I am alarmed at the idea of using surplus weapons plutonium in fuel for nuclear reactors (known as mixed-oxide or MOX fuel). A better method of disposition would be to immobilize the plutonium – that is, to mix it with ceramic or glass and to provide a radioactive barrier to further prevent theft and diversion. This would solve some problems without as many safety risks. 1

It is not demonstrably safe to use MOX fuel in existing reactors, almost none of which are designed to run on plutonium fuel. According to a study released by the Nuclear Control Institute in January, the use of a one-third core of warhead plutonium fuel in U.S. nuclear reactors could result in up to a 37% increase in cancer risk to the public in the event of a severe accident. That is irresponsible and unacceptable, and furthermore, no citizen especially wants the government to give him cancer. 2

In addition, it is unconscionable to implement such a program without involving the public on more than the present superficial level. 3

Minatom officials claim that plutonium is a valuable energy resource. Yet by their own estimates, plutonium-based nuclear energy will be more expensive than uranium-based nuclear energy for at least several decades. US officials say that MOX is not being pursued for its energy value but rather that it has been chosen to facilitate quick disposition of plutonium in Russia. However, immobilization is likely to be a much faster and cheaper method of plutonium disposition than MOX. 4

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WR007–1 **Alternatives**

DOE acknowledges the commentor's opposition to the use of surplus weapons-grade plutonium in MOX fuel and irradiating it in nuclear reactors. DOE has identified as its preferred alternative the hybrid approach. Pursuing both immobilization and MOX fuel fabrication provides the United States important insurance against potential disadvantages of implementing either approach by itself. The hybrid approach also provides the best opportunity for U.S. leadership in working with Russia to implement similar options for reducing Russia's excess plutonium in parallel. Further, it sends the strongest possible signal to the world of U.S. determination to reduce stockpiles of surplus plutonium as quickly as possible and in a manner that would make it technically difficult to use the plutonium in nuclear weapons again.

DOE does not agree that the MOX approach is inherently more dangerous than the immobilization approach. DOE and NAS have conducted studies to compare risks, including the nuclear material security and proliferation risks of alternatives analyzed in this SPD EIS. These studies include the *Nonproliferation and Arms Control Assessment of Weapons-Usable Fissile Material Storage and Excess Plutonium Disposition Alternatives* (DOE/NN-0007, January 1997), *Proliferation Vulnerability Red Team Report* (SAND97-8203, October 1996), *Management and Disposition of Excess Weapons Plutonium* (NAS, 1994), and *Management and Disposition of Excess Weapons Plutonium, Reactor-Related Options* (NAS, 1995). As discussed in Section 4.28.2.5, studies by NAS have led it to the following conclusion: "no important overall adverse impact of MOX use on the accident probabilities of the LWRs involved will occur; if there are adequate reactivity and thermal margins in the fuel, as licensing review should ensure, the main remaining determinants of accident probabilities will involve factors not related to fuel composition and hence unaffected by the use of MOX rather than LEU fuel."

The environmental, safety and health consequences of the MOX approach at the proposed reactors are addressed in Section 4.28. In addition, NRC would evaluate license applications and monitor the operations of both the MOX facility and domestic, commercial reactors selected to use MOX fuel, to ensure adequate margins of safety.

WR007–2 **Facility Accidents**

While it is understood that there are differences from the use of MOX fuel versus LEU fuel, these differences are not expected to result in substantial changes in the frequency of severe accidents in MOX-fueled reactors. Because differences between MOX fuel and uranium fuel are well characterized, they can be accommodated through fuel and core design. The fabrication of MOX fuel and its use in commercial reactors has been accomplished in Western Europe. This experience would be used for disposition of the U.S. surplus plutonium. Before any MOX fuel is used in the United States, NRC would have to perform a comprehensive safety review that would include information prepared by the reactor plant operators as part of their license amendment applications.

This SPD EIS analyzed several reactor accidents, including both design basis and beyond-design-basis accidents. For MOX fuel, as compared to LEU fuel, there is an increase in risk, about 3 percent, for the large-break loss-of-coolant accident (the bounding design basis accident). The largest increase in risk for beyond-design-basis accidents is approximately 14 percent for an interfacing systems loss-of-coolant accident at North Anna. In the unlikely event this beyond-design-basis accident were to occur, the expected number of LCFs would increase from 2,980 to 3,390 with a partial MOX core and prompt fatalities would increase from 54 to 60. Both of these accidents have an extremely low probability of occurrence. At North Anna, the likelihood of a large-break loss-of-coolant accident occurring is 1 chance in 48 thousand per year and the likelihood of an interfacing systems loss-of-coolant accident occurring is 1 chance in 4.2 million per year.

WR007–3 **General SPD EIS and NEPA Process**

The SPD Final EIS was not issued until specific reactors had been identified and the public had an opportunity to comment on the reactor-specific information. As part of the procurement process, bidders were asked to provide environmental information to support their proposals. This information was analyzed in an Environmental Critique prepared for the DOE source selection board prior to award of the MOX fuel fabrication and irradiation services contract. DOE then prepared an Environmental Synopsis on the basis of the Environmental Critique, which was released to the public as Appendix P of the *Supplement to the SPD Draft EIS* in April 1999. This *Supplement* included a description of the affected environment around the three proposed reactor sites, and analyses of the potential environmental impacts of operating these reactors using MOX fuel (Sections 3.7 and 4.28 of this SPD EIS, respectively). During the 45-day period for public comment on the *Supplement*, DOE held a public hearing in Washington, D.C., on June 15, 1999, and invited comments. For those interested parties who could not attend the hearing, DOE provided various other means for the public to express their concerns and provide comments: mail, a toll-free telephone and fax line, and the MD Web site. Further, interested parties would likely have the opportunity to submit additional comments during the NRC reactor license amendment process should the MOX approach be pursued per the SPD EIS ROD.

WR007–4 **Cost**

Although cost will be a factor in the decisionmaking process, this SPD EIS contains environmental impact data and does not address the costs associated with the various alternatives. A separate cost report, *Cost Analysis in Support of Site Selection for Surplus Weapons-Usable Plutonium Disposition* (DOE/MD-0009, July 1998), which analyzes the site-specific cost estimates for each alternative, was made available around the same time as the SPD Draft EIS. This report and the *Plutonium Disposition Life-Cycle Costs and Cost-Related Comment Resolution Document* (DOE/MD-0013, November 1999), which covers recent life-cycle cost analyses associated with the preferred alternative, are available on the MD Web site at http://www.doe-md.com. These documents, as well as data reports and documents used in the preparation of this EIS, are available in the public reading rooms at the following locations: Hanford, INEEL, Pantex, SRS, and Washington, D.C.

Operation of the proposed surplus plutonium disposition facilities is expected to take approximately the same amount of time for either the immobilization-only approach or the hybrid approach. The difference in timing for the hybrid approach is associated with the amount of time that MOX fuel would be irradiated in domestic, commercial reactors.

As shown in the cost report, *Cost Analysis in Support of Site Selection for Surplus Weapons-Usable Plutonium Disposition* (DOE/MD-0009, July 1998), it is expected that the hybrid approach, which includes both immobilization and MOX fuel, would be more expensive than the immobilization-only approach. However, pursuing the hybrid approach provides the United States important insurance against potential disadvantages of implementing either approach by itself as discussed in response WR007–1.

Fresh MOX fuel in commerce presents a proliferation threat as
the plutonium in it can be removed and used for weapons
purposes. A 1997 DOE non-proliferation assessment of
plutonium disposition found “that fresh MOX fuel remains a 5
material in the most sensitive safeguards category, because
plutonium suitable for use in weapons could be separated
from it relatively quickly and easily.”

Instead of solving the problem of placing plutonium into safe
and secure forms, a MOX program is likely to promote further
plutonium processing and use, something that is undesirable 6
on environmental, safety, economic, and non-proliferation
grounds.

Plutonium disposition programs must include significant and
meaningful public input, including access to all information,
including costs and operating records of the various actors
involved in a disposition program. The public in the 7
communities most directly affected should have ample
opportunity for meaningful input into the decision-making
process. All US funding of Russian programs should be
contingent on compliance with the appropriate environmental 8
and public process laws.

Sarah J. Lindholm

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WR007–5 **Nonproliferation**

In order to address security against terrorist-related incidents, all intersite shipments of plutonium for the surplus plutonium disposition program would be made using DOE’s SST/SGT system. This involves having couriers that are armed Federal officers, an armored tractor to protect the crew from attack, and specially designed escort vehicles containing advanced communications equipment and additional couriers. Further, DOE does not anticipate the need for any additional security measures at reactor sites, other than for the additional security applied for the receipt of fresh fuel. Commercial reactors currently have armed security forces, primarily to protect against perimeter intrusion. There would be increased security for the receipt and storage of fresh MOX fuel, as compared with that for fresh LEU fuel, for additional vigilance inside the perimeter. However, the increased security surveillance would be a small increment to the plant’s existing security plan. After irradiation, the MOX fuel would be removed from the reactor and managed with the rest of the spent fuel from the reactor, eventually being disposed of at a potential geologic repository built in accordance with the NWPA.

WR007–6 **Nonproliferation**

Consistent with the U.S. policy of discouraging the civilian use of plutonium, a MOX facility would be built and operated subject to the following strict conditions: construction would take place at a secure DOE site, it would be owned by the U.S. Government, operations would be limited exclusively to the disposition of surplus plutonium, and the MOX facility would be shut down at the completion of the surplus plutonium disposition program. For reactor irradiation, the NRC license would authorize only the participating reactors to use MOX fuel fabricated from surplus plutonium, and the irradiation would be a once-through cycle with no reprocessing.

WR007–7 **General SPD EIS and NEPA Process**

This comment is addressed in response WR007–3.

WR007–8 **DOE Policy**

For fiscal year 1999 (starting October 1998), the U.S. Congress appropriated funding to assist Russia in design and construction of a plutonium conversion facility and a MOX fuel fabrication facility. This funding would not be expended until the presidents of both countries signed a new agreement.

In July 1998, Vice President Gore and former Russian Prime Minister Sergei Kiriyenko negotiated the *Agreement on Scientific and Technical Cooperation in the Management of Plutonium* that enables the two countries to explore mutually acceptable strategies for disposing of surplus weapons-usable plutonium. The U.S. and Russian governments are currently working on their respective plutonium disposition programs under a *Joint Statement of Principles* which was signed by Presidents Clinton and Yeltsin on September 2, 1998, in Moscow. The two presidents agreed on principles to guide implementation of this program by building industrial-scale facilities in both countries. In 1999, negotiations are proceeding for a *Bilateral Plutonium Disposition Agreement* to enable the United States and Russia to work together to ensure that the disposition facilities are technically viable and that progress is made on implementing the selected approaches. Through these agreements and others that may be negotiated, the United States is attempting to work with Russia to safely disposition its surplus plutonium.