



UNITED STATES GENERAL ACCOUNTING OFFICE

WASHINGTON, D.C. 20548

119501

ENERGY AND MINERALS  
DIVISION

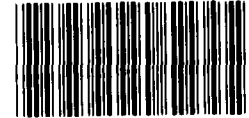
September 17, 1982

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**RELEASED**

The Honorable John D. Dingell  
Chairman, Subcommittee on Oversight  
and Investigations  
Committee on Energy and Commerce  
House of Representatives



119501

Dear Mr. Chairman:

**Subject:** Information on the Cost of Plutonium  
Needed to Operate the Clinch River  
Breeder Reactor For Its 5-Year  
Demonstration (GAO/EMD-82-128)

On July 14, 1982, you requested that we provide information on the cost of supplying the plutonium needed to fuel the Clinch River Breeder Reactor (CRBR) for its planned 5-year demonstration scheduled to run from 1989 through 1993. The Department of Energy (DOE) needs about 6.2 million grams of plutonium for fuel fabrication--2.1 million grams to begin operating the CRBR and an additional 4.1 million grams during the 5 year demonstration.

The only existing domestic source of plutonium for CRBR fuel is from DOE's defense programs. Currently, DOE breeder officials plan to use plutonium from this source to fuel the CRBR. According to DOE defense programs officials, however, national defense needs could impact their capability to supply the necessary plutonium. Depending on whether the plutonium comes from existing stockpiles or is produced in the future, its value could range from \$23 to over \$200 per gram, or about \$143 million to over \$1.2 billion if DOE's defense programs provide all the necessary plutonium. DOE officials emphasized, however, that an equivalent amount of plutonium is expected to be returned to defense programs from the plutonium produced in the CRBR and remaining in the fuel from the CRBR's planned use as a demonstration project. Because of plans to replace the plutonium, DOE officials believe the only cost to the Government for providing the plutonium from defense programs will be the cost to reprocess the CRBR spent fuel as a necessary step in returning

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the plutonium to DOE defense programs. 1/ They estimate that such reprocessing would cost between \$90 and \$120 million (1984 dollars).

DOE officials identified two other potential future sources of plutonium for CRBR fuel. They are (1) reprocessed spent fuel 2/ from commercial nuclear powerplants and (2) foreign sources. They estimated that plutonium acquired from commercial spent fuel might cost between \$15 to \$35 per gram. DOE officials could provide no detailed estimates of the potential cost of acquiring plutonium from foreign sources.

The following sections (1) provide background on the CRBR project and its plutonium requirements; (2) provide more detailed information on potential sources and estimated costs of this plutonium; and (3) describe our objective, scope, and methodology.

#### BACKGROUND ON THE CRBR PROJECT AND ITS PLUTONIUM REQUIREMENTS

From the nuclear power program's beginning, the Federal Government and the nuclear industry recognized that uranium resources are limited and long-term use of nuclear power would require more efficient use of domestic uranium resources. A breeder reactor, which produces more usable nuclear fuel than it consumes, would extend domestic uranium resources almost indefinitely. Thus, since the mid-1940s, various breeder reactor projects have been undertaken. In 1967, after evaluating several types of breeder reactors, the Atomic Energy Commission (AEC) 3/ declared the Liquid Metal Fast Breeder Reactor (LMFBR) to be its highest breeder reactor development priority and developed a broad-based LMFBR research and development program.

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1/The House/Senate Conference on H.R. 2330--the fiscal year 1982 and 1983 Nuclear Regulatory Commission authorization bill--is now considering a provision which could impact on the extent plutonium from CRBR spent fuel could be transferred back to DOE's defense programs. Specifically, the Senate version of that bill provides that special nuclear material produced in certain nuclear facilities may not be transferred, reprocessed, used or otherwise made available for nuclear explosive purposes.

2/Spent fuel from a commercial reactor contains plutonium that was produced during the nuclear fission process.

3/The AEC was a predecessor agency of DOE.

To demonstrate LMFBR technology AEC, in 1972, entered into an agreement with the Commonwealth Edison Company, the Tennessee Valley Authority, and the Project Management Corporation <sup>1/</sup> to build the CRBR and operate it for 5 years. Under the agreement DOE is required to provide fuel for the first 5 years of the CRBR's operation--the planned demonstration period.

Plutonium is a major ingredient of the fuel needed for the CRBR. DOE's Office of Nuclear Materials Production, under the Assistant Secretary for Defense Programs, is responsible for meeting the Government's plutonium requirements. That Office has traditionally provided plutonium, at no charge, to DOE's breeder program.

The CRBR will need about 2.1 million grams of plutonium to begin operating. According to DOE's current schedule, plutonium will be needed for fuel fabrication beginning in 1987 to permit CRBR operation in 1989. In theory, once the CRBR begins operating it should produce more than enough plutonium to re-fuel itself. DOE breeder program officials told us, however, that it is unlikely any plutonium produced will be available to provide fuel for the CRBR during its 5-year demonstration period. This is because the plutonium produced is in the CRBR's spent fuel and, according to the May 1982 Final Environmental Impact Statement on the LMFBR Program, DOE's breeder program will not have the capability to reprocess this spent fuel in order to extract plutonium until 1996--a few years after the CRBR demonstration is scheduled to end. Thus, additional plutonium--about 4.1 million grams--will be required to operate the CRBR through its 5-year demonstration period. All of this plutonium, about 6.2 million grams, will most likely have to be supplied from one or more sources outside DOE's breeder program.

SOURCES AND COST OF ACQUIRING  
PLUTONIUM FOR CRBR FUEL ARE  
SPECULATIVE

Although DOE officials have not specified exactly where they will acquire the necessary plutonium to fuel the CRBR, they identified several potential sources. These include DOE defense programs, which DOE breeder officials currently expect to provide all the necessary plutonium to fuel the CRBR, and two other potential future sources--reprocessing commercial nuclear spent fuel and/or foreign sources. The costs associated with acquiring plutonium from these sources not only vary widely but are speculative.

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<sup>1/</sup>The Project Management Corporation was formed as a non-profit organization by the utility industry to participate in the management of the CRBR project.

Currently, the only domestic source of plutonium is DOE's defense programs. According to DOE, the defense programs could supply CRBR plutonium requirements either from existing stockpiles or by producing it at existing production facilities or some combination of the two. DOE defense programs officials, however, will not specify the exact source of any plutonium they might supply because to do so might reveal classified information related to national defense plutonium requirements. Additionally, defense programs officials told us that this Nation's defense needs could impact on their capability to supply the necessary plutonium.

The value of any plutonium supplied by DOE's defense programs would vary significantly depending on whether the plutonium is obtained from current stockpiles or produced at existing facilities. For example, substantial amounts of plutonium capable of fueling the CRBR have already been produced and stockpiled--some of it from the early 1970s. The value of this plutonium, according to DOE defense programs officials, is about \$23 per gram. On the other hand, according to these same officials, if plutonium for the CRBR is produced in 1984 or later it would be valued at over \$200 a gram. Thus, the value of CRBR plutonium provided from DOE's defense programs could range from about \$143 million--if all the plutonium comes from existing inventories--to over \$1.2 billion--if all the plutonium required is produced after 1984. These officials told us, however, that if they had to provide all the plutonium from the defense programs facilities it would probably come from a combination of current inventories and future production. Thus, the value of any plutonium supplied would likely fall somewhere between the two estimates.

Defense programs officials also pointed out that they will expect the amount of plutonium provided to the CRBR project to eventually be returned to the defense programs from the plutonium produced and/or remaining from the CRBR's 5-year demonstration. In their view, therefore, the only cost to the Government for providing plutonium would be the cost to reprocess the CRBR spent fuel as a necessary step in reacquiring the plutonium. They estimated that if all the plutonium to fuel the CRBR was supplied from the defense programs such reprocessing would cost from about \$90 to \$120 million (1984 dollars). Although DOE defense programs officials acknowledge that there would be some additional costs--such as storing and transporting the CRBR spent fuel--they do not believe this would add significantly to above estimates. In addition, the above estimate does not include possible imputed interest cost to the Government that may occur in providing plutonium from the defense programs to the CRBR on an interim basis.

Another source of plutonium that may be available to DOE at some future time is reprocessed commercial nuclear reactor spent fuel. DOE officials estimate that the cost of plutonium from this source could range from \$15 to \$35 a gram. This cost

range is based on DOE officials' preliminary estimates of prices they might be able to negotiate for reprocessing services. Thus, the cost range is speculative at this time. Furthermore, domestic capability for reprocessing commercial spent fuel does not now exist, and it is not clear whether it will be available to meet CRBR project schedule and plutonium requirements.

Finally, DOE officials stated that some plutonium, if needed, could be acquired from foreign sources. They added, however, that this would involve high-level policy decisions and country-to-country negotiations. DOE officials said no negotiations are underway to acquire plutonium for the CRBR from foreign sources, nor are any related cost estimates currently available. Therefore, we believe it is premature to speculate about the potential cost of plutonium under this option.

#### OBJECTIVE, SCOPE, AND METHODOLOGY

Our overall objective was to obtain information on the cost of acquiring plutonium to fuel the CRBR for its first 5 years of operation. We discussed the plutonium requirements and costs with DOE headquarters officials and DOE officials at Oak Ridge, Tennessee, responsible for managing the CRBR project. We also reviewed data on the plutonium requirements and costs provided by these officials. In addition, we discussed the availability of plutonium for meeting these requirements with officials in DOE's Office of Nuclear Materials Production under the Assistant Secretary for Defense Programs.

We also used information we had previously gathered for a report entitled "DOE Confident It Can Fuel the Clinch River Breeder Reactor and Other Breeder Reactor Projects" (GAO/EMD-82-89, May 14, 1982). As agreed with your office, we did not verify all data provided by DOE because of your expressed need for this information as soon as possible, and because the potential sources and costs of plutonium are so speculative at this time. We did, however, selectively test the reasonableness of specific figures by examining supporting documentation and by comparing these figures to information gathered in previous audits. We also examined DOE's methodology and assumptions used in developing their estimates to ensure they were reasonable.

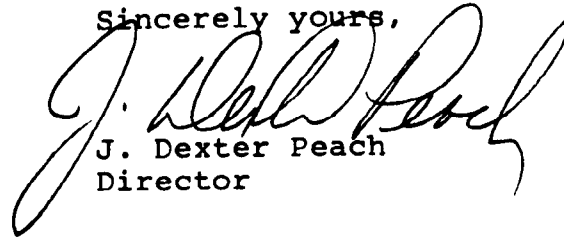
We performed our work in accordance with GAO's "Standards for Audit of Governmental Organizations, Programs, Activities and Functions."

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As your office requested, we did not obtain DOE's formal comments on this report. However, we discussed the facts presented in the report with responsible DOE officials to insure accuracy.

As arranged with your office, we plan no further distribution of this report until 3 days from the date of this report. At that time, we will send copies of the report to the Director, Office of Management and Budget, the Secretary of Energy, other interested parties, and make copies available to others upon request.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "J. Dexter Peach". The signature is written in black ink and is positioned above the printed name and title.

J. Dexter Peach  
Director