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Comments of the Institute for Energy and Environmental Research on the Draft Surplus Plutonium Disposition Supplemental Environmental Impact Statement (DOE/EIS-0283-S2) Issued by U.S. Department of Energy's National Nuclear Security Administration, July 2012

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Submitted via email to spdsupplementaleis@saic.com

I. Overview

The Institute for Energy and Environmental Research (IEER) is in general agreement with the comments, analysis, and recommendations filed by the Alliance for Nuclear Accountability (ANA) and others[1] on the Draft Supplemental Environmental Impact Statement DOE/EIS-0283-S2 (Draft SEIS). IEER's main comments, including some drawn from ANA et al. 2012, can be summarized as follows:

- The DOE has not identified specific utilities that have agreed to use MOX fuel or utilities that have made commitments to test MOX fuel. The reactors belonging to TVA identified by in the Draft EIS do not meet this test, since the TVA has not agreed to use MOX fuel produced by the DOE. Further, three of the five TVA reactors identified by the TVA are boiling water reactors (BWRs). MOX made from weapons plutonium has never been used on a commercial scale in power reactors and has never even been tested in Boiling Water Reactors (BWRs).
- Given the that the waste confidence rule and decision of the Nuclear Regulatory Commission (NRC) has been vacated by a federal court, the NRC has suspended all licensing and relicensing decisions. Given the license expiry dates of the TVA reactors, among other factors, it is unclear if the identified reactors will be available to consume all the MOX fuel that DOE plans to produce.
- In view of the fact that the Tennessee Valley Authority has not agreed to use MOX fuel made from weapons-grade plutonium, the DOE's "Preferred Alternative" is lacking an essential element. The additional MOX that is identified in the Preferred Alternative in

[1] Alliance for Nuclear Accountability et al., "Group Comments Submitted for the Record of the Department of Energy's *Draft Surplus Plutonium Disposition Supplemental Environmental Impact Statement* (DOE/EIS-0283-S2, July 2012)," October 10, 2012, referred to hereafter as ANA et al. 2012.

the Draft EIS would add to the 34 metric tons previously slated for MOX fuel production. The two matters are linked since the additional MOX would aggravate the problem of finding a sufficient number of reactors to use it within a reasonable time frame or even to use it at all.

- There would be storage costs and impacts if some or all of the produced MOX fuel has to be stored for a long period at SRS, if sufficient reactor facilities are not available and licensed to use weapons-MOX fuel. The impacts of prolonged storage of MOX fuel in case sufficient reactor capacity to irradiate it is not available should be evaluated.
- The costs of the MOX program are escalating out of control. This increases the likelihood of the entire program failing, especially given the tight federal budgetary environment. It is therefore essential for DOE to identify cheaper alternatives for the entire amount of plutonium that has been declared surplus to US nuclear weapons requirements, including the 13.1 metric tons considered in the Draft SEIS and the 34 metric tons that was not considered in it because it was previously slated for MOX fuel production. Given that cost increases, delays, and technical issues have put these plans into jeopardy, it is essential for DOE, both on security and environmental grounds to evaluate disposition alternatives for the entire surplus plutonium inventory.
- The plutonium disposition EIS must contain a "[a] full discussion of revisions of facilities at SRS and Los Alamos to process plutonium from nuclear weapons "triggers"" as stated in ANA et al. 2012.
- The agreement with Russia on surplus weapons plutonium disposition is not a treaty and the US can proceed to treat plutonium as a waste to be disposed of, especially given that Russia is proceeding on its own path and is not going to use MOX fuel in light water reactors.
- In view of the analysis in these comments, we conclude that the Draft SEIS is partial and essentially incomplete. It does not identify a valid and complete Preferred Alternative. As such it does not meet the requirements of the National Environmental Policy Act. It is essential for DOE to prepare a new or supplemental Programmatic Environmental Impact Statement (PEIS) for the entire surplus plutonium disposition program. A number of other parties have also asked for this.[2]
- An alternative that would process all surplus plutonium, including the 34 metric tons previously slated for MOX fuel production, and the 13.1 metric tons under consideration in the Draft SEIS, as TRU waste for disposal in a deep geologic repository should be evaluated. If the volume of TRU waste thus produced cannot be accommodated within the present legal framework for WIPP, other repository options should be evaluated.

More detail on some of these points is provided below.

II. The preferred alternative is incomplete and invalid

The Draft SEIS defines the "Preferred Alternative" as follows:

> ***Preferred Alternative:*** The MOX Fuel Alternative is DOE's Preferred Alternative for surplus plutonium disposition. DOE's preferred option for pit disassembly and

[2] ANA et al. 2012.

> the conversion of surplus plutonium metal, regardless of its origins, to feed for MFFF [MOX Fuel Fabrication Facility] is to use some combination of facilities at Technical Area 55 at Los Alamos National Laboratory and K-Area, H-Canyon/HB-Line, and MFFF at SRS, rather than to construct a new stand-alone facility. This would likely require the installation of additional equipment and other modifications to some of these facilities. DOE's preferred alternative for disposition of surplus plutonium that is not suitable for MOX fuel fabrication is disposal at WIPP. *The TVA does not have a preferred alternative at this time regarding whether to pursue irradiation of MOX fuel in TVA reactors and which reactors might be used for this purpose*.[3]

This is not a valid preferred alternative disposition option for plutonium since it is fundamentally incomplete.

First, as the Draft SEIS itself states, "[t]he TVA does not have a preferred alternative." Indeed, the TVA has not asked the NRC for consideration of the safety of weapons-MOX fuel use in any of its reactors, to say nothing of the troubled Browns Ferry reactors. The actions that the TVA would have to take to get these reactors approved by the NRC for weapons-MOX fuel use include safety and environmental reports, and, very likely, the preparation of an EIS by the NRC. It is difficult to imagine that the NRC would grant a license amendment for weapons-MOX fuel use in any reactors, much less reactors that are similar in design to the stricken Fukushima Daiichi reactors (as is the case with the Browns Ferry units), without a full EIS and safety evaluation.

Second, the licenses of two of the five reactors specified in the Draft EIS, TVA's Sequoyah reactors, expire in 2020 and 2021. This would be just after the presently estimated commissioning of the MOX plant in 2018. While the Sequoyah reactors could, in theory, be relicensed for another twenty years, it is essential to note that at present all commercial reactor licensing and relicensing decisions have been suspended by the NRC since its waste confidence rule was vacated by a federal appeals court in June 2012. The vacated rule was an essential basis of NRC reactor licensing and license extension decisions. While the NRC plans to issue an EIS to resurrect some form of the waste confidence rule, it is unclear whether the new document will meet the criteria set forth in the appeals court decision. Among other things the court required the NRC to consider long-term, even indefinite storage on-site of spent fuel, given that the availability of a repository is not assured. But the NRC decision setting forth the framework for the EIS includes consideration of only a limited time frame.[4] The outcome of an EIS process that actually addressed on site storage for hundreds of years is at present unknown. It cannot be assumed, *a priori*, that the impacts of such storage would be small. Therefore, it cannot be assumed that the Sequoyah reactors will be relicensed. The Draft EIS cannot rely on these reactors as part of the preferred alternative both because TVA has not agreed to weapons-MOX fuel use in them and because their license extensions are at present in question and will remain so for some time.

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[3] Draft SEIS Summary, p. iv, italics added.

[4] R. W. Borchardt, Executive Director for Operations, memorandum to Annette L. Vietti-Cook, Secretary, "Subject: Staff Requirements – COMSECY-12-0016 – Approach for Addressing Policy Issues Resulting from Court Decision to Vacate Waste Confidence Decision and Rule," NRC, September 6, 2012. Hereafter NRC 2012.

The license of the three Browns Ferry reactors expire in 2033 (Unit 1), 2034 (Unit 2), and 2036 Unit 3). None of these units will be able to accommodate the anticipated 24 years that the Draft SEIS estimates would be the operational life of the MOX facility;[5] indeed, it unclear if even a much shorter period could be accommodated. The MOX plant would have to produce fuel that would be specifically designed for BWRs and this fuel would need to be tested. Hence the beginning of full scale use (one-third MOX core) at Browns Ferry could not begin until well into the decade of the 2020s even if there are no further delays in completing the work on the MFFF and the related facilities that are needed.

In view of the above scheduling and licensing issues, the DOE has not identified licensed reactors for half or more of its MOX fuel production, quite apart from the fact that the TVA has not agreed to use or test any of it.

Hence, the Preferred Alternative is essentially incomplete even in its own terms. The appeal to "generic reactors" in the Draft SEIS as possible facilities for weapons-MOX irradiation is entirely speculative and without technical or legal foundation; it raises a host of questions. Would they be existing reactors? Given the parade of utilities that have backed out of weapons-MOX fuel use after expressing interest, striating in the mid-1990s, this is an unlikely and speculative prospect. If the term "generic design" refers to new designs of reactors, then there are even more questions: Are they certified designs? If not, when would they be certified? Would they be certified for MOX fuel use? Would they need fuel different from the types that the DOE currently plans to manufacture? What would be the schedule of licensing and constructing such reactors? How would that schedule match with the planned production schedule of the MOX plant? It is worth noting explicitly, though it should go without saying, that the claims of reactor vendors cannot be a basis for assuming some new reactor design could use weapons-MOX fuel. Only and NRC certification could provide such a basis.

Third, given the history of delays that have plagued the MOX program, and the likelihood of further delays arising for instance, from the need to add to and modify facilities at Los Alamos, another epicenter of cost overruns and delays (not to speak of seismic issues), it is unclear even a decade of post-testing MOX fuel use could be accommodated at two or even all three of the Browns Ferry reactors.

Fourth, the Draft EIS admits that the amount of spent fuel to be stored will increase by 2 to 16 percent during the period weapons-MOX fuel use.[6] Given that the waste confidence decision has been vacated and the needed EIS process has not even begun (no formal scope has been published as yet), it is incorrect to assume that the impacts of extended spent fuel storage will be small. MOX spent fuel will add to the risks, costs, and potential impacts. Indeed, a central problem with the Draft SEIS is that it implicitly assumes the impacts of MOX spent fuel storage are small:

[5] Draft SEIS, Vol. 2, Table C-30, p. C-25.
[6] Draft EIS, Vol. 2, Appendix I, p. I-17.

> It is expected that increases of this magnitude would be managed within the reactor's normal planning for storage in its used fuel storage pool or dry storage casks.[7]

There is at present no valid estimate of the environmental impacts of prolonged spent fuel storage, and such impacts are required to be calculated by federal court order:

> …[W]e hold the WCD [Waste Confidence Decision] is defective on far simpler grounds: As we have determined, the WCD is a major federal action because it is used to allow the licensing of nuclear plants….Therefore, the WCD requires an EIS or, alternatively, an EA that concludes with a finding of no significant impact. The Commission did not supply a suitable FONSI here because it did not examine the environmental effects of failing to establish a repository.
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> Even taking the Commission's word that the WCD constitutes an EA for the permanent storage conclusion,…the EA is insufficient because a finding that "reasonable assurance exists that sufficient mined geologic repository capacity will be available when necessary," …does not describe a probability of failure so low as to dismiss the potential consequences of such a failure. Under NEPA, an agency must look at both the probabilities of potentially harmful events and the consequences if those events come to pass….An agency may find no significant impact if the probability is so low as to be "remote and speculative," or if the combination of probability and harm is sufficiently minimal….Here, a "reasonable assurance" that permanent storage will be available is a far cry from finding the likelihood of nonavailability to be "remote and speculative." The Commission failed to examine the environmental consequences of failing to establish a repository when one is needed.
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> …[W]e are focused on the effects of a *failure* to secure permanent storage. The Commission apparently has no longterm plan other than hoping for a geologic repository. If the government continues to fail in its quest to establish one, then SNF will seemingly be stored on site at nuclear plants on a permanent basis. The Commission can and must assess the potential environmental effects of such a failure.[8]

The practical result of the action of the court that vacated the Waste Confidence Decision is that there is currently no valid environmental impact assessment of spent fuel storage for the long-term. Such an assessment is required even for LEU. Therefore, the Draft SEIS's assumption that additional MOX spent fuel storage could be accommodated as part of "normal planning" is not in compliance with the requirements of NEPA as currently interpreted. The NRC has decided to do an EIS,[9] and is not appealing the court's decision to vacate the Waste Confidence Decision.

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[7] Draft SEIS, Vol. 2, p. I-17.
[8] State of New York et al. v. Nuclear Regulatory Commission, U.S. Court of Appeals for the District of Columbia Circuit, No. 11-1045, June 8, 2012.
[9] NRC 2012.

In view of the above considerations regarding the impacts of MOX spent fuel storage and the fact that there is at present no valid waste confidence rule, the Draft SEIS estimation of the environmental impacts MOX spent fuel storage is invalid under NEPA. A valid analysis must await the EIS process now envisaged by the NRC. Then the incremental impacts of extended MOX spent fuel storage must be added to that assessment. While the Commissioners of the NRC have asked the staff to complete the process in two years and limited the time frame for considering impacts of storage,[10] it is pertinent to note that the staff put the needed time at five years for a limited EIS and seven years for the full EIS that would include very long term storage (200 to 300 years).[11]

The absence of reactors that would use all or even part of the MOX fuel and the waste as well as the suspension of licensing and relicensing decisions by the NRC, there is a real prospect that MOX fuel would just accumulate at Savannah River Site after production begins. The costs and impacts of long-term storage need to be taken into account in the SEIS. Further, if the storage time is long, increasing amounts of plutonium-241 will decay into americium-241. The usability of weapons-MOX fuel after prolonged storage needs to be examined in the SEIS. It is possible the sufficiently long storage would necessitate reprocessing to remove the americium-241, leading to higher costs, increased impacts, and greater delays. Such costs and delays may further jeopardize the entire program.

IEER's analysis indicates that the Preferred Alternative in fundamentally incomplete and, given the lack of consideration of waste impacts and licensing issues discussed above, invalid. This reinforces the recommendation that it needs to be redone in the form of a supplemental or new PEIS.

III. Alternatives

In view of the various fundamental problems with the Preferred Alternative in the Draft SEIS, which also generally affect the prior NEPA analysis and decision to convert 34 metric tons of weapons-grade plutonium into MOX, it is essential that non-MOX alternatives be explored in more detail for all the surplus plutonium. Specifically, these alternatives must take into account the plain reality that the spent fuel standard for plutonium is obsolete and is not being followed by the DOE regarding at least some of the plutonium that DOE is disposing of and/or proposes to dispose of at WIPP. IEER is in agreement with the following comments and analysis in ANA et al. 2012:

> DOE earlier presented that getting plutonium into a form which had the equivalent radiation barrier as spent fuel – the so-called "spent fuel standard" –

[10] NRC 2012.

[11] Memorandum from R. W. Borchardt, Executive Director for Operations, to NRC Chairman Macfarlane, Commissioner Svinicki, Commissioner Apostolakis, Commissioner Magwood, Commissioner Ostendorff, "Subject: Approach for Addressing Policy Issues Resulting from Court Decision to Vacate Waste Confidence Decision and Rule," COMSECY-12-0016, NRC July 9, 2012. See the table on p. 9 for suggested staff schedule.

was a main driver for the plutonium disposition program. Now, DOE quietly admits in the Draft SEIS that:

"DOE believes that the alternatives analyzed in this *SPD Supplemental EIS*, including the WIPP Alternative, provide protection from theft, diversion, or future reuse in nuclear weapons akin to that afforded by the Spent Fuel Standard." (S-14).

This admission is an affirmation that MOX isn't the only equally acceptable disposal option and underscores the need for a new, in-depth analysis for disposal of plutonium as waste. Given the lack of clarity with the MOX option, it is clear that a "Plan B" for non-MOX options is urgently required. This draft "alternatives study" must get underway immediately and DOE must fully explain as part of the NEPA process when this will be finished and when the public can comment.[12]

The total volume of TRU waste processed for disposal using the criteria for acceptance at WIPP and a total of 47.1 metric tons of plutonium of all varieties to be processed and disposed of, the expected volume would be almost 50,000 cubic meters (in round numbers). This is estimated on the basis of 1 gram of plutonium-239 per liter of waste (which is about the same as 200 grams of plutonium-239 per 55-gallon drum, which is about 200 liters).

An analysis of the space available at WIPP within the Land Withdrawal Act limitations needs to be made. In the event that the full amount cannot be accommodated at WIPP, as is quite possible, other processing and repository disposal arrangements are also possible and need to be evaluated. The following are among the possibilities that should be evaluated:

1. The full amount could be processed as denatured MOX fuel unsuitable for use in a reactor, interspersed with LEU spent fuel, and disposed of in deep geologic repository for spent fuel.
2. A new repository could be cited for TRU waste generated by processing surplus plutonium into a disposable form. Such a repository would be similar to WIPP in that it would not be faced with the high heat load that is characteristic of commercial power reactor spent fuel, and that would also characterize MOX spent fuel. Hence, salt would be a suitable medium for citing the facility, lowering construction costs relative to hard rock. In any case, IEER has concluded that such a repository is needed for a large amount of other waste, such as commercial Greater-than-Class-C (GTCC) low level waste, what the DOE has called "GTCC-like" waste and other wastes, such as the activated graphite reactor blocks at Hanford that would cause severe water pollution if disposed of in a shallow disposal facility. This matter was discussed at length in earlier comments prepared by IEER for a different EIS process and filed by the Yakama Nation,.[13]

[12] ANA et al. 2012, p. 13.

[13] "Comments of the Institute for Energy and Environmental Research on the Department of Energy's Draft Environmental Impact Statement for the Disposal of Greater-Than-Class C (GTCC) Low Level Radioactive Waste and GTCC-Like Waste (DOE/EIS-0375-D), published in February 2011". These comments were part of the comments filed by the Yakama Nation on the Draft GTCC EIS in June 2011. See Attachment 3 at

3. Some of the plutonium could be mixed with high-level waste in DWPF at SRS (as now proposed in the Draft SEIS) and the rest could be disposed of at WIPP or a repository similar to it.

Even if a second repository for waste other than spent fuel is needed because the TRU waste generated cannot be accommodated at WIPP, the costs of plutonium processing and disposal are may well be less than that of completing all the MOX facilities, producing MOX, using it as a fuel, storing it on-site for a prolonged period and disposing it of in a deep geologic repository along with LEU spent fuel. It should be noted that MOX spent fuel disposal will take more room in a repository than LEU spent fuel due to its higher heat generation on all relevant time scales for similar levels of irradiation. Further, an advantage of disposing of all of surplus plutonium as a waste in a separate repository for all non-spent-fuel and non-high-level waste that would be problematic for surface disposal[14] would be that the Waste Acceptance Criteria need not be as stringent as they are at WIPP. For one thing, the new criteria would probably not have to include considerations such as liquids and chemical hazardous waste in the TRU waste made from surplus weapons plutonium.

IV. Costs

DOE has not published an estimate of the cumulative costs of the MOX program. Future cumulative costs have been estimated in ANA et al. 2012 as $17.5 billion. That document also provides a figure of $100,000 per kilogram for preparation of surplus plutonium for disposal at WIPP.[15] Assuming that this is about the order of magnitude of processing surplus plutonium as TRU waste, the total preparation cost would be about $5 billion (rounded) for all surplus plutonium. The construction costs of WIPP for the repository alone, excluding waste preparation and packaging and transportation, amounted to roughly $3 to $4 billion in 2010 dollars. Assuming a similar cost for a new repository for low-heat waste, such as TRU waste, processing and disposal as TRU waste could cost on the order of $10 billion, perhaps less – which is considerably lower than the estimated cost of further pursuing the MOX program.

The point here is not to make a precise cost estimate but to show that the argument that the volume of TRU waste would be too large to manage if all surplus plutonium is processed into TRU waste is does not hold up to scrutiny. Yet, the Draft SEIS rejects even the processing of 13.1 metric tons into TRU waste on the grounds that there would not be sufficient capacity at WIPP.[16] Insufficient space at WIPP is not a valid reason for rejecting the TRU waste option out of hand. As discussed, it is essential for a variety of reasons, that the DOE evaluate non-MOX alternatives for all surplus plutonium, including the entire 13.1 metric tons that are the subject of the Draft SEIS and the 34 metric tons previously slated for MOX fuel production.

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http://ieer.org/wp/wp-content/uploads/2011/06/GTCC-EIS-Comments-2011_YakamaNation_with_IEER.pdf . Hereafter referred to as IEER 2011.

[14] See IEER 2011.

[15] ANA et al. 2012, p. 5.

[16] Draft SEIS 2012, Summary, p. S-33.