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*Plutonium Reprocessing
and Nuclear Proliferation*

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Plutonium Reprocessing and Nuclear Proliferation

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the Joint Economic Committee
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¹ The views and recommendations presented in this testimony are solely those of the author and do not necessarily represent those of RAND or any of its research sponsors.

Mr. Chairman and members of the Committee, it is my pleasure to appear before you to express my views on the challenges the plutonium trade poses to effective nuclear nonproliferation regimes. For this testimony, I will focus on two areas. First, what problems will arise in safeguarding this trade? Second, what should the United States and other countries do regarding the emerging international market in plutonium reprocessing and use?

Problems of International Trade in Plutonium

Plutonium trade creates two problems. First is the potential for diversion of plutonium by terrorist or subnational groups. If the global economy comes to make extensive use of military or civilian plutonium, that would make it much more difficult for the International Atomic Energy Agency (IAEA) to do its job. Plutonium would appear in many vulnerable places--reprocessing plants, fabrication plants, storage facilities, reactor sites and, most troublesome of all, the transportation network on land, at sea and in the air. IAEA safeguards can be effective, but only if the world does not create an impossible environment for the IAEA to operate in. Allowing massive use of plutonium in civilian nuclear power comes close to creating such a hostile environment.

The second problem that arises from the plutonium trade is the potential for seizure of plutonium by host nations, instead of subnational groups. Neither the IAEA nor any other organization can prevent countries from seizing plutonium that is located within their territories. This possibility is de-emphasized by many plutonium proponents, who argue that any country that wants nuclear weapons will get them. This is simply not true. Libya and perhaps Iran have wanted nuclear weapons for years, but fortunately they have not succeeded in obtaining them. Although plutonium separation and use could be restricted to industrialized countries such as Japan, it would eventually be difficult for the world to draw an equitable line dividing those countries which can have separated plutonium and those which cannot. Countries with good nonproliferation credentials now could turn bad in the future. Had the United States helped the Shah of Iran develop a civilian plutonium reprocessing capability, as it had done with many other programs, Iran would have had separated plutonium now for its nuclear weapon development program. Allowing widespread use of plutonium would lead to many countries being situated dangerously and ambiguously near the nuclear threshold. There would likely be no timely warning to the international community, when any of these countries decided to cross the threshold. The Treaty on the Non-Proliferation of Nuclear Weapons (NPT) cannot be reasonably interpreted to have the intent that nonnuclear weapon states can come within merely days of having nuclear weapons.

Why, then, would the world want to introduce such a problematic element into commerce? From the dawn of the nuclear age to the seventies, it was thought that uranium resources for power generation were running out fast and that plutonium would soon be more economical. Since the eighties, projections of civilian nuclear power growth have been revised severely downward and additional types and amounts of uranium ores have been discovered. Still, some countries are unwilling to alter their original plan of

eventual plutonium use, because they remain worried that they could not develop an alternative by the time the economics favors plutonium. But in RAND's recent study², we found that plutonium use will be uneconomical for the next 30-50 years, or possibly much longer. Moreover, there will always be enough plutonium in the spent fuel to support even an optimistic plutonium-based breeder reactor buildup, in the event that breeders are needed unexpectedly. Therefore, countries do not have to plunge into plutonium use prematurely. It is disappointing to see that, while countries are reiterating their commitment to nonproliferation, they are not willing to forego even their uneconomical plutonium activities, which raise grave proliferation concerns.

Limiting access to weapon-usable fissile materials³ is a key instrument in the current international nuclear nonproliferation regime. Plutonium proponents have not suggested an effective substitute. It would be unfortunate, if we gave up one of the very few effective nonproliferation instruments for some economic benefits that do not show any sign of appearing.

What the U.S. and Other Countries Should Do Regarding the Plutonium Trade

Is the plutonium trade too far along to be reversed? The United States, Germany and Belgium have had civilian reprocessing activities in the past, but have since terminated such operations. Countries that are currently reprocessing spent fuel for civilian purposes are France, the former Soviet republics (FSRs), the U.K., Japan, India, Israel and N. Korea. Although the last three countries are claiming a civilian intent for their reprocessing activities, some or all of the plutonium they have separated is most likely used in their undeclared nuclear weapon programs. It is the difficulty of ascertaining its real purpose that makes civilian reprocessing dangerous. While the FSRs still plan for thermal recycle⁴ and continue to develop breeders, their economic destitution in general and the economic penalties of using plutonium in particular make a rapid commercialization of plutonium unlikely. In Europe, the breeder programs have shrunk drastically because of miserable economic perspectives, poor reactor performance and/or strong political opposition, and a quick reversal is unlikely. As to thermal recycle, the U.K. has no plans for it. France's interest in thermal recycle has been driven significantly by its scaled-back and troubled breeder program. The plutonium need by the breeder program has declined sharply, but the French do not want to adjust plutonium separation activities downward fully. Instead, they view thermal recycle as a means to consume the excess plutonium. Germany's interest

² Brian G Chow and Kenneth A Solomon, *Limiting the Spread of Weapon-Usable Fissile Materials*, MR-346-USDP, November 1993.

³ Weapon-usable fissile materials are defined as uranium with a fissile isotopic content of 20 percent or more and plutonium of practically any isotopic composition. Weapon-usable plutonium includes plutonium separated from the typical spent fuel of commercial nuclear reactors (reactor-grade plutonium) and plutonium from nuclear weapons (weapon-grade plutonium). Plutonium before being separated from the intensely radioactive spent fuel is not, however, considered as weapon-usable fissile material is this testimony.

⁴ The use of plutonium in a reactor which relies on relatively low energy (thermal) neutrons for fission. Thermal recycle includes the use of plutonium in most of the existing commercial nuclear power plants such as pressurized water reactors and boiling water reactors.

in thermal recycle also has much to do with using it as a means to eliminate separated plutonium and "close" the nuclear fuel cycle. Only Japan still has an aggressive program in both breeders and thermal recycle. But even there, the pace of the program has been slowed, and further postponements are likely.

It is unrealistic to expect countries to terminate their plutonium programs immediately. The strategy should be to scale back current plutonium programs and discourage the startup of new programs. Nuclear proliferation is an international problem and requires an international solution. The end of the Cold War and the dismantling of tens of thousands of nuclear weapons have resulted in a new strategic environment that deserves a concerted international reexamination and renegotiation of plutonium, as well as weapon-usable uranium, activities. We can take some immediate pressure off countries such as Germany by allowing longer storage of separated plutonium at their contractors' reprocessing sites or in the United States, instead of passively watching the use of civilian plutonium in reactors. As to reprocessing, our chance of success is better on the demand, as opposed to the supply, side. We should encourage countries not to sign any more plutonium reprocessing contracts. Moreover, given the difficulties of developing permanent spent fuel or waste repositories anywhere in the world, establishing interim spent fuel storage as an intermediate step would relieve some countries from the need to reprocess.

Longer-term steps are often ignored and not taken by the international nuclear community, because they are not urgent. Yet, they would improve the alternatives to plutonium for energy security and would allow countries that forgo plutonium activities to share the benefits of plutonium, if it ever unexpectedly turned economical. The steps recommended below have been elaborated in our aforementioned report, the summary of which I would like to be included in the hearing record. These steps will provide added assurance and incentives for countries to terminate their plutonium programs.

- Prolonging the world's reliance on existing reactors in the once-through mode. This entails improving the reactors' efficiency and identifying additional uranium resources at current and higher prices.
- Encouraging development of advanced nuclear reactors that would be safer and even more efficient and proliferation-resistant. These advanced reactors do not have to be breeders; highly efficient converters will do. Both uranium- and thorium-based fuel cycles should be considered.
- Confining sensitive civilian nuclear materials and facilities within the five currently declared nuclear weapon states to the extent possible, while agreeing to share the benefits, if any, of these activities with other nations. Exceptions may have to be made for some Japanese and others' facilities that are already in operation. Still, these countries should scale back their plutonium activities. If Japan and other countries are interested, they should be allowed to be passive stockholders in sensitive facilities located in nuclear weapon states in exchange for forgoing their own activities. Also, as an added inducement, countries forgoing

sensitive nuclear activities can become the host countries of international banks holding natural uranium and low-enriched uranium. In general, states without sensitive activities will be favored over states with such activities as sites for non-sensitive, yet important, components of the international nuclear fuel cycle activities.

Concluding Remarks

Since the dawn of the nuclear age, many countries have planned to use plutonium in their civilian nuclear programs. Even though they now recognize that the date for economic use of plutonium will be distant and that the threat of North Korea's plutonium-based nuclear weapon program is serious, halting the momentum toward a plutonium economy is still a daunting task. But, the chance to change the nuclear course is now better than ever. Many countries, including some of the most ardent plutonium supporters such as France, Germany, and the U.K., have scaled back their plutonium activities as a result of political and economic pressure. Even Japan's plutonium program faces delays. Considering that a continuation of the past course would situate many countries uncomfortably near the nuclear threshold, we have no alternative but to make a serious attempt to discourage the spread of both military and civilian plutonium, as well as other sensitive nuclear materials, worldwide.

