Los Alamos Study Group

Nuclear Disarmament • Environmental Protection • Social Justice • Economic Sustainability

Toward a viable plutonium pit production plan: part 2

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Dear --

Please thank _____ for our rich and illuminating meeting this week …

There are five sections in this email:

1. **This introduction.**
2. **What we think is a good pit policy, one which we can support.**
3. **Some general observations.**
4. **What about low production (10 WR ppy reliably) at LANL?**
5. **Portions of NNSA's original Pit Production Analysis of Alternatives (AoA).**

1. Introduction

I have been mulling over our conversation. Here are two possible new pit policies (one we like and one we don't; we obviously don't like the program of record either for reasons previously stated, summarized here) as well as some general observations and background material that is especially relevant and easily forgotten.

After careful thought, we cannot find any national security benefit in making *any* useful quantity of war reserve (WR) pits at Los Alamos National Laboratory (LANL) *at all*, especially now that the Savannah River Plutonium Processing Facility (SRPPF) is a key part of the program of record.

Proposed LANL pit production suffers from a great many adverse circumstances, and is now significantly delayed. For reasons mostly beyond NNSA's control it will never be safe, adequate, reliable, cost-effective relative to the Savannah River Site (SRS) due to its high operational cost and very high cost per pit, and it is not enduring. As you know, *enduring* pit production in LANL's PF-4 old facility is not supported by any NNSA study, and is a contradiction in terms.

Production at the Savannah River Site (SRS), on the other hand, enjoys corresponding positive circumstances in every one of these aspects, provided its life blood -- scarce specialized talent and materials, NNSA and congressional attention, and money -- are not drained away supporting the inferior LANL site.

Spending more than half of pit program resources at LANL does not add program resilience. It subtracts from the program resilience NNSA could have if it invested fewer but still adequate funds more wisely.

There is also no need for any new pits in the early-to-mid 2030s -- such pits being the primary if not the only *raison d'etre* for LANL pit production -- to support the *entire* presently-deployed "triad" of U.S. nuclear forces. What impacts there might be to the silo-based "hedge" -- which we do not support in the first place -- can be mitigated, if desired, by retaining W78 warheads on Minuteman III missiles during the first half of Sentinel deployment.

I don't think we can evade the reality that the W87-1 is a make-work program, especially W87-1 in the early 2030s. I can't see how "strong deterrence" proponents can make a logical case for that warhead, on that schedule. without sooner or later invoking the "benefits" of what amounts to spending money for its own sake. The best argument I can see is that due to today's growing, parallel programs and the resulting over-hiring (i.e. bloat), the NNSA warhead complex will need large new things to do in the early 2030s to maintain continuity of effort at the hoped-for level. The real problem is the *present* increase of activity in multiple programs, which is not only difficult today but sets the stage for difficulties later as well.

2. What we think is a good pit policy, one which we can support

On this side of nuclear disarmament, we can support a policy of *pit production demonstration and training* at LANL. Such a policy must inevitably entail some *de minimus* production of at least "developmental" or "demonstration" pits until the SRPPF is in operation, or nearly so.

We do not understand the quantitative side of demonstration and training (how many is *de minimus?)* or the qualitative side (are any WR pits, as opposed to "developmental" pits, really necessary for training?).

In this regard, we note:

- LANL is currently making developmental pits but not WR pits;
- LANL is training SRS pit production staff without making WR pits;
- While making WR pits might be valuable training, training might interfere with WR production, should the latter be attempted at any significant level;
- SRS is going to set up a "cold" training center (i.e. without plutonium) on-site in parallel with completing SRPPF so all parties can learn and practice most of the actual pit production process with surrogate materials, presumably to WR standards using WR processes where possible; and
- NNSA has all the authority and fiscal tools necessary to induce LANL pit managers, experts, and workers to temporarily or permanently relocate to the SRS vicinity if NNSA needed to do that, using both "carrots" (pay and benefits) and "sticks" (likely or certain job losses at LANL). The notion that "only LANL knows how to make pits and has the trained staff to do so" is true only for the moment, and will only remain true only as long as, and to the extent that, NNSA wants it to remain true.

Overall, it appears to us that setting up LANL as a demonstration and training center is quite distinct from setting up LANL for reliable pit production at any level.

In our plan,

- **The Los Alamos Plutonium Pit Production Project (LAP4) would be canceled immediately.**
- **There would be only one operational shift at LANL's plutonium facilities; 24/7 work would not be necessary.**
- **Net hiring at LANL for pit missions would cease, as there are already enough staff for a single operational shift.**
- **SRPPF design and construction would proceed as currently planned, with strong efforts to capture scarce design and construction talent, and scarce resources such as gloveboxes.**

- **A number of capital projects and capital equipment purchases at LANL could be canceled or curtailed given a single-shift work strategy with no LAP4 and about 2,000 fewer workers in "the pipeline."**

Key questions which would help better quantify the benefits of this plan include:

- **What LANL capital projects and capital equipment purchases could be avoided, at what cost savings?**
- **What personnel and other operational costs could be avoided?**
- **Overall, how much money would this plan save relative to the current plan?**
- **What benefits would there be in plutonium facility space needed, in material at risk (MAR), in waste production, and in conflicts with other programs, already somewhat severe?**
- **How would transportation and housing needs be affected?**
- **How much faster could SRPPF be completed in the absence of competition with LANL for designer time, gloveboxes, and other resources? In this regard, NNSA should be required to produce a plan to essentially *eliminate* -- not just *reduce* -- program risk at SRPPF. In our view, NNSA is not really serious about pit production.**
- **How many pits would be produced at SRS given the new schedule for completion, and by when?**

3. Some general observations

If the SRS design team were disbanded, it is unlikely to ever be reassembled. Nuclear skills are scarce. The relevant technical skills are in demand in other sectors. So any viable policy would need to be clear that the SRS project would go forward at all due speed to avoid the absurd idea of disbanding, then reconstituting, a SRPPF (or "PF-4 replacement") design team. (PF-4 replacement at LANL is almost certainly not a viable idea due to geographic and geologic constraints.) So, relying on LANL for pit production for the foreseeable future (ala Frank von Hippel) would be a recipe for unilateral nuclear disarmament. Since pretty much everybody knows this, no branch of government will support it.

So all such a proposal amounts to is a laboratory subsidy plan that tries to build two pit factories when one adequate one would do nicely, at half the cost, while accelerating early-to-need pit production, promoting a new warhead, and MIRVing silo-based missiles. It is a complete and flagrant waste, one that signals -- what? Not exactly an arms race. It signals stupidity, I would say. Perhaps this: "Go ahead, Amerikanskis. Spend twice what you should, and get a dysfunctional mess. We'll just carry on while you destroy yourselves."

Why is so important to *accelerate* pit production far beyond any need created by pit aging and incur roughly double the cost by doing so?

Pit reuse across type may be possible, if also "highly suboptimal" (NNSA) in certain cases. The simplest, cheapest, quickest, and best form of pit reuse, which is *not* technically suboptimal, is to not remove them from the warhead at all. Deploy them in their well-tested, extensively-surveilled configuration, in this case (the W87-0) with insensitive high explosive (IHE) and high accuracy. Taking pits out of the W87-0 and putting them in the W87-1 just to keep everybody busy is a lot like digging holes and filling them in, with a result considerably less solid than the original ground -- and extremely expensive in the bargain.

Why would anybody build TWO pit factories when a single factory in an adequate facility like SRPPF can do the work of both with a very modest additional equipment, at a cost increment well within the current estimating error? So why would we want to bend over backwards to try to get LANL pit production started? Why not just end LANL's pain now and focus on a) the only hope NNSA has for an adequate, enduring, reliable, safe pit factory, namely SRPPF, and b) the only pit production training facility NNSA has, namely PF-4?

For those who oppose: a) MIRVing, b) the W87-1, and c) the entire Sentinel system, it makes no sense to support an early W87-1 production schedule. The Sentinel could be ENTIRELY deployed with W87-0s. The W87-0 is not in danger of aging out until let us say at least 2066 (i.e. 1986 + at least 80 years), which would provide at least 30 years of service life past a 2036 build, or at least 20 years of service past a 2046 build. So why can't the W87-1 be delayed until SRS can supply the pits, or beyond that?

We see only negative security value in MIRVing silo-based missiles.

The W78 is available for MIRVing on the MMIII until it is retired.* After that, SRPPF could make W87-1s. What is so important about producing the W87-1 as fast as possible?

> *About half the MMIIIs are currently MIRVable with W78s. The present quantitative upload hedge (not considering differences in accuracy) could be preserved if desired through about half the Sentinel deployment process, *with no new pits and W87-1s at all.* It appears that the halfway point in Sentinel deployment will not occur before 2035, almost when SRPPF may begin production even *with* competition from LANL. Sentinel deployment could be significantly delayed again, and SRPPF could, we believe, be completed sooner without LANL competition. In other words, there might be no negative impact at all on the upload hedge as a result of zero LANL production.

From the point of view of "strong nuclear deterrent" advocates, the reason to halt preparations for production at LANL is to actually focus strongly on a workable, adequate, reliable, enduring pit factory -- which is NNSA is not doing at present.

4. What about low production (10 WR ppy reliably) at LANL?

It is important to distinguish this from two other policies with which it might be confused. First, this would presumably be WR production with a *single production shift, without 24/7 work.* By March of 2020, NNSA understood that to produce as few as 20 ppy at LANL, two production shifts and so 24/7 operations would be needed, requiring some 2,000 additional staff and, as has later become clear, several more line-item projects. This would not, in other words, be the blurry and ill-conceived "10-20 ppy" proposed by Asplund and von Hippel in their recent article.

Second, in the policy discussed here, SRPPF would continue "full speed ahead." As noted above, if the SRS design team were disbanded, it is unlikely to ever be reassembled. Available equipment would change, for one thing. Essentially all the work done to date on SRPPF would be lost and would need to start over from scratch, with the high risk of never assembling a competent design team. Attempting to later expand pit production infrastructure *at LANL* would also incur a decade-and-a-half delay, if a competent team could be assembled, plus the very high risk of failure for fundamental reasons of geography and geology.

So this alternative is somewhat like the first one discussed, with the difference that 10 WR pits per year would be produced, and *some considerable part of the current suite of capital projects supporting pit production at LANL would be needed*.

Could LAP4 be entirely canceled in this alternative, saving the entire estimated remaining $4.9 to $5.4 billion in the LAP4 project (i.e. an estimated $6.1 to $6.6 minus $1.2 already spent)? This is doubtful. It is

likely that to achieve "reliable" production at 10 ppy, most or all of the LAP4 project, including the "30 base" and then the "30 reliable" equipment sets would need to be installed, which (no doubt simplifying the issue) would then be used by a single shift to produce at least 10 WR ppy instead of the currently planned dual production shifts.

There would be considerable savings in personnel costs due to using a single shift at LANL, perhaps on the order of $2 billion in cumulative savings through 2032.

As for schedule, the "30 reliable" equipment set is not expected to be installed until the 4th quarter of FY2031, or more likely 2-4 years later as NNSA says in its FY2024 congressional budget request, from which the above LAP4 cost estimates have been taken.

If this is so, it suggests that the total number of WR pits that might be ready by let us say the end of 2035 might be in the range of 71 pits (1 in FY25, an average of 5 each in FY26 - FY31, and an optimistic reliable "10" in FY32-FY35). Suppose by some miracle LANL were to begin 10 WR ppy production in 2026 and kept it up steadily. Through 2036 LANL would produce about 110 WR pits under this plan.

We must conclude that until proven otherwise, the proposed "10 WR ppy reliable" plan will be too little and too late to matter, and it would probably cost most of what the currently-proposed 30 WR ppy production plan would cost. It could well roughly double LANL per-pit cost, up from the current $100 million or so per pit to the neighborhood of $200 million per pit for pre-SRPPF pits.

The Sentinel missile system will be deployed at a rate of approximately 50 silos and missiles per year, starting in what is now estimated to be in 2031. The original deployment was to be in 2029, ending in 2036. With 2 years delay (here and here) we might expect deployments in 2031 through 2038, absent better information, or 50 per year as before, roughly one per week.

The entire fleet of Sentinel missiles (400 plus 50 for the silos in warm stand-by) could be deployed with W87-0 warheads, without new warhead or pit production, with 30 warheads extra for surveillance and about 50 left over. It is not publicly known whether or not W87-0s will be MIRVable on Sentinel.

We don't think much if anything would be gained by painstakingly stockpiling LANL W87-1 pits over a very expensive and dangerous decade's worth of work, when SRPPF would be able to produce that many pits and more in a single full production year, or at most two.

If, as a result of focusing on SRPPF, its expected year of first full production could be shifted two years earlier, the result would be at least an extra 160 pits (operating on a single shift only), as much as 16 years of LANL production at 10 ppy or more than 5 years of production at LANL's proposed full rate of 30 ppy. LANL production, we believe, is just not worth the candle.

If W87-1 pits are needed, NNSA would be far better off focusing entirely on facilitating construction, training, and operations at the SRPPF facility. Dividing scarce resources in order to subsidize LANL pit production is a fool's errand, at ANY scale.

5. Portions of NNSA's original Pit Production Analysis of Alternatives (AoA).

The AoA, produced under Obama's appointed NNSA Administrator Frank Klotz during the first year of the Trump administration, was pretty darn thorough -- one of the better NNSA products.

For reference, here's the part about the decision made by NNSA on behalf of the Secretary of Energy, to never attempt to use PF-4 as an enduring pit facility.

First this background at p. 3:

> The planned expansion of pit production capability is classified as a major system acquisition project under DOE Order 413.3B Change 3. The results of this AoA support development of CD-1 documentation during Fiscal Year (FY) 2018. A Steering Committee/Advisory Group chaired by the Office of Defense Programs (NA-10) Deputy Administrator, who serves as the PSO for this acquisition, provided oversight for the AoA.

Then at pp. 47-48:

> The recommendations for elimination of non-viable alternatives as described above were presented to the PSO in June 2017.
>
> PF-4 was constructed in the mid-1970s with a planned useful lifetime of 50 years. It began operations in 1978, at which time it had ample margin to accommodate changes in safety and regulatory requirements. Over the last 35 or more years, that margin has been consumed with increasingly stringent nuclear safety requirements. By the time an 80-ppy production capability could be established in PF-4, the building would be over 50 years old. It will be problematic for PF-4 to support additional changes in nuclear safety risk tolerance, increased pit manufacturing activity, and higher capacity for plutonium missions such as pit reuse and rework. This is primarily due to the increase in MAR [Material at Risk] and resulting offsite accident dose, the age of the facility, and the available processing space capacity and condition.
>
> Based on the preliminary AoA analyses, the PSO determined that continuing to rely on PF-4 for the Nation's enduring pit production capability presented unacceptably high mission risk for the following reasons:
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> - Jeopardizes program of record: Efforts to remove contaminated gloveboxes and install new equipment in an operating manufacturing space, beyond what is already planned under the Plutonium Sustainment program, creates unacceptably high risk to achieving 30 ppy by 2026.
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> - Space and capacity constraints: The AoA Team estimates about 110,000 ft2 of HC-2, SC-1 processing space is necessary to produce 80 ppy with high confidence.15 PF-4 has about 74,000 ft2 of suitable space, 36,000 ft2 short. Even if missions such as ARIES and plutonium-238 component manufacturing, totaling about 14,000 ft2, were relocated, the total processing space in PF-4 would still be approximately 22,000 ft2 short.
>
> The recommendations for elimination of alternatives from further consideration, as described above, were approved. The following five alternatives were retained for detailed cost, schedule, risk, and effectiveness evaluation:
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> - New construction at LANL
> - New construction at SRS
> - New construction at INL
> - Refurbishment of FPF at INL
> - Refurbishment of MFFF at SRS
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> Note that under each of these final alternatives, the full 80-ppy production line plus metal preparation would occur in a single location. Table 5–8 shows the elimination of other potential alternatives to produce this final list.

As a result of this decision, the Executive Summary of the AoA contains this passage (p. 2, emphasis added):

> Although the modular building strategy envisioned at CD-0 utilizing PF-4 does not meet the functional and process requirements for an 80 WR ppy production, **after a new 80 WR ppy capability is established, PF-4 can return to the research and development mission for which it was built.**

This was very good advice.

Here's the AoA on splitting production between two sites, also a strategy specifically rejected for strong economic (and we might add, environmental) reasons (pp. 45-46).

> **5.3.2.6 Alternatives Involving Splitting Production Between PF-4 and Another Facility were Recommended for Elimination from Further Consideration**
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> Several alternatives involving splitting production between PF-4 and another facility (at various locations) were developed, i.e., 30 ppy at PF-4 and 50 ppy in another facility. These alternatives would capitalize on the capability for 30 ppy that is currently being installed in PF-4 by the Plutonium Sustainment Program, and supplement it with a new capability somewhere else.
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> Table 2–4 shows the total number of pieces of equipment needed for 30 ppy, 50 ppy, and 80 ppy at high confidence. If PF-4 can produce 30 ppy at high confidence, the difference between adding 50 ppy somewhere else and establishing an 80 ppy capability is 22 pieces of equipment requiring about 6,350 ft2. The marginal cost for the additional space to get to 80 ppy is small.
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> The AoA Team estimates that the 30 ppy capability currently planned in PF-4 through the Plutonium Sustainment Program (the Status Quo alternative) will produce almost 30 ppy on average, similar to LANL's estimate for the capability. To provide 80 ppy at high confidence, the equipment needed to get to 30 ppy at high confidence must be added to PF-4 in the 30/50 ppy split cases. The AoA team estimates that an additional seven pieces of equipment, requiring about 2,000 ft2, would need to be added to PF-4 to get to 30 ppy at high confidence. Table 5-7 shows the equipment requirements for the 30/50 ppy split case vs the 80 ppy case.
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> Table 5-7. Number of pieces of equipment for 30/50 ppy case vs 80 ppy case
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> 30/50 ppy Split Case: 201
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> 80 ppy Case: 133
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> The 30/50 ppy split cases require almost 70 pieces more total equipment, require additional reconfiguration of about 2,000 ft2 of space in PF-4, and add long-term production risk and surveillance costs due to multiple production lines. The savings provided by a reduction of 6,350 ft2 in the production facility is marginal and is offset by the above considerations. Therefore, the 30/50 split production alternatives were recommended for elimination from further consideration.

Thank you for your attention and best wishes,

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