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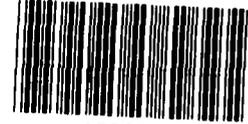
UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

RESOURCES COMMUNITY
AND ECONOMIC DEVELOPMENT
DIVISION

January 26, 1984

B-207463

The Honorable Richard L. Ottinger
Chairman, Subcommittee on Energy
Conservation and Power
Committee on Energy and Commerce
House of Representatives



123307

Dear Mr. Chairman:

Subject: Lost DOE Sales to the Secondary Enriched Uranium
Market Have Resulted in Reduced Revenues
(GAO/RCED-84-76)

Your letter of July 25, 1983, expressed concern about a number of issues related to the Department of Energy's (DOE's) uranium enrichment program. Under this program, DOE enriches uranium for use as a fuel in nuclear power reactors. On November 15, 1983, we responded to your question concerning DOE's allocation of enrichment costs.¹

Another issue you asked us to address was the effect the secondary enriched uranium market has on DOE's enrichment program sales and revenues for fiscal years 1984 through 1988. The secondary market is one in which utilities operating nuclear power reactors become sellers of enriched uranium, generally at discounted prices with the intent of disposing of their surplus inventories. These surpluses have accumulated in recent years because many foreign and domestic utilities are contractually obligated to purchase enriched uranium beyond their specific needs.

DOE has lost sales to secondary market transactions for fiscal years 1984 through 1988 amounting to 9.4 million separate

¹Questions concerning DOE's allocation of costs were addressed in our report: DOE's Allocation of Costs for Uranium Enrichment Services (GAO/RCED-84-64, Nov. 15, 1983).

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work units² of enriched uranium. This represents an estimated revenue reduction of more than \$1.3 billion (in 1984 dollars), or about 9 percent of DOE's \$14 billion estimated revenue for the period. According to DOE officials, if current price discounts continue to be offered on the secondary market through fiscal year 1988, DOE's sales losses for the period could increase and revenues could be reduced by more than \$4 billion, or nearly a third of DOE's estimated revenue. These DOE officials and officials from firms which represent buyers and sellers of enriched uranium believe there is potential for even additional sales losses if further price discounts are offered by those utilities holding surplus inventories.

This report does not address a related question on the effects of a new contract DOE offered to its utility customers on January 18, 1984. We plan to separately address this issue as part of a broader review of the enrichment services program.

OBJECTIVE, SCOPE, AND METHODOLOGY

The objective of our work was to answer the specific question you asked concerning the effect of the secondary enriched uranium market on DOE's sales and revenues under existing contracts for fiscal years 1984 through 1988. To determine the amount of DOE's lost sales to the secondary market, we reviewed DOE records which identified contracted deliveries of enriched uranium that had been terminated by customers and the amounts of enriched uranium those customers purchased from the secondary market. We reviewed DOE reports, analyses, and testimony which contained information on the history and rationale for these sales losses. We interviewed DOE program officials within the Office of the Deputy Assistant Secretary for Uranium Enrichment and Assessment in Germantown, Maryland, and officials from five firms representing utilities interested in buying or selling surplus enriched uranium on the secondary market. These firms are New York Nuclear Corporation, Nuexco, Nukem, Swuco, and Ugusa.

As requested by your office, we did not obtain official agency comments on this report. We did, however, discuss the information contained in a draft of the report with DOE program officials, who agreed with the accuracy of the facts presented. Our review was primarily conducted from August to November 1983. Except for not obtaining agency comments, we performed our review in accordance with generally accepted government auditing standards.

²A separative work unit is a measure of the amount of effort expended to separate a given amount of natural uranium into two components--one having a higher concentration and one having a lower concentration of fissionable uranium-235.

OVERVIEW OF DOE'S URANIUM ENRICHMENT
PROGRAM AND THE EMERGENCE OF THE
SECONDARY MARKET

Uranium enrichment is a process used to increase the concentration of the fissionable uranium-235 isotope found in natural uranium to the levels required for use as a fuel in nuclear power reactors. Since 1969, the federal government--through the former Atomic Energy Commission, the former Energy Research and Development Administration, and now DOE--has operated enrichment plants primarily to enrich customer-owned uranium for use as a fuel in domestic and foreign nuclear power reactors.³ DOE's existing uranium enrichment capability consists of three plants located at Paducah, Kentucky; Portsmouth, Ohio; and Oak Ridge, Tennessee. These plants use a uranium enrichment technology known as gaseous diffusion and have the capacity to produce about 27 million separative work units of enriched uranium per year. DOE is operating the plants at less than half that capacity and estimates that in fiscal year 1984 it will produce about 12 million separative work units.

In providing enrichment services to its customers, DOE is required under section 161(v) of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2201(v)), to price such services at amounts that will recover all of the government's enrichment costs over a reasonable period of time. To satisfy this requirement, each year DOE projects the costs of providing enrichment services to its customers over the ensuing 10-year period and uses this information to develop a price that is calculated to fully recover such costs. DOE currently charges two different prices depending on the type of contract involved.

DOE has three different types of contracts with its customers: (1) requirements, (2) long-term, fixed-commitment, and (3) adjustable, fixed-commitment. DOE's price for its enrichment services under the long-term, fixed-commitment and adjustable, fixed-commitment contracts is \$138.65 per separative work unit of enriched uranium. The price under the requirements contract is \$11.20 per separative work unit higher in order to compensate for the greater risk and costs associated with certain of the contract's provisions. Under each of these contract types, DOE supplies fuel for the life of the nuclear power reactor covered (usually 30 years). The following chart shows, as of October 1983, the number of contracts DOE had in each category and, for

³The Atomic Energy Commission was abolished on January 19, 1975, and its uranium enrichment activities were transferred to the Energy Research and Development Administration. On October 1, 1977, the Energy Research and Development Administration was abolished and its enrichment activities were transferred to DOE.

fiscal year 1983, the number of separative work units provided under each.

<u>Contract type</u>	<u>Contracts^a as of October 1983</u>	<u>Separative work units provided during fiscal year 1983</u> (in millions)
Requirements	75	5.4
Long-term, fixed- commitment	16	(b)
Adjustable, fixed- commitment	<u>185</u>	<u>8.5^b</u>
Total	<u>276</u>	<u>13.9</u>

^aA utility may choose to cover each of its nuclear reactors under separate contract or group several together under one contract.

^bSince the number of separative work units purchased under long-term, fixed-commitment contracts are small, DOE combines them with the adjustable, fixed-commitment category.

Source: Office of the Deputy Assistant Secretary for Uranium Enrichment and Assessment, DOE.

Customers with requirements contracts can defer scheduled deliveries of enriched uranium from DOE if their projected needs do not materialize. If these customers do have a need and decide to purchase enriched uranium from the secondary market, they may terminate DOE deliveries by providing notice and paying penalty charges if required. The termination provision of the requirements contracts signed prior to 1971 allows customers to terminate without penalty if DOE is provided with 3.5 years' or more notice. If less notice is given, the requirements contract provides for a penalty charge ranging from 10 percent to 25 percent of the price for the separative work units being terminated depending on when notice is given. DOE changed the termination provision in 1971 so that any customer signing a requirements contract would have to provide more than 5 years' notice to terminate free of charge and, if less notice is given, pay a penalty charge of 40 percent of the price for the separative work units being terminated.

Beginning in 1973, DOE no longer offered its customers the requirements-type contracts and instead offered them a long-term, fixed-commitment contract which required them to commit to firm quantities of enriched uranium 10 years in advance. DOE believed it needed these commitments by utilities to plan future production levels and construction requirements for new capacity. In anticipation of projected nuclear power industry growth, utilities

readily signed these contracts to ensure that they would have a long-term supply of enriched uranium. However, soon after these contracts were signed, prospects for the nuclear power industry changed dramatically as a result of reduced consumer demand for electricity and concern over nuclear proliferation, health, and safety issues. About 60 of the over 200 domestic nuclear power-plants ordered through the mid-1970's were cancelled. In addition, construction of others has been indefinitely deferred, or has slipped several years. Furthermore, only six domestic plants have been ordered since 1974 and none since 1978.

Since DOE customers had signed long-term contracts based on forecasts that have proved to be overly optimistic, some of these customers found themselves committed to purchasing enrichment services that they no longer needed. In 1979, to grant its existing customers some relief and to provide more flexibility to new customers, DOE offered a new contract. This contract--the adjustable, fixed-commitment contract--reduced the commitment period from 10 to 6.25 years but continues to obligate customers to purchase enrichment services which, in some cases, they do not need if original projections of the requirements were overly optimistic. About 80 percent of the long-term, fixed-commitment customers converted to this new contract.

During the mid-1970's, competition developed as Eurodif and Urenco (two European consortiums) and Techsnabexport (Soviet Union) began supplying foreign nuclear facilities with enriched uranium, and by 1983 these suppliers had captured about 60 percent of the foreign market. Parallel to the decline in the growth of the domestic nuclear power industry, the nuclear power programs of other nations generally have not expanded as was once anticipated. This resulted in some foreign utilities under contract to foreign suppliers being committed to enrichment services that they do not need.

The combination of foreign competition and reduced demand by foreign and domestic utilities that are contractually committed to purchase unneeded enriched uranium from DOE and foreign suppliers has resulted in a worldwide surplus. DOE estimates that utilities have surplus inventories of about 39 million separative work units of enriched uranium in fiscal year 1984 and that this surplus will increase to about 45 million by fiscal year 1988. The secondary market has emerged as a result of this surplus. Essentially it is a market in which both foreign and domestic utilities with excess supplies sell to other utilities generally at discounted prices.

DOE allows its fixed-commitment customers to assign unneeded enriched uranium deliveries to other DOE fixed-commitment customers having enriched uranium needs. Thus, during the 1978 - 1979 time period DOE's fixed-commitment customers entered the secondary market to reduce their surplus inventories, usually at prices below those currently being charged by DOE.

The initial assignments were at prices discounted between \$2 to \$5 per separative work unit. As worldwide competition increased among utilities holding DOE- and foreign-supplied enriched uranium surpluses, the discounts also increased. By mid-1983, some utilities offered enriched uranium at prices between \$90 and \$100 per separative work unit, which is from \$50 to \$60 below DOE's enriched uranium price of \$149.85 offered to DOE requirements contract customers. These large discounts provided an economic incentive for DOE's 3.5-year requirements customers to terminate future deliveries, pay a penalty charge, and purchase enriched uranium on the secondary market. Such secondary market transactions reduce DOE sales and revenues because customers who receive assignments of enriched uranium, or purchase directly from utilities with surpluses, would normally have purchased their requirements from DOE. The following section addresses the effects this enriched uranium secondary market has had on DOE's sales and revenues for fiscal years 1984 through 1988.

DOE SALES LOSSES AND REDUCED REVENUE
INVOLVING THE SECONDARY MARKET
FOR FISCAL YEARS 1984 THROUGH 1988

DOE has lost sales to secondary market transactions for fiscal years 1984 through 1988 amounting to 9.4 million separative work units of enriched uranium, or an estimated revenue reduction of \$1.3 billion. The following chart shows that 8.4 million separative work units, or about 89 percent of these lost sales and reduced revenues, involved the assignment of DOE-produced enriched uranium from one DOE fixed-commitment contract customer to another. The remaining 11 percent of the sales losses involved requirements contract customers who terminated their contracted DOE deliveries and purchased their enriched uranium needs from foreign or domestic utilities holding surpluses.

DOE Sales Losses And Revenue Reductions Involving Secondary Market
Transactions For Fiscal Years 1984 Through 1988

Fiscal year	Assignments between DOE fixed-commitment customers		Purchases by DOE requirements contract customers from foreign or domestic utilities		Totals ^a	
	Sales lost ^b	Estimated revenue reductions ^c	Sales lost ^b	Estimated revenue reductions ^c	Sales lost ^b	Estimated revenue reductions ^c
----- (in millions) -----						
1984	1.6	\$ 223.6	0.7	\$111.9	2.4	\$ 335.5
1985	1.9	257.6	0.1	19.6	2.0	277.2
1986	2.5	341.2	0.0	-0-	2.5	341.2
1987	1.1	156.9	0.1	18.5	1.3	175.4
1988	<u>1.3</u>	<u>179.5</u>	<u>0.1</u>	<u>10.8</u>	<u>1.4</u>	<u>190.3</u>
Totals ^a	<u>8.4</u>	<u>\$1,158.7</u>	<u>1.1</u>	<u>\$160.7</u>	<u>9.4</u>	<u>\$1,319.4</u>

^aAmounts may not total due to rounding.

^bSales losses are in separative work units of enriched uranium.

^cEstimated reductions in revenue are shown at DOE's current enrichment prices.

Source: Prepared by GAO using data on secondary market transactions provided in October 1983 by the Office of Uranium Enrichment and Assessment, DOE.

In addition to the above losses, DOE program officials believe potential for further losses to secondary market transactions for fiscal years 1984 through 1988 is great. Although assignments between DOE's fixed-commitment contract customers have accounted for the vast majority of the secondary market losses to date, these officials told us that the greatest potential for further sales losses is from those requirements contract customers having the 3.5 year termination provision. This is largely because surplus inventories are projected to remain high for these years and many customers have reduced their scheduled purchases from DOE and have not yet contracted to meet their projected needs.

DOE documents show that its requirements contract customers have terminated deliveries of about 15 million separative work units, or about 70 percent of the 21 million originally scheduled for delivery to these customers in fiscal years 1984 through 1988. As indicated in the above chart, these customers have replaced only 1.1 million separative work units of enriched uranium on the secondary market. DOE program officials believe many of these customers will purchase additional enriched uranium on the secondary market at the time their requirements materialize. If the remaining 13.9 million separative work units of enriched

uranium deliveries already terminated were replaced with secondary market purchases, DOE's revenues would be reduced by \$2 billion.

DOE program officials further believe that if sellers on the secondary market continue to offer enriched uranium at reduced prices, the remaining 6 million separative work units under 3.5 year requirements contracts may be terminated. If these customers do terminate and meet their needs with purchases from the secondary market, DOE's revenues would be reduced by an additional \$1 billion. Officials from the five firms representing buyers and sellers of enriched uranium told us that under current conditions DOE's customers with requirements contracts having 3.5-year termination provisions do not have sufficient economic incentive to purchase enriched uranium from DOE because of the large price discounts offered by secondary market sources.

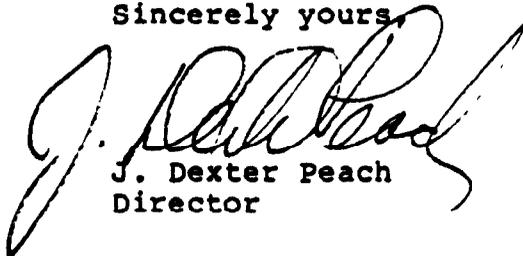
Under its requirements contracts having 5-year termination provisions, DOE has scheduled deliveries for fiscal years 1984 through 1988 of about 21 million separative work units, valued at about \$3.1 billion. DOE program officials believe these scheduled deliveries are potentially vulnerable to the secondary market if utilities dealing in the secondary market offer further price discounts. To date, these customers have not terminated the scheduled deliveries to purchase on the secondary market because the penalty charge is greater than the discount offered. Officials from the five firms we spoke to agreed with DOE program officials that if the secondary market price for enriched uranium continues to decrease, these customers may find it economically advantageous to terminate their future DOE deliveries.

Officials from DOE and the five firms said that some utilities would continue to buy from DOE regardless of price because of reasons such as loyalty or the lack of expertise for dealing in the secondary market. However, these officials would not project how many of the utilities with 3.5 and 5 year requirements contracts would opt to continue buying from DOE rather than terminating their DOE scheduled deliveries and purchasing enriched uranium from the secondary market.

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As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 3 days from the date it is issued. At that time, we will send copies to the Director, Office of Management and Budget; the Secretary of Energy; and interested committees and Members of Congress. Copies will also be made available to others upon request.

Sincerely yours

A handwritten signature in black ink, appearing to read "J. Dexter Peach". The signature is stylized and cursive, with a large initial "J" and a long, sweeping underline.

J. Dexter Peach
Director