomic Energy Act of 1954, which was added by Public Law 88-489, requires AEC to establish criteria in writing, setting forth the terms and conditions under which AEC will provide uranium enrichment services for domestic and foreign customers. Before AEC establishes such criteria, it must submit the proposed criteria to the Joint Committee on Atomic Energy for a 45-day period unless the Joint Committee waives in writing, the conditions of, or all or any portion of, such a 45-day period.

On July 1, 1966, AEC submitted the original criteria to the Joint Committee. At the Joint Committee's request, we reviewed the criteria and the proposed contracts for uranium enrichment services. In our report to the Chairman (B-159687, August 1, 1966), we stated that the provisions having an effect on pricing afforded a reasonable basis for recovering, over a long term of operation, the Government's cost of furnishing enrichment services and that the proposed ceiling charge (\$30 a unit of separative work, subject to upward escalation for the cost of electric power and labor) would be adequate to permit recovery of appropriate

Government costs projected over a number of years.¹ The original criteria became effective on December 23, 1966, and have been the basis upon which AEC has offered to provide uranium enrichment services to its customers.

On September 21, 1967, AEC announced that the actual charge for uranium enrichment services would be \$26 a unit of separative work. At the Joint Committee's request, we reviewed the basis used by AEC in establishing the amount to be charged, and, in a report to the Chairman (B-159687, September 25, 1967), we stated that the charge was adequate to permit recovery of appropriate Government costs projected over a number of years and was consistent with the original criteria.

COMMERCIAL CRITERIA

On June 10, 1970, AEC proposed an amendment to the original criteria which changed the basis for computing the charge for enrichment services from a cost-recovery basis to a basis related to the price a commercial firm would charge assuming operation in new uranium enrichment facilities. Also, AEC announced that the price for each unit of separative work based on these commercial criteria would be \$28.70--an increase of \$2.70 from the existing price of \$26.

At the request of the Joint Committee on Atomic Energy, we made a review and issued a report on the proposed revisions to the criteria and price (B-159687, July 17, 1970) in which we discussed the need for and applicability of the commercial basis.

In our report, we stated that, on the basis of our interpretation of the legislative history; the language of subsection 161v of the Atomic Energy Act of 1954, as amended; and statements from the 1966 hearings on Uranium Enrichment Services Criteria, it did not appear to be consistent with

¹As of July 1, 1970, the ceiling price was \$32.91. AEC's current estimates show that the ceiling price is expected to be about \$36.50 by July 1, 1971.

the intent of the Congress to conclude that the term "reasonable compensation" as used in subsection 161v permitted including a profit over a period of time. We expressed the view that there was doubt that the commercial criteria, under which more than full costs might be recovered over a period of time, was authorized under subsection 161v. We stated that we did not believe that the commercial criteria should be adopted without further action by the Congress.

With respect to the proposed price increase, we concluded that, because of cost escalation and operating levels lower than originally anticipated, a price increase might be warranted.

After the issuance of our report, AEC requested the views of the Department of Justice with respect to the legal validity of AEC's proposed amendment to the original criteria. On August 5, 1970, the Department of Justice concurred in AEC's contention that there was nothing in the legislative history which would preclude the possibility of setting prices higher than the Government's full costs if this appeared to be in the national interest in the development and utilization of nuclear power.

After expiration of the required 45-day period, AEC, on August 25, 1970, by publication in the Federal Register, established the commercial criteria and established the \$28.70 price to become effective 180 days after such publication pursuant to the criteria.

After publication of the above notices, the Joint Committee on Atomic Energy reported out a bill which, among other things, proposed an amendment to subsection 161v to clarify the congressional intent at the time this subsection was enacted into law. The clarified provision states that the prices for enrichment services "shall be on a basis of recovery of the Government's costs over a reasonable period of time." This amendment was contained in Public Law 91-560 approved on December 19, 1970.

AEC has taken the position that all legal requirements associated with an increase in price to \$28.70 will have been met on February 22, 1971, and that this price will go into effect on that date.

REVISED CRITERIA

AEC submitted its proposed revised criteria to the Joint Committee on December 21, 1970, to establish criteria in compliance with the amendment to subsection 161v discussed above. AEC also announced that the price for enrichment services on the basis of the proposed criteria would be set at \$32 for each unit of separative work, or \$3.30 higher than the price of \$28.70 a unit which is scheduled to go into effect on February 22, 1971. This increase in price is considered necessary because of increases in the projected costs of separative work, principally the cost of electrical power.

CHAPTER 2

EFFECTS OF AMENDMENT TO SUBSECTION 161v

OF THE ATOMIC ENERGY ACT OF 1954

Prior to enactment of Public Law 91-560, approved December 19, 1970, subsection 161v of the Atomic Energy Act of 1954, as amended, provided in part that prices for enrichment services be established on a basis which would provide reasonable compensation to the Government. Public Law 91-560 clarified this provision to require that prices for enrichment services be established on a basis of recovery of the Government's costs over a reasonable period of time.

As a result of this amendment to subsection 161v, AEC has proposed a revision to the Uranium Enrichment Services Criteria. Our review of the proposed revised criteria showed that they were identical to the original criteria except for certain language modifications made to conform to the wording of the amendment to subsection 161v. (See app. IV.)

In our opinion, the provisions of the criteria having an effect on pricing afford an adequate basis for recovering, over a reasonable period of time, appropriate Government costs of furnishing enrichment services.

In announcing the proposed revision to the criteria, AEC stated that the previously announced increase in the enrichment price from \$26 to \$28.70 a unit of separative work would go into effect on February 22, 1971--180 days after that price had been published in the Federal Register. The \$28.70 price was established under the commercial criteria discussed in our July 17, 1970, report to the Joint Committee. We expressed the view that there was doubt that the commercial criteria, under which more than full costs might be recovered over a period of time, was authorized by subsection 161v.

The Joint Committee has requested us to examine into AEC's legal basis for implementing the \$28.70 price.

In the report of the Joint Committee, which accompanied the proposed legislation subsequently enacted as Public Law 91-560 (S. Rept. 1247, H. Rept. 1470, 91st Cong.), the Committee stated:

"Under the clarified version of subsection 161v., it is intended that the criteria in effect since 1966 will continue to be in effect unless and until the Commission proposes revisions thereto that conform to the requirements of the statute and submits them to the Committee for the 45-day review period. ***" (Underscoring supplied.)

From this statement, it seems clear that the intent of the Congress in enacting the amendment to subsection 161v was to continue in effect the cost-recovery criteria established in 1966. Consequently, and in view of our report of July 17, 1970, concerning this matter, it is our opinion that, in order for the \$28.70 price to be valid, such price must be justifiable on the basis of the original criteria established in 1966.

By letter of December 30, 1970, we requested the Chairman, AEC, to advise us regarding the basis for AEC's view that the price of \$28.70 predicated upon a commercial-enterprise type of operation properly may be made for enrichment services effective February 22, 1971. Also we asked to be advised whether such price of \$28.70 could be justified on the basis of the original cost-recovery criteria established in 1966.

By letter of January 11, 1971, the Chairman, AEC, advised us that an opinion of July 2, 1970, by AEC's General Counsel and a separate opinion dated August 5, 1970, by the Acting Assistant Attorney General, Department of Justice, held that the proposed revision to the criteria and the proposed price of \$28.70 to be established in accordance therewith would be legally valid under subsection 161v. Those opinions constitute the basis for AEC's view that the price of \$28.70, as established, may properly be made effective February 22, 1971. The Chairman also stated that the price of \$28.70 could have been justified under the criteria of 1966 at the time the price was established

pursuant to the criteria transmitted to the Joint Committee by letter of June 10, 1970.

Concerning the proposed \$2.70 increase in the existing price from \$26 to \$28.70, we stated at pages 35 and 36 of our report of July 17, 1970, referred to above, that:

"We believe that, because costs for the 10-year period ending in 1975 are estimated to exceed revenues by about \$160 million, a price increase is needed to ensure recovery of appropriate Government costs over the original period.

"The proposed price increase of \$2.70 a unit would be expected to result in additional revenues totaling about 80 to 85 percent of the amount projected as a loss under the \$26 price through 1975. For the period 1970-80, the \$28.70 price is estimated to result in sufficient revenues to provide for recovering Government costs including an estimated amount for contingencies."

We have no reason, therefore, to believe that the \$28.70 price could not have been justified under the 1966 criteria.

In view of the statement that the price of \$28.70 could have been established pursuant to the 1966 criteria, we see no legal basis to further question the validity of such price to be effective February 22, 1971.

CHAPTER 3

COMMENTS CONCERNING PROPOSED \$32 PRICE

FOR URANIUM ENRICHMENT SERVICES

The following sections discuss AEC's experience under the price of \$26 a unit of separative work and the factors considered and assumptions made by AEC in determining the amount by which the price should be increased.

There are many technical judgments relating to optimizing plant operations that have an obvious impact on the operating cost estimates which form the basis for the price charged for enrichment services. Also, on the basis of the operating experience which AEC has gained since the \$26 price was established in 1967, certain of the estimates of cost and operating performance have been refined.

Because of the complexity of the technical judgments involved and because of the need for timely completion of our examination to enable early review by the Joint Committee of the proposed price increase, we directed our examination primarily toward an analysis of the factors resulting in the need for the price increase and the effects of variances in the assumptions used in developing the proposed price.

EXPERIENCE UNDER \$26 PRICE

AEC's price of \$26 a unit of separative work was established in 1967 on a basis that was intended to ensure recovery of appropriate Government costs projected over a number of years.

The following table, which was prepared from AEC's records, compares AEC's original forecasts used as the basis for establishing the \$26 price with AEC's actual cost of production, including its computation of imputed interest on preproduction. Data for fiscal years 1966 are not included because they are classified.

	Fiscal year 1968			Fiscal year 1969			Fiscal year 1970		
	Original forecast	Actual	Increase or decrease(-)	Original forecast	Actual	Increase or decrease(-)	Original forecast	Actual	Increase or decrease(-)
Total cost of production (in millions)	\$ 227	\$ 221	\$ -6	\$ 194	\$ 200	\$ 6	\$ 179	\$ 195	\$ 16
Unit cost of production	\$23.76	\$24.84	\$1.08	\$24.56	\$28.58	\$4.02	\$25.73	\$31.59	\$5.86
Production of separative work units (in thousands)	9,563	8,912	-651	7,846	6,997	-849	6,933	6,185	-748

The above table shows that production has been substantially lower than anticipated but that there has not been a comparable reduction in operating costs. This situation has resulted primarily from an overestimate, at the time the initial projections were made, of the production efficiency of the diffusion plants at low power levels.

FACTORS RESULTING IN NEED FOR PRICE INCREASE

As previously discussed, the \$28.70 price scheduled to go into effect in February 1971 was based on commercial criteria and therefore the components of this charge were not based on estimated Government costs. The following table compares the components of the original \$26 price, which was based on estimated Government costs, with those of the proposed \$32 price. The cost components are stated in current-year dollars.

<u>Cost components</u>	Existing unit price of \$26 (note a)	Proposed unit price of \$32 (note b)	Differences between components of \$26 and \$32 price
Power	\$10.91	\$13.70	\$2.79
Other operating	2.50	3.50	1.00
Depreciation	3.65	3.30	-.35
Added factor (note c)	3.79	3.75	-.04
Cascade improvement and power uprating programs	.50	1.85	1.35
Interest on preproduction	<u>1.15</u>	<u>1.75</u>	<u>.60</u>
Total identified costs	22.50	27.85	5.35
Contingency	<u>3.50</u>	<u>4.15</u>	<u>.65</u>
Unit price	<u>\$26.00</u>	<u>\$32.00</u>	<u>\$6.00</u>

^aBased on a campaign period of fiscal years 1966-75.

^bBased on a campaign period of fiscal years 1971-80.

^cIncludes interest, administration, and research and development costs.

The above table shows that AEC's estimated costs for each unit of separative work have increased substantially since the \$26 price was established. A major part of this increase has occurred since announcement of the \$28.70 price in June 1970. The increases in the cost components of the

unit charges for (1) power, (2) other operating costs, (3) the Cascade Improvement Program (CIP) and the Cascade Power Upgrading Program (CUP) (see p. 22), and (4) interest on preproduction resulted from the following factors.

Power costs--The \$26 and \$32 prices were based on average constant power costs of 4 and 5.2 mills per kilowatt-hour, respectively. These amounts represented the expected costs of power at the time the prices were developed. When AEC announced the \$28.70 price it was experiencing a power cost of about 4.37 mills per kilowatt-hour.

Since electric power represents about 75 percent of the out-of-pocket costs of operating the gaseous diffusion plants at full capacity, the increased cost of power was a major factor in the decision to raise the price for enrichment services.

Other operating costs--The \$32 price is based on estimated other operating costs which are \$1 a unit higher than the estimate on which the \$26 price was based. These costs include (1) costs of operating and maintaining the gaseous diffusion plants (exclusive of power), (2) plant test costs, (3) equipment and general plant project costs, and (4) miscellaneous costs.

Estimated operation and maintenance costs for a fully powered plant have increased from \$24 million annually at the time the \$26 price was established to \$38 million annually. AEC attributes this increase of \$14 million to:

- A \$6 million understatement in the \$24 million estimate.
- An \$8 million increase as the result of cost escalation.

The \$26 price was based on estimated plant test costs of \$5.5 million each year over the original campaign period; however, the \$32 price anticipates an increasing funding level for such costs because of CIP and CUP, from \$8.3 million in fiscal year 1971 to \$12.5 million in fiscal year

1974. Beginning in fiscal year 1978, these costs are expected to return to the \$5.5 million annual level originally estimated.

Equipment and general plant project costs were inadvertently omitted in computing the \$26 price, and current estimates show that approximately \$10 million annually is needed for these items.

Estimated miscellaneous costs are about the same as those on which the \$26 price was based.

CIP and CUP--The \$26 price was based on an estimated cost of \$289 million for CIP with amortization charges beginning in fiscal year 1972. Approximately \$59 million of this amount was to be amortized between fiscal year 1972 and fiscal year 1975. There was no provision for CUP in the original estimate.

As a result of AEC's research and development efforts and additional work on the scope of CIP, the \$32 price provides for amortization charges on the basis of an estimated cost for CIP of \$525 million--or \$236 million more than the prior estimate. Also the \$32 price anticipates an investment of \$225 million for CUP.

In arriving at the \$32 price, AEC projected that costs totaling about \$318 million would be amortized between fiscal year 1975 and fiscal year 1980 for CIP and CUP. Therefore additional costs of \$259 million (\$318 million minus \$59 million) are provided for by the \$32 price that were not provided for by the \$26 price.

Interest on preproduction--The unit price of \$32 includes \$1.75 for imputed interest on the Government's investment in preproduced inventories, or an increase of 60 cents from the amount included in the \$26 price. AEC estimates that a greater preproduced inventory will be in existence for a longer period of time partially due to the fact that inventory levels have increased because AEC has experienced and is anticipating reductions in near-term requirements from those originally projected. Also the shift in campaign periods adds the years 1976-80 when the average preproduced inventories are expected to be higher than the

levels of the first 5 years of the earlier campaign period on which the \$26 price was based.

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Following is a comparison by year of AEC's original unit cost estimates (which were projected through fiscal year 1975) with (1) estimates prepared in the latter part of fiscal year 1970, when AEC determined that there was a need to increase the unit price, and (2) AEC's current unit cost estimates. These estimates include imputed interest on preproduction.

<u>Fiscal year</u>	<u>Original estimates</u>	<u>Revised estimates</u>	<u>Current estimates</u>
1968	\$23.76	\$24.84 ^a	\$24.84 ^a
1969	24.56	28.58 ^a	28.58 ^a
1970	25.73	30.94	31.59 ^a
1971	23.04	29.32	33.02
1972	22.93	27.42	32.70
1973	21.38	26.71	31.33
1974	20.70	26.87	31.19
1975	20.22	26.05	29.80
1976	-	24.68	28.31
1977	-	22.56	26.65
1978	-	21.11	25.71
1979	-	19.53	24.68
1980	-	18.59	24.21

^aActual costs, including AEC's computation of imputed interest on preproduction.

The above table shows that the unit cost is expected to begin to decrease in fiscal year 1972 and to continue to decrease through fiscal year 1980. The continuing decrease is due to the fact that these projections take into consideration the anticipated increases in the production of separative work and the estimated cost benefits to be derived during 1975 to 1980 from CIP and CUP. It should be noted that, although long-range projections of production rates and costs must be considered in establishing a price based on recovery of costs over a 10-year period, the precision of projections decreases as periods of time increase and therefore there are substantial uncertainties involved in such projections.

EFFECTS OF VARIANCES IN ASSUMPTIONS ON PROPOSED PRICE

Following is a discussion of various assumptions on which AEC based its computation of the proposed price of \$32 a unit of separative work and of the effects that changes in these assumptions would have on the price.

Demand for enrichment services

The gaseous diffusion plants were built for national defense purposes; however, the enriched uranium requirements for defense purposes have greatly decreased and the plants are now available to produce fuel for civilian nuclear power reactors and to meet other requirements. At full capacity the diffusion plants consume about 6,000 megawatts of electricity (MWe) and produce about 17 million units of separative work annually. During fiscal year 1970, however, the diffusion plants were operated at about one third of full capacity and produced only about 6.2 million units of separative work.

In the last several years there has been a significant growth in the size and the number of nuclear plants being constructed and operated for the production of electrical power and continued growth is expected. This development has resulted in a corresponding growth in the need for enriched uranium which is produced in the gaseous diffusion plants.

AEC estimates that the demand for enrichment services from its gaseous diffusion plants will require plant capacity prior to 1980 substantially in excess of current capacity and that the demand will continue to increase for a number of years thereafter. Through 1980 this demand is expected to be met by the use of preproduced inventories.

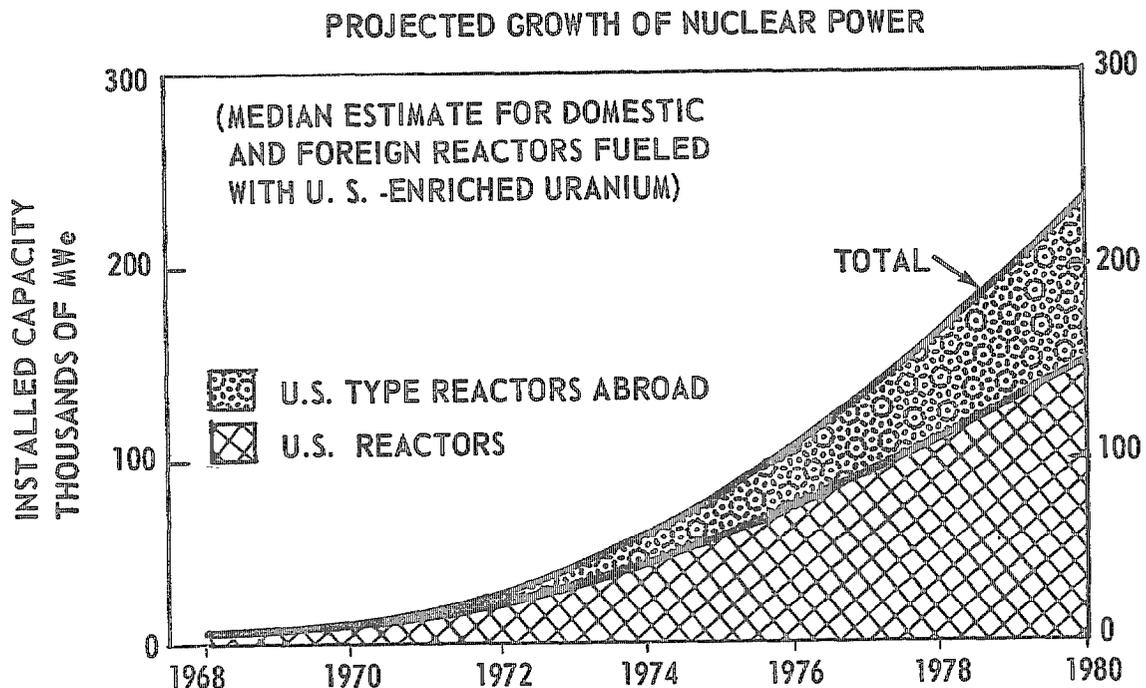
AEC's projections of the demand for future enrichment services and its studies and plans for meeting the demand are based in large part on judgment as to technological and economic developments expected to occur in the nuclear field and therefore are subject to a great deal of uncertainty. We found, however, that projections of nuclear growth by industry fell within the range of AEC planning estimates.

Currently projected requirements for enriched uranium are based on AEC's 1970 forecast of installed civilian nuclear power plants. Because of the considerable uncertainties involved in projecting nuclear power growth, AEC planning is based on a range of anticipated nuclear power capacity in enriched uranium reactors by the end of 1980, as follows:

	Cumulative installed capacity (in MWe)		
	<u>Low</u>	<u>High</u>	<u>Medium</u>
Domestic plants	130,000	170,000	150,000
Foreign plants (note a)	<u>70,000</u>	<u>100,000</u>	<u>89,000</u>
Total	<u>200,000</u>	<u>270,000</u>	<u>239,000</u>

^aExcludes United Kingdom requirements which are not expected to be provided by the United States.

AEC uses the medium as its primary basis for estimating the total requirements for separative work from the U.S. gaseous diffusion plants. The chart below illustrates the projected growth of nuclear power.



During fiscal year 1970 the foreign demand for enrichment services was about 1.1 million units of separative work. The need for enrichment services to provide fuel for foreign reactors (excluding the United Kingdom) is expected by AEC to increase to about 4.8 million units of separative work in 1975 and to about 11.6 million units by 1980.

Considerable interest has developed in some countries in obtaining an enrichment capability which would enable those countries to achieve at least some independence in supplying their enriched uranium requirements. AEC has taken this situation into consideration in preparing its long-range forecasts of foreign demand. These forecasts are based on the assumption that there will be some reduction in foreign demand beginning in 1975, at which time it is assumed that the United States will be providing 95 percent of the above foreign demand. AEC assumes that in 1980 the United States will be providing about 9.8 million units of separative work, or 85 percent of the above foreign demand.

AEC estimates do not show any reduction in foreign demand which may result because of the proposed increased price of \$32 a unit. According to AEC there was no need to adjust its estimates because the technology of plants built abroad is unlikely to be sufficiently advanced for many years to constitute strong economic competition for United States' plants.

To show the effects of a reduction in demand (either foreign or domestic) on unit production costs, we requested AEC to develop a case study showing the effect on the proposed \$32 price of an assumed additional reduction in total annual demand of 10 percent in the 1976-80 period because of the price increase or delays in the development of the nuclear industry. The study showed that the price for each unit of separative work was not very sensitive to relatively small reductions in future demand and that, assuming a 10-percent reduction in total demand and no change in production, the cost of production would be increased by about 20 cents a unit. This increase is attributable to the additional interest costs on the higher preproduced inventories.

Plutonium recycle

Plutonium recycle is the process whereby replacement fuel loaded into reactors will contain plutonium recovered from spent fuel discharged from such reactors and thereby reduce the need for enriched uranium. In computing the proposed \$32 price, AEC assumed that plutonium recycling would begin in 1974 and would reduce the separative work requirements by 8.5 million units through 1980. At our request AEC recomputed the estimated costs of production for the period 1971-80 assuming that plutonium recycling capability was not developed. AEC's computation showed that estimated production costs would decrease by about 10 cents a unit if such an assumption were made.

Cascade improvement and cascade
power uprating programs

As part of its program to meet the projected rapid growth in enrichment service requirements, AEC plans to increase the capacity of the gaseous diffusion plants through implementation of (1) CIP, which would incorporate the latest technology available into the existing plant equipment and (2) CUP, which would permit effective use of larger amounts of electric power by the existing and improved equipment. AEC estimated that the total capital investment in CIP and CUP would amount to about \$750 million and that full implementation of these programs could increase the existing plants' annual separative work capacity at full power by about 50 percent.

Prior to March 1969, AEC contemplated installing CIP in fiscal years 1973-78 and CUP in fiscal years 1977-78. At the time the \$32 price was calculated, AEC's estimates showed that these improvements were expected to be installed in fiscal years 1974-79. This delay resulted because AEC's fiscal year 1970 budget did not include funds to begin CIP. In fiscal year 1971, the Congress appropriated \$21.1 million to start CIP; however, as of January 1971 AEC had been apportioned only \$5 million.

AEC's studies show that implementation of CIP and CUP will substantially increase the efficiency of the existing plants and result in a reduction in the unit cost of separative work. Thus any delay in implementing these programs could be expected to increase the average unit cost of separative work over the 10-year campaign period. In making its current projections, AEC has assumed that appropriated funds totaling about \$750 million will be available in fiscal years 1971-79 for the installation of CIP and CUP.

The initial increased capacity attributable to CIP and CUP will be available beginning in fiscal years 1975 and 1978, respectively. AEC therefore based the proposed \$32 price on amortization of the capital improvement costs necessary to implement CIP and CUP beginning in fiscal years 1975 and 1978, respectively, and continuing over the remaining useful life of the existing gaseous diffusion plants

which is currently projected to end in fiscal year 1988. Any delay in implementing CIP and CUP would result in amortizing the capital costs over a shorter period of time and thus increase the unit cost of separative work.

AEC advised us that, assuming a 1-year delay in implementing CIP and CUP and no change in other factors, the estimated costs of production would increase by about 50 cents a unit (excluding contingency) over the campaign period.

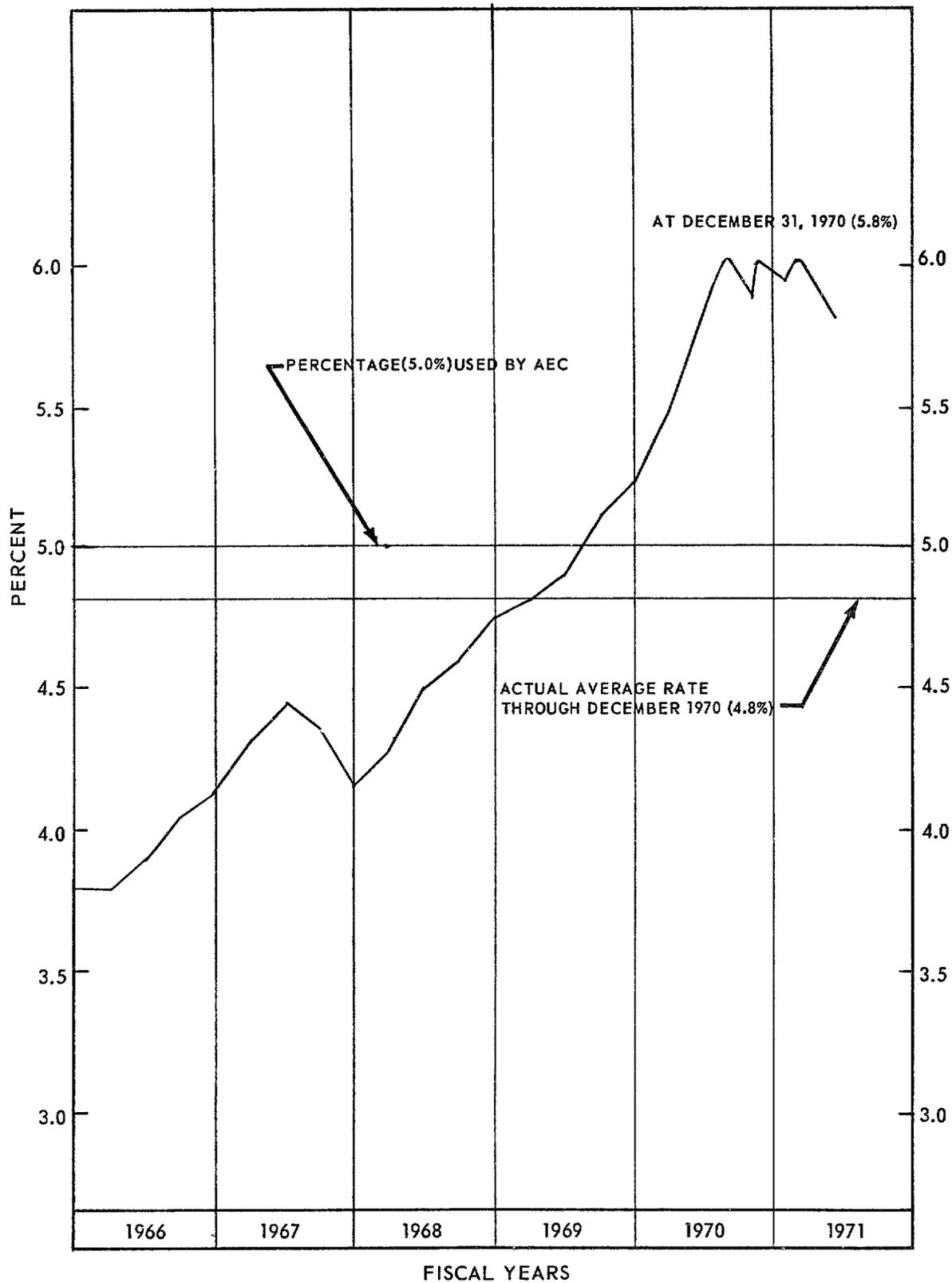
Cost of money to the Government

AEC's computation of the proposed \$32 price was based on the assumption that the average cost of money to the Government would be 5 percent a year. In computing the actual cost of money to the Government, AEC uses the index for total marketable public issues that is published on the final workday of each month in the "Daily Statement of the Treasury."

The graph on the following page shows the actual cost of money to the Government from July 1965 through December 1970 on the basis of the Treasury statements.

To illustrate the effect that a change in the interest rate has on the unit price of separative work, we requested AEC to calculate the effect on production costs of rates differing from the rates used in its cost projections. AEC advised us that an increase in the projected rate from 5 to 6 percent would increase estimated production costs by \$1.05 a unit (excluding contingency) and that a decrease to 4 percent would similarly cause a \$1.05 reduction.

TREASURY INTEREST RATES ON TOTAL MARKETABLE PUBLIC ISSUES



ALLOWANCE FOR CONTINGENCIES

In developing the proposed \$32 price, AEC included a contingency factor of 15 percent, or \$4.15 a unit, to provide an allowance for possible future changes in both annual and cumulative requirements for enrichment services, projected plant operational levels and costs based thereon, and the projected level of unit costs for labor, power, and other cost elements. The \$26 price also included a 15-percent contingency factor.

In our opinion, and on the basis of AEC's past experience, there is a need to provide for unforeseen events which could have an effect on the cost of enrichment services. We believe that the provision of a contingency factor represents a reasonable method of providing for variances between projected and actual unit costs of production that could result from the factors discussed in this chapter.

CONCLUSIONS

Although many of the assumptions made by AEC in arriving at the proposed \$32 price for uranium enrichment services are subject to a great deal of uncertainty, our review revealed no basis for questioning their reasonableness. We believe that the proposed \$32 price is consistent with the pricing provisions of the revised criteria and the provisions of subsection 161v of the Atomic Energy Act of 1954, as amended.

In the Joint Committee's report, which accompanied the proposed legislation subsequently enacted as Public Law 91-560, the Committee stated:

"The Joint Committee believes it advisable for the Commission, within the context of the applicable criteria, to reassess the enrichment services charge at such fixed intervals and utilizing such averaging periods as, in the opinion of the Commission, are reasonably calculated to assure recovery of appropriate Government costs, with relative price stability, and the contingency factors necessary to provide for cost variations." (Under-scoring supplied.)

AEC, consistent with this statement, has taken steps directed to the preparation of financial statements showing the results of operations of the enrichment activity and has advised us that it intends to use such statements in its periodic reassessment of the price for enriching services.

We suggested that AEC publish such statements annually and that AEC periodically prepare information showing its current projections of costs and revenues over a period of several years. Such information would provide AEC and the Joint Committee with an indication of the extent to which the established price is meeting the objective of recovering Government costs over a reasonable period of time.

AEC agreed to accept our suggestions.

CHAPTER 4

SCOPE OF REVIEW

Our review was performed at AEC Headquarters in Germantown, Maryland, and was directed toward (1) ascertaining whether AEC's proposed revision to the Uranium Enrichment Services Criteria is in conformity with the provisions of Public Law 91-560, (2) examining into AEC's legal basis for implementing the \$28.70 uranium enrichment price on February 22, 1971, (3) evaluating AEC's proposed increase in the uranium enrichment price to \$32, and (4) analyzing the specific assumptions upon which the \$32 price is based.

We reviewed applicable legislative history, AEC's policies and procedures, and AEC's records relating to the enrichment activity. In addition, we obtained the views of various AEC representatives knowledgeable of, and responsible for, the production and sale of enriched uranium.

As part of our review, we requested AEC to make certain studies to determine the sensitivity of some of the assumptions on which the proposed \$32 price was based.

In reviewing the proposed \$32 price, we evaluated, to the extent feasible consistent with the many technical factors involved, the reasonableness of AEC's assumptions and methods employed in developing the price based on these assumptions. Because of time limitations, we did not verify all of the many complex mathematical computations made by AEC in arriving at the proposed price.

We also obtained data from AEC showing production costs experienced under the present \$26 price. We did not verify the accuracy of the data.

APPENDIXES

CHET HOLIFIELD, CALIF.,
CHAIRMAN
MELVIN PRICE, ILL.
WAYNE N. ASPINALL, COLO.
JOHN YOUNG, TEX.
ED EDMONDSON, OKLA.
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CATHERINE MAY, WASH.
EDWARD J. BAUSER, EXECUTIVE DIRECTOR

Congress of the United States

JOINT COMMITTEE ON ATOMIC ENERGY

WASHINGTON, D.C. 20510

December 21, 1970

JOHN O. PASTORE, R.I.,
VICE CHAIRMAN
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CLINTON P. ANDERSON, N. MEK.
ALBERT GORE, TENN.
HENRY M. JACKSON, WASH.
GEORGE D. AIKEN, VT.
WALLACE F. BENNETT, ARIZ.
CARL T. CURTIS, NEBR.
MORRIS COTTON, N.J.

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

Dear Mr. Staats:

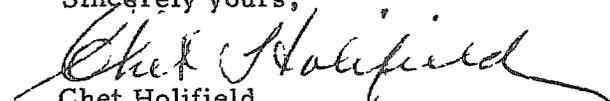
By letter dated December 21, 1970, the AEC submitted to the Joint Committee on Atomic Energy in compliance with the recent amendment to subsection 161v. of the Atomic Energy Act of 1954, as amended, a proposed amendment to the Uranium Enrichment Services Criteria. The act requires in general that such an amendment lie before the Joint Committee for forty-five days while Congress is in session before becoming effective.

According to the AEC letter, it was further determined, with Commissioner Ramey non-concurring, that the charge for enriching services on the basis of the amended Criteria will be set at \$32 per kilogram unit of separative work.

In this connection the Joint Committee would appreciate it if the General Accounting Office would review the proposed amendment, the increased price, the specific assumptions upon which the new price is based, and other related matters, and furnish the Joint Committee with a report thereon at your earliest convenience.

To assist you in this matter, I am enclosing a copy of the letter from Dr. Seaborg dated December 21, 1970, with attachments. Thank you for your cooperation in this matter.

Sincerely yours,


Chet Holifield
Chairman

Enclosure

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D. C. 20545

DEC 21 1970

Honorable Chet Holifield
Chairman, Joint Committee on
Atomic Energy
Congress of the United States

Dear Mr. Holifield:

Revision of the Uranium Enrichment Services Criteria is required to establish Criteria in compliance with the recent amendment to Subsection 161v. of the Atomic Energy Act of 1954, as amended. Attachment "A" is the proposed amendment to the Criteria which has been developed to effect this change. This amendment of the Criteria is herewith submitted to the Joint Committee on Atomic Energy for its review pursuant to Subsection 161v. of the Atomic Energy Act of 1954, as amended.

It has further been determined, with Commissioner Ramey non-concurring, that the charge for enriching services on the basis of the amended Criteria will be set at \$32.00 per kilogram unit of separative work. Major assumptions used as a basis for this charge are presented in Attachment "B". Commissioner Ramey's views are presented in Attachment "C".

The \$32.00 charge is within the limitation of the ceiling charge which was \$32.91 as of July 1, 1970, and is currently estimated to increase to approximately \$36.50 by July 1, 1971. An increase in the recently established charge of \$28.70 which will go into effect on February 22, 1971, is necessary because of increases in the projected costs of separative work, principally the cost of electrical power.

Upon establishment of the amended Criteria, the Commission will announce this charge by publication in the Federal Register. The new charge will go into effect 180 days after such publication, in accordance with paragraph 5(j) of the Criteria.

As Attachment "D" we are enclosing a copy of a public announcement which we plan to make on this action in the next day or so. We would be pleased to provide any further information in this connection as the Committee may require.

Cordially,

/s/ Glenn T. Seaborg

Chairman

Attachments:
A, B, C & D

GAO note: Attachment D has been deleted.

ATTACHMENT "A"

REVISION OF URANIUM ENRICHMENT SERVICES CRITERIA
SECTION 5 - GENERAL FEATURES OF STANDARD DOMESTIC CONTRACTS

Para. (c) - Charge for Enriching Services

Subpar. (1) - The charge for enriching services, in accordance with the Act, will be established on a nondiscriminatory basis and on a basis of recovery of the Government's costs over a reasonable period of time. Applicable charges for enriching services and related services will be those in effect at the time of delivery of enriched uranium to the customer as (i) published in the Federal Register, or (ii) in the absence of such publication, determined in accordance with the Commission's pricing policy. The charge per unit of separative work for enriching services will be the same as that employed in the Commission's published schedule of charges for sale or lease of enriched uranium. The AEC may impose an appropriate surcharge representing additional costs, if any, to the AEC for providing enriching services on short notice.

Subpar. (2) - AEC's charge for enriching services will be established on a basis that will assure the recovery of appropriate Government costs projected over a reasonable period of time. The cost of separative work includes electric power and all other costs, direct and indirect, of operating the gaseous diffusion plants; appropriate depreciation of said plants; and a factor to cover applicable costs of process development, AEC administration and other Government support functions, and imputed interest on investment in plant and working capital. During the early period of growth of nuclear power, there will be only a small civilian demand on the large AEC diffusion plants. These plants were originally constructed for national security purposes, but will be utilized in meeting future civilian requirements. In this interim period of low plant utilization, the Commission has determined that the costs to be charged to the separative work produced for civilian customers will exclude those portions of the costs attributable to depreciation and interest on plant investment which are properly allocable to plant in standby and to excess capacity.

Subpar. (3) - Projections of supply and demand over a reasonable time period will be used in establishing a plan for diffusion plant operations. This plan will be the basis for establishing an average charge for separative work over the period involved, which charge will be kept as stable as possible as operating plans are periodically updated. Under such operating plans, AEC will at times be preproducing enriched uranium. Interest on the separative work costs of any such preproduced inventories will be factored into the average separative work charges.

ATTACHMENT "B"

MAJOR ASSUMPTIONS USED AS BASIS FOR ENRICHMENT
CHARGE OF \$32.00 PER KILOGRAM UNIT OF SEPARATIVE
WORK

1. Campaign Period - 10 year campaign period, FY 1971-80.
2. Discount Rate and Contingency - The time value of expenditures and revenues is based on an average cost of money to the government of 5% per year. The total unit cost of separative work is increased by a contingency factor of 15% to provide an allowance for possible future changes in both annual and cumulative requirements for enriching services, projected plant operational levels and costs based thereon, and the projected level of unit costs for labor, power, and other elements of the cost of enriching services.
3. Requirements - Requirements for enriched uranium are based on the AEC's 1970 forecast of installed civilian nuclear power plants corresponding by the end of 1980 to 150,000 Mwe of domestic power plants and 89,000 Mwe of foreign plants in the rest of the free world using enriched uranium (exclusive of the United Kingdom which has its own uranium enriching capability). The estimate for enriching services further assumes the use of plutonium recycle, beginning in 1974, to reduce requirements for enriched uranium and that a portion of the projected foreign market for enriching services varying from 5% in 1975 to 15% in 1980 will be supplied from sources other than the United States. Government requirements are included to reflect appropriate needs for enriched uranium for Weapons, Military Non-Weapons (including the Navy program) and Civilian Uses for other than power reactors (including research and development needs).
4. Costs - Costs are based on projected levels in FY 1972 and extended thereafter without further adjustment for cost inflation. The elements of cost included are consistent with those enumerated in Section 5 (c) (2) and (3) of the proposed Uranium Enrichment Services Criteria as set forth in Attachment "A".

(Attachment "C")

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D. C. 20545

December 18, 1970

TO: W. B. McCool, Secretary

FROM: James T. Ramey, Commissioner

SUBJECT: Position on Revised Criteria and Increased Price for
Enriching Services for Uranium Fuel

At Information Meeting 1085 on December 14, 1970, the Commission considered SECY-758 entitled "Revision of Uranium Enrichment Services Criteria and Price," a draft public announcement and a table entitled "Cost Components of the Proposed Unit Charge for Separative Work." Following its discussion of these documents the Commission approved the revised criteria as described in SECY-758 and an increase in price for separative work from the \$28.70/kg SWU which is scheduled to go into effect on February 22, 1971, to \$32.00/kg SWU. I agreed to the revised criteria, but did not concur in the proposed increased price.

The proposed price increase to \$32.00 is approximately the same as it would have been if calculated on the basis of the criteria established on August 25, 1970, using cost elements updated to reflect such factors as higher power cost caused by the increase in coal prices. The following are the reasons for my nonconcurrence in this price:

1. As a matter of good business and governmental practice, I believe revisions in the price for enrichment services should take place no more often than once in any given year. With adequate notice, this should permit reasonable planning on the part of the domestic and foreign utilities and equipment companies which purchase these vital fuel services.
2. The abrupt further increase of \$3.30 on top of the February 22, 1971 increase of \$2.70 gives a total increase of 23% over the present \$26.00 price. This could have a disruptive and inflationary effect on nuclear energy costs domestically and internationally. It is particularly not clear that the international implications of this increase have been adequately considered.
3. I would favor continuing with the planned increase to \$28.70 on February 22, 1971 on the basis of either the new or the old criteria. Thereupon I believe the Commission staff should continue its economic and technical studies and a new price, if justified, could be proposed for 1972. In line with my dissent of June 10, 1970 on the first increase, I believe that a formula based on a 15 year averaging period is the most reasonable for pricing purposes. This is growing more manifest with the stretch out of the Cascade Improvement and Cascade Upgrading Programs and delays in the breeder.

/s/ James T. Ramey
James T. Ramey - Commissioner



UNITED STATES
ATOMIC ENERGY COMMISSION

WASHINGTON, D.C. 20545

JAN 11 1971

Mr. F. H. Barclay, Jr.
Associate General Counsel
General Accounting Office
441 G Street, N.W.
Washington, D. C. 20548

Dear Mr. Barclay:

This is in response to your request for the basis of our belief that the charge of \$28.70 per kilogram unit of separative work based on the revised Uranium Enrichment Services Criteria properly may be made effective February 22, 1971, for enrichment services. You also requested our views as to whether such charge could be justified on the basis of the original Criteria established in 1966.

We believe the \$28.70 charge properly may be made for enrichment services rendered on and after February 22, 1971, until modified by the Commission pursuant to the proposed revised Criteria submitted to the Joint Committee on Atomic Energy on December 21, 1970. Our basis for this view is set forth in the enclosed opinion of our General Counsel.

With regard to your latter question, a determination made at this time would result in a charge of \$32.00 as indicated by our recent submission to the Joint Committee of proposed revisions to the Criteria established on August 25, 1970, which would reinstate the Criteria of 1966 in compliance with P.L. 91-560. The \$28.70 charge could also have been justified under the Criteria of 1966 at the time we established the \$28.70 pursuant to the Criteria of 1970.

Sincerely,

A handwritten signature in black ink, appearing to read "James S. Swabey", written over a horizontal line. The signature is fluid and cursive, extending below the line.

Chairman

Enclosure:
Opinion