

October 11, 1979

**Memorandum to the Files by Gary R. Bray,
ACDA/NP/NE [Bureau of Nonproliferation and
Regional Arms Control, Nuclear Energy Division],
'Japanese Plutonium Supply and Demand Update'**

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Summary:

The memorandum describing Japan's latest plutonium supply and demand.

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UNITED STATES ARMS CONTROL AND DISARMAMENT AGENCY

October 11, 1979

MEMORANDUM TO THE FILES

FROM: ACDA/NP/NE - Gary R. Bray ^{nRB}

SUBJECT: Japanese Plutonium Supply and Demand Update

The last set of graphs and tables detailing the Japanese plutonium supply and demand situation was developed early in March 1979. The general conclusion of that paper was that the Japanese would experience a shortage plutonium for their FBR and ATR programs during the decade of 1980 to 1990 but would have a large excess of plutonium during the 1990's.

Additional information has become available and the attached paper reflects on improved plutonium supply picture for the 1980's. The most important changes in the supply situation are the addition of plutonium arising from the reprocessing of magnox fuel at Windscale and the reprocessing of spent FBR fuels on a laboratory and pilot plant scales in Japan during the 1980's.

The general conclusion reached by the attached paper is that Japan will have more than enough plutonium to conduct its FBR and ATR programs presently planned for the 1980's and will in fact have an excess of plutonium by 1990. This conclusion is based on the assumption that all announced programs in the area of plutonium utilization meet their respective schedules, goals and objectives both in the area of supply and demand. This includes the operation of the Tokai Mura reprocessing facility, reprocessing of some FBR spent fuel as well as deployment of another LMFBR and a large ATR facility.

It is recognized that several different scenarios can be developed. On one hand, an extreme case could be presented that all or most of the programs related to the supply of plutonium fall short of their objectives while the reactor deployment programs remain on schedule resulting in a large plutonium shortfall. On the other hand an extreme case can be presented in which all plutonium supply programs met their objectives but deployment of FBR's and ATR's are delayed resulting in an excess of plutonium. Both cases are equally credible.

The Japanese can be expected to dispute the conclusion of the attached paper. First the Japanese will state that the reprocessing of FBR spent fuel during the 1980's is a research and development program and as such is not directed at the production of plutonium. Therefore, the quantity of plutonium recovered from their FBR reprocessing program is very difficult to predict. Secondly, the Japanese will state that the recovery of plutonium at the Tokai Mura reprocessing facility is dependent on the U.S. approval to operate that facility and upon the Japanese technical ability to maintain the reprocessing facility in an operable mode. And finally, the Japanese will point to the fact that the return of the plutonium from Western European reprocessing of Japanese spent fuel will depend upon the Western Europeans meeting their operational schedules and upon the U.S. approvals to return the recovered plutonium to Japan and is, therefore in doubt. The U.S. approval for the return of recovered plutonium from Europe could be delayed until 1986 or later depending on when the plutonium is available.

A separate observation is also important. It appears, but has not been confirmed, that the Japanese have used only magnox generated plutonium in their FBR program and presently plan to continue that mode of operations. If this is true the U.S. has no direct control over the reprocessing of Japanese FBR fuel and the resultant recovered plutonium.

The projected excess of plutonium in Japan by 1990 occurs without the operation of a large (1,500 MTU/year) LWR reprocessing facility. If such a reprocessing facility were to be placed in operation in Japan the only reasonable use that could be made of the recovered plutonium would be thermal recycle in existing LWR's.

ACDA/NP/NE:GRBray:nw

Japanese Plutonium
Supply and Demand
Dates

October 12, 1979

The following graph and table update information relative to the Japanese plutonium supply and demand situation. The two major changes to the information presented during March 1979 is, first, the addition of the quantity of plutonium being recovered from the continuing reprocessing of magnox fuel at Windscale, and secondly, the addition of the quantity of plutonium to be recovered from reprocessing of FBR spent fuels scheduled to be reprocessed in Japan during the 1980's.

Spent magnox fuel is generated from Takai-1 a gas cooled 159 MWe reactor. This spent fuel is being shipped to the UK and reprocessed on a continuing bases. There is approximately 70kg of plutonium per year recovered from the reprocessing of this magnox fuel. At present there is approximately 400kg of Japanese plutonium on inventory at Windscale. The Japanese are presently planning to utilize this plutonium to fabricate the next core for Joyo.

The Japanese have a two phase program for the reprocessing of FBR spent fuel. A FBR fuel reprocessing test facility will be constructed in Japan by 1987. Preliminary design for the construction of this facility has already been completed. Meanwhile, a chemical processing facility is now under construction at Tokai Works with completion scheduled for mid fiscal 1980. The stated reprocessing capacity of this facility is approximately 120 kg HM/day.

The Japanese are still planning to have approximately 5,600 MTU of spent fuel reprocessed in Western Europe during the decade 1980 to 1990. The plutonium recovered from this reprocessing is scheduled to start return to Japan by 1986.

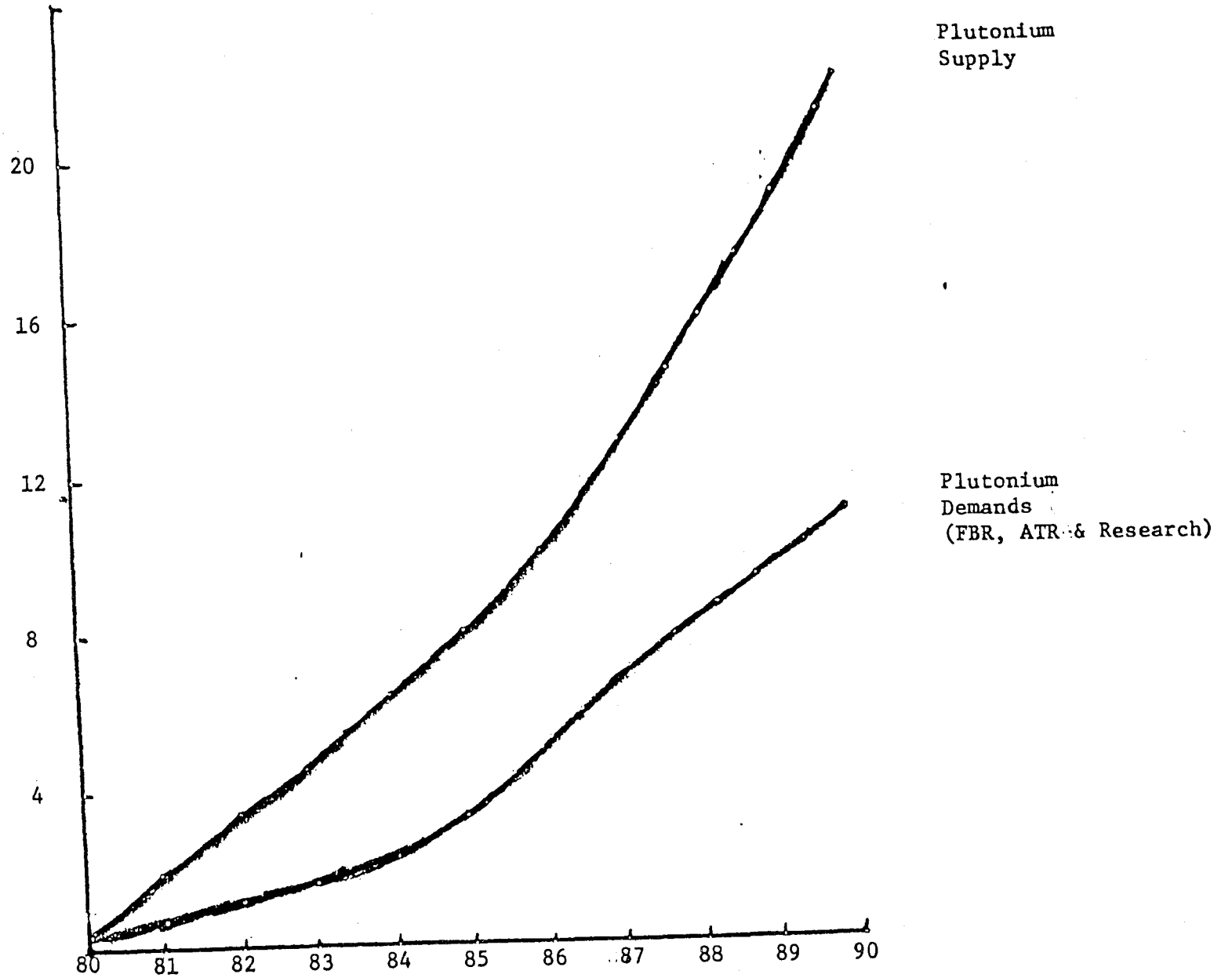
The plutonium demand situation is as presented by the Japanese in earlier meetings. The near term demands include fuels for both Joyo and Fugen and require approximately 270 kgs of plutonium per year. Later large quantities of plutonium will be required by Monju and a future ATR demo facility.

In summary, the attached graph shows that the present announced Japanese programs should provide more than enough plutonium to meet stated requirements without the introduction of a large reprocessing facility. If a large (1,500 MTU/year) reprocessing facility is placed in operations early in 1990's between 10,000 to 15,000 kgs of plutonium will be recovered with no stated end use.

Cumulative Japanese Plutonium Supply and Demand

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Author: [illegible]

Metric Tons Plutonium



Projected Japanese Plutonium Supply and Demand (Kg PuF)

<u>Demand</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>
annual for Joyo	180	180	180	180	180	180	180	180	180	180	180
cumulative for Joyo	180	360	540	720	900	1080	1260	1440	1620	1800	1980
annual for Fugen	95	95	95	95	95	95	95	95	95	95	95
cumulative for Fugen	95	190	285	380	475	570	665	760	855	950	1045
annual for Monju					680	680	680	680	680	680	680
cumulative for Monju					680	1360	2040	2720	3400	4080	4760
annual for ATR Demo						600	600	300	300	300	300
cumulative for ATR Demo						600	1200	1500	1800	2100	2400
annual for R&D	50	50	50	50	50	50	50	50	50	50	50
cumulative for R&D	50	100	150	200	250	300	350	400	450	500	550
annual Total Demand	325	325	325	325	1005	1605	1605	1305	1305	1305	1305
cumulative Total Demand	325	650	975	1300	2305	3910	5515	6820	8125	9430	10,735
<u>Supply</u>											
MOX reprocessing at UK (Annual)	400	70	70	70	70	70	70	70	70	70	70
(cumulative)	400	470	540	610	680	750	820	890	960	1030	1100
Tokai reprocessing (Annual)	600	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
(cumulative)	600	1800	3000	4200	5400	6600	7800	9000	10,200	11,400	12,600
FBR-Fuels reprocessing (annual)		180	180	180	180	180	180	180	180	180	180
(cumulative)		180	360	540	720	900	1080	1260	1440	1620	1800
URG-UK&France reprocessing (annual)							1000	1000	1000	1000	1000
(cumulative)							1000	2000	3000	4000	5000
Annual Total Supply	1000	1270	1450	1450	1450	1450	2450	2450	2950	3370	3370
Cumulative Total Supply	1000	2270	3720	5170	6620	8070	10,520	13,040	15,990	19,360	22,730
<u>Balance</u>											
annual balance	675	945	1125	1125	445	(-155)	845	1145	1645	2065	2065
cumulative balance	675	1620	2745	3870	4315	4160	5005	6150	7795	9860	11,925