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January 14, 2013

The Honorable Dr. Steven Chu
Secretary
Department of Energy
1000 Independence Avenue SW
Washington, D.C., 20585

Dear Secretary Chu:

I write to request information related to the Department of Energy's efforts to dispose of excess weapons-grade plutonium through the fabrication of mixed oxide (MOX) fuel that will be burned in nuclear reactors. I have long opposed these plans on the grounds that the cost and environmental impact of this approach have been grossly underestimated, that this approach blurs the longstanding distinction between civilian and military uses of nuclear technology and raises nonproliferation concerns, and that alternative approaches have not been properly considered¹. In addition to these concerns, several recent reports suggest that the Mixed Oxide Fuel Fabrication Facility (MFFF), under construction at the Savannah River Site, may be over budget, behind schedule, and lacking even a single customer for its product. These reports call into question the viability and fiscal wisdom of the Department's current approach. I am very concerned about these reports, as they suggest that the MOX program may be both wasting taxpayer dollars and ultimately failing to reduce our stores of surplus weapons-grade plutonium.

The MFFF is designed to blend plutonium-oxide, derived from surplus weapons-grade plutonium, with uranium-oxide to produce fuel rods for commercial power reactors. Construction on MFFF began in 2007, with a construction budget of \$4.8 billion and a planned completion date in 2016. A report in the Sept. 28 issue of Nuclear Weapons and Materials Monitor, however, suggests that DOE internal estimates of construction costs are now \$2 billion higher due to "a significant rise in commodity prices as well as hiring and retention issues, problems finding nuclear qualified vendors and difficulty obtaining specialty components from the long-dormant nuclear industry." Some of these same issues were also identified as risks in the National Nuclear Security Administration's (NNSA) FY13 Congressional budget request for MFFF, where difficulties in finding suppliers that meet Nuclear Quality Assurance 1 standards and an almost complete turnover in the construction management staff of Shaw AREVA MOX

¹ <http://markey.house.gov/document/2012/2002-letter-doe-plutonium-disposition;>
<http://markey.house.gov/document/2012/2002-letter-doe-mox;> <http://markey.house.gov/document/2012/1997-letter-doe-mox>

Services in a single year are cited². These challenges are also highlighted by a recent Nuclear Regulatory Commission (NRC) report on flawed welds in glove boxes delivered to MFFF by a supplier³.

Moreover, in unscripted comments, NNSA personnel have confirmed the reality of these underlying budgetary and supply problems. In a Sept. 17 article, "U.S. Department of Energy Honors Byers Precision Fabricators," the Blue Ridge Times-News quoted Kevin Hall, an acting project director for NNSA overseeing the MFFF construction, as saying, "I'm getting behind schedule. And I'm going to have to determine whether I have to go to Congress and ask for more money — never a lot of fun."⁴ Furthermore, the DOE Office of Engineering and Construction Management currently lists the MFFF as being in their worst performance category: "expected to breach its Performance Baseline cost, schedule, or scope"⁵.

Additionally, the projected operating costs for the MOX plutonium-disposition program are listed at nearly \$500 million per year in the FY13 budget. With operations planned for at least 20 years, this represents nearly \$10 billion of taxpayer dollars spent on a program with an uncertain future in an era of shrinking federal budgets.

Even more troubling than these cost over-runs are reports that NNSA lacks customers for the MOX product that is costing so much to produce. The use of MOX fuel potentially requires some reactor modifications as well as changes in the management of the spent fuel waste. It is unclear which utilities might be willing to take on the challenge of using this new fuel, and it is undecided whether DOE will subsidize these additional costs. In the recent draft supplemental environmental impact statement (SEIS) on plutonium disposition, DOE listed burning of MOX fuel in the Brown's Ferry and Sequoyah nuclear reactors run by the Tennessee Valley Authority (TVA) as the preferred alternative for plutonium disposition⁶. TVA, however, has declared no intention to use MOX fuel and, in fact, has publicly stated that even considering it is not in their list of top priorities. Preston Swafford, chief nuclear officer at TVA, stated he believed MOX could be safely used in TVA reactors but that even considering the use of the fuel was "just so low on my radar screen that I refuse to jump in the fray."⁷ Instead Swafford emphasized the need to fix problems identified by the NRC in the Brown's Ferry reactors. NNSA has not identified any other utilities that are planning to use MOX fuel, raising concerns that MFFF-produced fuel may not even have a customer.

There is also the issue of testing of the MOX fuel before it is deployed in commercial reactors. Although there is a long history of using MOX made from spent nuclear fuel in Europe, there is no such experience here in the US. In addition, there is a different composition of plutonium isotopes in weapons-grade plutonium and the plutonium extracted from spent nuclear fuel rods, which may influence the behavior of the MOX fuel. NRC has not approved MOX for use in any commercial reactor and a recent presentation to NRC by Global Nuclear Fuel, which

² <http://www.cfo.doe.gov/budget/13budget/Content/Volume1.pdf>

³ <http://www.nrc.gov/reading-rm/doc-collections/event-status/event/en.html>

⁴ <http://www.blueridgenow.com/article/20120917/ARTICLES/120919810?tc=ar>

⁵ <http://energy.gov/management/downloads/november-2012-project-dashboard>

⁶ <http://nnsa.energy.gov/aboutus/ouroperations/generalcounsel/nepaoverview/nepa/spdsupplementaleis>

⁷ <http://timesdaily.com/stories/From-bomb-to-power.195760>

manufactures fuel assemblies for light water reactors, suggested a lengthy testing procedure would be required to qualify MOX from the MFFF for use in US commercial boiling water reactors (BWR), potentially delaying any commercial use until at least 2025⁸. Previous tests conducted at Duke's Catawba pressurized water reactor (PWR) were terminated after only two cycles, and it remains unclear if additional testing in PWRs will be required. It is likely that at least some additional testing in BWR and PWR will be required before commercial MOX use, likely incurring additional costs and delays in the program.

There are also concerns related to the placement of MOX fuel on-site or into any future nuclear waste repository. Spent MOX fuel reportedly is thermally hotter than spent low enriched uranium fuel. Because of this higher temperature, spent MOX fuel may need to be stored at lower density in cooling pools and dry storage and may need to be stored longer than standard spent fuel. It is not clear that these increased requirements for MOX waste have been adequately considered in the cost and utility of the MOX program.

While there is near-universal agreement on the need for the permanent disposal of our surplus weapons-grade plutonium, it is far from clear that the Department's current plan is the most cost-effective means of doing so. The Alliance for Nuclear Accountability estimates that the lifetime cost of the MOX program will likely approach \$20 billion⁹. An estimate by the Congressional Research Service¹⁰ suggests that the 47 metric tons of weapons-grade plutonium that is slated for disposal would provide the fuel necessary to produce between 170 and 300 billion kilowatt hours of electricity, depending on the isotopic blend of the plutonium and the extent of fuel burnup in reactors. Assuming a wholesale electrical power price of \$0.1/kilowatt hour, this represents between \$16 and \$28 billion worth of electrical power. The cost of the nuclear fuel, however, is only a fraction of the cost of producing and distributing that power. The Congressional Research Service estimates that the replacement value of the MOX nuclear fuel used to generate this power is between \$1.1 and \$2 billion, produced by a program that potentially has a \$20 billion price tag. The Alliance for Nuclear Accountability estimates that this same plutonium could be disposed of as waste for less than \$5 billion. I am very concerned about moving forward with a disposal plan that will potentially cost \$15 billion more than other alternatives and has an uncertain chance of success in order to provide \$2 billion in electrical power generation subsidies for select utilities and customers.

In light of these concerns, I request answers to the following questions:

1. Please provide an updated estimate for the construction costs for the MFFF and associated structures. Please explain any changes in estimated costs compared to the FY13 budget.

⁸ <http://www.ananuclear.org/Portals/0/GNF%20on%20MOX%20LUAs%20NRC%20meeting%208.8.2012.pdf>

⁹ <http://ananuclear.org/Portals/0/group%20comments%20on%20draft%20plutonium%20SEIS%2010.10.2012%20pdf.pdf>

¹⁰ <http://markey.house.gov/sites/markey.house.gov/files/documents/2013-01->

[10 CRS Plutonium Electricity Generation Memo Markey.pdf](#)

2. Has the Department obtained reports prepared or delivered by Shaw AREVA MOX Services or other associated contractors indicating that costs for the MFFF construction are likely to increase? If yes, please provide a copy of each such report.
 - a. Are these potential cost increases being reviewed by DOE and incorporated as appropriate into the Department's FY14 budget request (and estimates for the project's overall costs)? If no, why not? If yes, when will this review be finalized? If yes, how large are the costs increases in these reports and what factors are suggested as driving the increase?
3. Please give a detailed timeline for the completion of the MFFF and other facilities necessary for the MOX plutonium disposition program. Please list all key contractors involved in this construction.
4. Please describe all steps being taken and planned to address the problems the DOE Office of Engineering and Construction Management identified when classifying the MFFF construction project as likely to breach the baseline cost, schedule, or scope in their recent reports.
5. What is the current estimate for the startup cost of the MFFF?
6. Have negotiations for "Early Option 2" MFFF plant startup with AREVA been completed? If yes, please provide a copy of the contract. If no, please provide an outline of the proposed scope of work, estimated costs, and an estimate of when the contract will be signed.
7. Please give a detailed timeline for the necessary work to startup the conversion of plutonium pits to MOX fuel. Include both necessary demonstration projects as well as the work associated with ramp-up to full-scale production. List all key contractors involved in these startup processes.
8. What is the timeline for applying for NRC approval to initiate MOX production at MFFF? Does DOE anticipate any risks with the equipment or processes planned for MFFF? In your response, please describe how the MFFF equipment and processes, which are modeled on the MELOX plant in France, has been adapted for U.S. regulatory environment and nuclear industry safety culture.
9. What is the current estimate for the annual operating costs of the MFFF and associated facilities after startup, when MOX fuel is being produced?
10. Please provide a detailed timeline for the production of MOX fuel. For example, how many fuel assemblies will be produced in each year of the program? When will the MFFF exhaust the current supply of surplus weapons-grade plutonium? Are there current plans for the MFFF and related facilities beyond this date? List all key contractors involved in production operations.
11. Has DOE considered any use of the MOX plant beyond the existing mission to make MOX fuel from surplus weapons-grade plutonium? For example, has there been

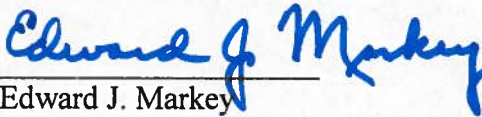
discussion or documents prepared related to production of fuel for fast neutron reactors or next-generation reactors?

12. What is the current estimate for the shutdown, decontamination, and decommissioning costs for the MFFF and related facilities?
13. Please provide a detailed timeline for the shutdown process of the MFFF and related facilities. List all key contractors involved in the shutdown procedure.
14. What additional costs besides those asked for above are anticipated in the currently planned plutonium disposition program? Please describe each activity, the anticipated cost, and list the key contractors involved.
15. What testing do you anticipate will be required for NRC to certify the use of MOX in boiling water reactors? What about in pressurized water reactors?
16. If NRC requires testing of MOX fuel assemblies, do you have arrangements with a nuclear power utility in place to conduct those tests? If no, why not?
 - a. If yes, which utilities will participate in the testing? Please provide a detailed work plan and timeline for any planned or anticipated testing, including both irradiation in reactors and analysis of extracted fuel rods.
17. Please list the nuclear power utilities DOE has contacted to discuss the possibility of using MOX for power production, and provide me with copies of all correspondence related to such discussions.
18. Which nuclear power utilities have agreed to use MOX fuel? Under what conditions have these utilities agreed to use the fuel? When are these utilities expected to begin using MOX fuel?
19. Which nuclear power utilities are considering the use of MOX fuel? What conditions have these utilities placed on making a commitment? Please describe DOE's next steps to secure an agreement.
20. If no utilities have agreed to or are considering the use of MOX or if more utilities are needed to burn all the MOX fuel within a reasonable timeframe, please describe DOE's plan to secure an agreement with additional nuclear power utilities.
21. What reactor and procedure modifications are expected to be necessary for each of the nuclear power utilities that have agreed or are considering the use of MOX fuel? If no specific utility has agreed to or is considering the use of MOX fuel, describe the typical necessary reactor and procedure modifications for a boiling water reactor and a pressurized water reactor. Does DOE expect to subsidize the cost of these reactor or procedure modifications? If so, what are the anticipated costs of these modifications?
22. How would MOX fuel be distributed to nuclear power utilities? Would the utilities pay market price, a discounted price, or be given the fuel outright?

23. Please describe any anticipated differences in the handling of spent MOX fuel as compared to spent low enriched uranium fuel. What additional costs are anticipated for these necessary changes in waste handling with spent MOX fuel? Will DOE subsidize these costs?
24. Do you agree with the CRS estimate¹¹ that the MOX fuel produced by the currently planned plutonium disposition program would have a value between \$1.1 and \$1.93 billion in 2013 dollars? If not, please explain where you disagree with the CRS estimate and how this changes the estimate of the value.
25. Please provide an estimate of the costs associated with disposal of surplus weapons-grade plutonium as waste. For example, what would be the per kilogram cost of disposal at the Waste Isolation Pilot Plant (WIPP) or another suitable facility?
26. Please provide a timeline for the potential disposal of surplus weapons-grade plutonium as waste at WIPP or another suitable facility.

Thank you for your attention to this important matter. Please provide written responses to these questions no later than February 15, 2013. If you have any questions, please have a member of your staff contact Dr. Chris Schaffer or Dr. Michal Freedhoff in my office at 202-225-2836.

Sincerely,


Edward J. Markey

¹¹ [http://markey.house.gov/sites/markey.house.gov/files/documents/2013-01-10 CRS Plutonium Electricity Generation Memo Markey.pdf](http://markey.house.gov/sites/markey.house.gov/files/documents/2013-01-10_CRS_Plutonium_Electricity_Generation_Memo_Markey.pdf)