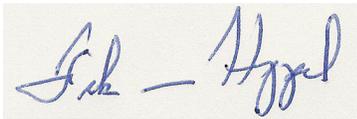


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Re: “Draft EIS for Plutonium Pit Production at the SRS in South Carolina”

Comments on National Nuclear Security Administration’s *Draft Environmental Impact Statement for Plutonium Pit Production at the Savannah River Site in South Carolina*, DOE/EIS-0541.



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Draft EIS is posted here on NNSA’s website:

<https://www.energy.gov/nepa/downloads/doeeis-0541-draft-environmental-impact-statement>

Summary

Irrespective of its other merits or demerits, the *Draft EIS* does not provide a rationale for urgently building pit-production capacity at the Savannah River Site (SRS) in parallel to establishing a pit-production capacity at the Los Alamos National Laboratory (LANL).

Technically, my comments would support the “no-action” alternative but they are really an argument for deferring the decision on an SRS pit-production facility for a decade.

A decade delay would:

1. Make it possible to see whether the production line at LANL – presumably the model for the production line at SRS – works or needs to be redesigned.
2. Provide an opportunity for pit experts at LANL and Livermore National Laboratory (LLNL), peer-reviewed by the JASON group, to determine a new lower bound on the functional life of the remarkably durable pits in the current stockpile.
3. Make it possible to settle the national policy debate over scrapping US intercontinental ballistic missiles (ICBMs), which would make it unnecessary to replace the W78 ICBM warhead.

¹ Affiliation for identification only.

4. Provide time for a decision on whether to replace the W76 and W88 submarine-launched ballistic missile (SLBM) warheads and, if so, determine whether the new warheads could be made with refurbished stored pits or require the manufacture of new pits.
5. Allow a broader-scope and deeper review in a Programmatic Environmental Impact Statement of the tradeoffs associated with pit production and reuse before finalizing the site-specific NEPA documents.

The discussion below therefore explains the following assertions:

1. *The pit production facility at Los Alamos National Laboratory (LANL) would, in effect, serve as a pilot plant for the proposed pit-production facility at the Savannah River Site. The LANL design must therefore be shown to work to establish confidence in the scaled-up version proposed for SRS.*
2. *The JASON 2019 review of pit longevity found that NNSA has not adequately sustained the research program that a 2007 JASON review report concluded had established that most of the pits in the existing US warhead stockpile could be expected to be functional for at least a century, i.e. for at least another 50 years. NNSA recently committed to resource that program more adequately so that it can be determined if the pits are likely to continue to be functional for significantly longer than a century.*
3. *The need to manufacture more pits of existing or new types has not been settled.*
4. *A Programmatic EIS is required.*

1. The LANL Pit Production Facility is a Pilot for the SRS Facility

The pits in the current US nuclear stockpile were almost all produced at the Rocky Flats Plant in Colorado, which operated from 1952 till 1989 and, in its later decades, produced about 1,000 pits per year.² That plant was shut down permanently in 1992 because of its releases of hazardous materials into the environment.³

In 1993, DOE asked LANL to establish a pit manufacturing capability at its PF-4 plutonium facility and, in 1996, tasked it to produce 31 “war reserve” W88 pits to fill an order that had not been completed because of the shutdown of Rocky Flats. It took the PF-4 facility 16 years, until 2012, to fabricate the pits: eleven in 2007, and a declining number annually thereafter.⁴

The plan was to transition to the production of W87 pits for the US Minuteman III intercontinental ballistic missile but pit production was shut down by safety problems in 2013.⁵ Pit production at PF-4 is still shut down and NNSA’s budget submission for fiscal year 2021 states that it is engaged in

² NNSA, “Plutonium Pit Production,” April 2019, <https://www.energy.gov/sites/prod/files/2019/05/f62/2019-05-13-FACTSHEET-plutonium-pits.pdf>.

³ Dana Coffield, “Judge Upholds Plea-Bargain on Rocky Flats; Rockwell To Pay \$18.5 Million Fine” (Associated Press, 1 June 1992) <https://apnews.com/7b90ebb526dc79de86f4123a6b1fa979>.

⁴ Bradford G. Storey, *Pit Manufacturing Fiscal Year 2012 Program Report to the University of California* (LANL, 2012) Table 1, https://www.lasg.org/MPF2/LA-UR-12-25400_Pit_manuf_rpt_UC_FY2012.pdf.

⁵ R. Jeffrey Smith and Patrick Malone, “Safety problems at a Los Alamos laboratory delay U.S. nuclear warhead testing and production,” *Science*, 30 June 2017, <https://www.sciencemag.org/news/2017/06/safety-problems-los-alamos-laboratory-delay-us-nuclear-warhead-testing-and-production>.

“activities to hire, train, qualify, and retain required pit production personnel, recapitalization of equipment needed to restore Plutonium Facility (PF)-4’s ability to produce War Reserve (WR) [pits,] towards producing the first WR pit during 2023 [and] manage capital acquisitions to increase production capability of PF-4 to produce 10 pits per year.”⁶

NNSA’s goal is to produce 30 pits in 2026. The cost of the planned upgrades to PF-4 is estimated at \$1.75 billion through FY2025 with the total cost to be determined.⁷

Given that LANL’s PF-4 facility, the location of the nation’s current pit production capabilities, has produced only 30 pits in a quarter century and is struggling to reestablish production by 2026, one wonders who is going to design the plutonium-pit production facility at SRS and train its workers? It would appear more prudent to let LANL prove its equipment and personnel-training abilities at Los Alamos first rather than stretch it thinner by establishing a parallel effort at SRS, which has no pit production experience whatsoever.

2. The alternative of pit reuse

Delaying the SRS pit production facility by refurbishing and reusing existing pits during the life extension of existing warheads and the production of replacement warheads beyond 2030 is dismissed by a vague statement in the draft EIS (at Vol. 1, section 2.3.4):

“NNSA currently stages plutonium pits at Pantex. Like the pits in the active stockpile, those pits are aging and would not mitigate plutonium aging risks or enable NNSA to implement enhanced safety features to pits to meet NNSA and DoD requirements. Consequently, only reusing pits was eliminated from detailed analysis.”

A more substantive analysis is required – preferably in a Programmatic Environmental Impact Statement that would cover the contributions of the Kansas City Plant and LLNL as well as SRS, LANL and Pantex. Some relevant considerations are sketched here.

As already noted, almost all the pits currently in the US operational nuclear-warhead stockpile were produced between 1978 and 1989, which makes the oldest pits about 40 years old.⁸

The question is, how much longer will they last?

The 2005 Defense Authorization Act directed NNSA’s Administrator to commission an independent review of the efforts at LANL and LLNL to estimate pit lifetimes. The review was carried out by the JASON group of independent consultants and an unclassified summary of its findings was released in early 2007.⁹

The laboratories had been assessing the effects of aging effects on the functionality of US pits. They also had been doing accelerated-aging experiments on new samples of the plutonium alloy used in US pits by spiking them with Pu-238, which decays by alpha emission with a half-life of 88 years vs. 24,000 years for the dominant isotope in weapon-grade plutonium, Pu-239.

⁶ Department of Energy *FY 2021 Congressional Budget Request*. Vol 1. “National Nuclear Security Administration,” p. 160.

⁷ *Ibid.* pp. 195, 195.

⁸ Steve Fetter and Frank von Hippel, “Does the United States Need a New Plutonium-Pit Facility?” *Arms Control Today*, May 2004, Table 1, <https://www.armscontrol.org/act/2004-05/features/does-united-states-need-new-plutonium-pit-facility>.

⁹ JASON, *Pit Lifetime* (MITRE Corporation, 2007) <https://fas.org/irp/agency/dod/jason/pit.pdf>.

The summary conclusion of the 2007 JASON report was,

“We judge that the Los Alamos/Livermore assessment provides a scientifically valid framework for evaluating pit lifetimes. The assessment demonstrates that there is no degradation in performance of primaries of stockpile systems due to plutonium aging that would be cause for near-term concern regarding their safety and reliability. Most primary types have credible minimum lifetimes in excess of 100 years as regards aging of plutonium; those with assessed minimum lifetimes of 100 years or less have clear mitigation paths that are proposed and/or being implemented.”

The JASON report also recommended additional research (pp. 17-18):

“to gain experience with Pu that has suffered the equivalent of a century or more of aging (i.e., with accelerated aging), thereby allowing an interpolation rather than an extrapolation in estimating performance changes and degradation due to aging. In particular, one wants to know the modes of failure that will be among the first to appear, because these can inform the stockpile surveillance program in order to make it most sensitive to aging-induced degradation [and] ongoing study of the current accelerated-aging Pu samples, which are spiked with the rapidly-decaying ²³⁸Pu, as well as production of samples that have been aged by alternative means. In all of these cases, the objective is to get the equivalent of multi-century experience on aging phenomena, associated with decay (e.g., radiation damage) as well as with activated processes such as annealing.”¹⁰

At least some work on accelerated aging did continue and, in 2012, the Lawrence Livermore National Laboratory (LLNL) reported

“no unexpected aging issues are appearing in plutonium that has been accelerated to an equivalent of ~ 150 years of age.”¹¹

The deputy program leader for enhanced surveillance of pit aging at Livermore was quoted as saying,

"In the near term, the nation can save tens of billions of dollars that might be required to build a new production facility,"

In March 2018, the Senate, in its report on the Energy and Water Appropriations Act for FY2019 directed the NNSA administrator to contract with JASON to do an update on its 2007 report and

“assess the efforts of the NNSA to understand plutonium aging and the lifetime of plutonium pits in nuclear weapons [and] include recommendations of the study for improving the knowledge, understanding, and application of the fundamental and applied sciences related to the study of plutonium aging and pit lifetimes, an estimate of minimum and likely lifetimes for pits in current warheads, and the feasibility of reusing pits in modified nuclear weapons. The report shall be submitted in unclassified form but may include a classified annex.”¹²

The Senate also instructed that the NNSA “Administrator shall make available all information that is necessary to successfully complete a meaningful study on a timely basis.”

JASON submitted a “letter report” on 23 November 2019 that informed Congress that¹³

¹⁰ Not mentioned in the published JASON reports is the possibility that older retired pits may be available all the way back to the 1940s that could provide additional data on plutonium aging out to 75 years.

¹¹ “Plutonium at 150 years,” (Lawrence Livermore National Laboratory, 14 December 2012) <https://www.llnl.gov/news/plutonium-150-years>.

¹² Senate Report, *Energy and Water Development Appropriations Bill, 2019*, p. 104, <https://www.congress.gov/115/crpt/srpt258/CRPT-115srpt258.pdf>.

¹³ JASON letter report, 23 November 2019, <https://fas.org/irp/agency/dod/jason/pit-aging.pdf>.

“in general, studies on Pu aging and its impacts on the performance of nuclear-weapon primaries have not been sufficiently prioritized over the past decade. A focused program of experiments, theory, and simulations is required to determine the timescales over which Pu aging may lead to an unacceptable degradation of primary performance.”

The JASON letter also suggests that, contrary to Congress’s instruction, NNSA did not cooperate adequately with the review:

“The labs briefly presented their program to address Pu aging to JASON. The plan seemed sensible, but a detailed JASON assessment would require additional information about the program as well as technical details.”

Laudably, NNSA was embarrassed by this fiasco and, on 6 April 2020, Administrator Lisa E. Gordon-Hagerty informed the Chairman of the Senate Armed Services Committee Subcommittee on Strategic Forces that NNSA planned to fund a second phase of the JASON study during the summer of 2020 to¹⁴

“Assess the need for the full study, and if deemed necessary and timely, perform a more detailed, multi-year JASON study.”

The letter also stated that

“NNSA has launched an enhanced program focused on understanding the potential effects of plutonium radioactive decay, or aging, on pit performance.

Therefore, within a decade, important new information on pit aging should be available to inform a decision on whether a second pit production facility will be required.

3. The need to produce new pits for new warheads

In addition to its concern about possible aging effects in the plutonium of the legacy pits, NNSA argues that the new facility is required “for producing pits with enhanced safety features to meet NNSA and DoD requirements” (Vol. 1, Sec. 1.3.2). There is no elaboration on this claim in the Draft EIS, but I am able provide some information because I was involved in this discussion almost 30 years ago, during the launch of the Stockpile Stewardship Program by the Clinton Administration.¹⁵

At the time, the weapon labs were proposing to replace the W78 ICBM warhead and the W76 and W88 submarine-launched ballistic missile (SLBM) warheads with warheads containing insensitive high explosive (IHE). That proposal has been sustained over the decades since through a number of incarnations, including proposals for warheads that would be “interoperable” between the ICBMs and SLBMs, but actually would have different variants for the ICBMs and SLBMs because of different fuses, reentry vehicles, etc., the benefit being a reduction in the size of the reserve warhead stockpile.¹⁶

The main argument, however, was for insensitive high explosive.

¹⁴ Lisa E. Gordon Haggerty to Senator Deb Fischer, 6 April 2020, <https://fas.org/irp/agency/dod/jason/pit-aging.pdf>.

¹⁵ Frank von Hippel, “The Decision to End U.S. Nuclear Testing,” *Arms Control Today*, December 2019, <https://www.armscontrol.org/act/2019-12/features/decision-end-us-nuclear-testing>.

¹⁶ Lisbeth Gronlund, *Bad Math on New Nuclear Weapons: The Costs of the 3+2 Plan Outweigh Its Benefits* (Union of Concerned Scientists, 2015), <https://www.ucsusa.org/sites/default/files/attach/2015/11/Bad-Math-Nuclear-Weapons-3-Plus-2.pdf>.

The purpose of IHE is not to reduce the probability of an accidental nuclear explosion. Other elements of the safety design are supposed to do that, and, thus far, no warhead accident has resulted in a nuclear yield. The benefit from the use of IHE would be to reduce the number of accidents in which the chemical explosive around the pit detonates and disperses plutonium.¹⁷ There were many such accidents involving aircraft-carried warheads prior to the decision in 1968 not to fly nuclear-armed aircraft in peacetime.¹⁸ The Navy has had no such accidents with SLBM warheads, however, and therefore has in the past not been willing to invest in adapting new IHE warheads to its SLBMs, including flight tests.

It appears, however, that the Navy has finally acquiesced or been overruled on this matter and the plan is to replace its two SLBM warheads, the W76 and W88, with new IHE warheads.

As I understand it, the current proposal is to build two new IHE warheads: the W87-1, which would replace the W-78 on the “Ground-Based Strategic Deterrent” (GBSD), the successor to the Minuteman III missile and potentially also the W-88 the high-yield warhead on the Trident II submarine-launched ballistic missile. A second warhead, sometimes referred to as the W93, would replace the W76.¹⁹ Recent news reports indicate that the US is coordinating with the UK on the W93, since the warhead on the UK’s SLBMs is closely related to the W76 and the US and UK SLBMs come from a shared pool of missiles.²⁰

W87-1. The pit of the W87-1 would be identical to the pit of the W87-0, a warhead originally developed for the MX ICBM. W87-0s are currently deployed on the Minuteman III, and the plan is to use both W87-0s and W87-1s on the GBSD.²¹ The 400 Minuteman IIIs are to be replaced one-for-one with GBSDs, which is, like the Minuteman III, to be deployed with only a single warhead per missile.

DOD reportedly has 540 W87-0s in stock with 200 deployed on the Minuteman III along with 200 W78s.²² Therefore, the W78s, could be replaced with stored W87-0s.

In fact, as the *Draft EIS* notes, this same point was made during the EIS scoping process:

“There is a straight-forward alternative available right now that would lead to all the warheads on U.S. land-based missiles using insensitive explosives: that is to replace the W78s with W87 warheads currently in storage.” (I, Table 1-1)

¹⁷ S.D. Drell, John Foster and Charles Townes, *Nuclear Weapons Safety: Report of the Panel on Nuclear Weapons Safety* of the House Committee on Armed Services, 1990, <https://fas.org/nuke/guide/usa/drell-safety.pdf>.

¹⁸ Department of Defense, *Narrative Summaries of Accidents Involving U.S. Nuclear Weapons, 1950-1980*, <https://nsarchive.files.wordpress.com/2010/04/635.pdf>.

¹⁹ DOD’s *Nuclear Weapons Matters Handbook 2020*, Figure 4.2, shows the W78 being replaced by the W87-1 beginning around 2030. The W87 and W88 are shown as being replaced beginning sometime around 2035-40, and the W76 is shown as being replaced beginning sometime around 2040-55. Their replacements are designated only as FBW (Future Ballistic Warheads), <https://www.acq.osd.mil/ncbdp/nm/nmhb/chapters/chapter4.htm>.

²⁰ “Planned W93 Warhead Will Contribute to new U.K. Nuke, DOD Officials Say,” *Defense Daily*, 13 February 2020, <https://www.defensedaily.com/planned-w93-warhead-will-contribute-new-u-k-uke-dod-officials-say/nuclear-modernization/>; Andrew Chuter, “Britain confirms new nuclear warhead project after US officials spill the beans,” *Defense News*, 25 February 2020, <https://www.defensenews.com/global/europe/2020/02/25/britain-confirms-new-nuclear-warhead-project-after-us-officials-spill-the-beans/>; Dan Leone,

²¹ *NNSA Has Taken Steps to Prepare to Restart a Program to Replace the W78 Warhead Capability* (US Government Accountability Office, 2018) Footnote 9, <https://www.gao.gov/assets/700/695759.pdf>.

²² Hans M. Kristensen and Matt Korda, “United States nuclear forces, 2020,” *Bulletin of the Atomic Scientists*, 2020, Vol. 76, NO. 1, 46–60, Table 1, note d, <https://doi.org/10.1080/00963402.2019.1701286>.

Although the *Draft EIS* states in Vol. 1, p.14 that “[c]omments were considered in preparing this Draft EIS, I do not see any response to this comment.

DOD prefers to have two types of warheads available for each missile in case one type develops a problem but, because the W87-1 would have the same “physics package” as the W87-0, it would provide much less diversity than having a different warhead type.

It is possible also that DOD wishes to preserve the option of loading more warheads onto the GBSD in case of a breakdown in nuclear arms control with Russia. In the Clinton Administration’s Nuclear Posture Review, this was called the “warhead upload hedge”²³ To get three W87s on a GBSD would require a larger-diameter third stage than the Minuteman III has. Northrup-Grumman’s GBSD appears to have such a larger-diameter third stage.²⁴

To fully load up every deployed GBSD with three warheads would require 1200 warheads, which would require more W87-1s and therefore more pits. No realistic circumstance that would require uploading the US ICBMs again has been suggested, however. In fact, the downloading to one warhead each was done to make the deterrent relationship with Russia more stable.

Destroying one US warhead in a first strike would require more than one Russian warhead. Furthermore, in 2013, the Joint Chiefs reportedly informed President Obama that they could cover all essential targets in potential adversary nations with one third fewer warheads than the 1550 counted warheads allowed by New START.²⁵

Also, many respected defense experts, including former Secretary of Defense Perry, argue that the US should abandon fixed land-based ICBMs because they are targetable, which has resulted in Strategic Command keeping them in a dangerous launch-on-warning posture.²⁶

The *Draft EIS* is silent on these critical considerations.

W93. Relatively little firm information has been made public about the design of the proposed W93. NNSA’s *Fiscal Year 2020 Stockpile Stewardship and Management Plan* describes “the Next Navy Warhead,” as “not yet an established program of record.”²⁷

An anonymous “senior defense official” has asserted, however, that the W93 would be “previously nuclear-tested designs, it’s not going to require any nuclear testing.”²⁸ This must mean that a previously tested IHE primary would be used.

²³ US Department of Defense, “Nuclear Posture Review,” 19, <https://fas.org/nuke/guide/usa/doctrine/dod/npr-slides-1994.pdf>

²⁴ This was pointed out by Hans Kristensen, 17 September 2019, <https://twitter.com/nukestrat/status/1173971761634926592>; see also the Northrup-Grumman cutaway, <https://news.northropgrumman.com/news/features/northrop-grumman-celebrates-60-years-supporting-air-forces-intercontinental-ballistic-missile-mission>.

²⁵ David Sanger, “Obama to Renew Drive for Cuts in Nuclear Arms,” *New York Times*, 10 February 2013, <https://www.nytimes.com/2013/02/11/us/politics/obama-to-renew-drive-for-cuts-in-nuclear-arms.html>. New START counting rules count each strategic nuclear bomber as a single warhead even though they could each carry many.

²⁶ William Perry, “Why It’s Safe to Scrap America’s ICBMs,” *New York Times*, 30 September 2016, <https://www.nytimes.com/2016/09/30/opinion/why-its-safe-to-scrap-americas-icbms.html>.

²⁷ *Fiscal Year 2020 Stockpile Stewardship and Management Plan* (NNSA, 2019) p. 2-37, footnote 1, https://www.energy.gov/sites/prod/files/2019/08/f65/FY2020_SSMP.pdf.

²⁸ Patrick Tucker, “A New Nuclear Warhead? STRATCOM Chief Can’t Answer Yes or No,” *Defense One*, 27 February 2020, <https://www.defenseone.com/politics/2020/02/new-nuclear-warhead-stratcom-chief-cant-answer-yes-or-no/163395/>.

In 1990, in hearings before the Senate Appropriations Committee's Subcommittee on Energy and Water, DOE's then Deputy Assistant Secretary of Energy for Military Applications listed all US nuclear weapons with insensitive high explosive, including those that had been produced and deployed and some that were tested but not deployed as a result of the end of the Cold War:²⁹

- B61-3, -4, -6, -8, -9, -10 tactical and B61-7 strategic bombs
- [Deleted]
- W80-0, -1 sea- and air-launched cruise missile warheads,
- B83 and B83-ALT 904 strategic bombs,
- W-84 warheads for the ground-launched cruise missile,
- W-85 warheads for the Pershing II intermediate-range ballistic missile,
- W87-0, -ALT 323, -1, ICBM warheads
- W89 SRAM II warhead (cancelled in Phase 3 development³⁰)
- B90 NSB, -NDB strike and depth bombs (cancelled in Phase 3 development³¹)
- W91 warhead for the short-range (air-to-ground) attack missile, tactical, SRAM-T and for the follow-on to the Lance tactical missile warhead³² (cancelled in Phase 3 development³³).

If pits are used from warheads that were produced and retired, there will be no need to make new pits. If pits are selected from warheads that were tested but not produced or were not produced in sufficient numbers, then new pits will have to be produced. However, the production of pits that may or may not be needed for a warhead whose design has not yet been decided should not be used as a justification for urgently expanding US pit-production capacity beyond the currently planned expansion at LANL.

4. Need for a Programmatic EIS on Pit Production

The above issues should be dealt with in the Final EIS for Plutonium at SRS. They also require, however, a Programmatic EIS on the proposal for pit production, inspection, lifetime estimation, refurbishment and reuse in NNSA's larger complex, including the Kansas City Plant and LLNL as well as LANL, Pantex and SRS.

²⁹ Senate Appropriations Committee Subcommittee on Energy and Water Development, *Hearing on H.R. 5019, An Act Making Appropriations for Energy and Water Development for the Fiscal Year Ending September 30, 1991, and for Other Purposes*, p. 303.

³⁰ <https://en.wikipedia.org/wiki/W89>; development phases are described in <https://www.energy.gov/sites/prod/files/2018/06/f53/6x%20process.pdf>.

³¹ https://en.wikipedia.org/wiki/B90_nuclear_bomb

³² House Appropriations Committee Subcommittee on Energy and Water Development, Hearings, Part 6, 12 March 1990, p. 584.

³³ <https://en.wikipedia.org/wiki/W91>.