Plutonium Pit Production for the US Nuclear Arsenal: "Navigating the Great Transition"

Greg Mello, Los Alamos Study Group, 20 Feb 2019

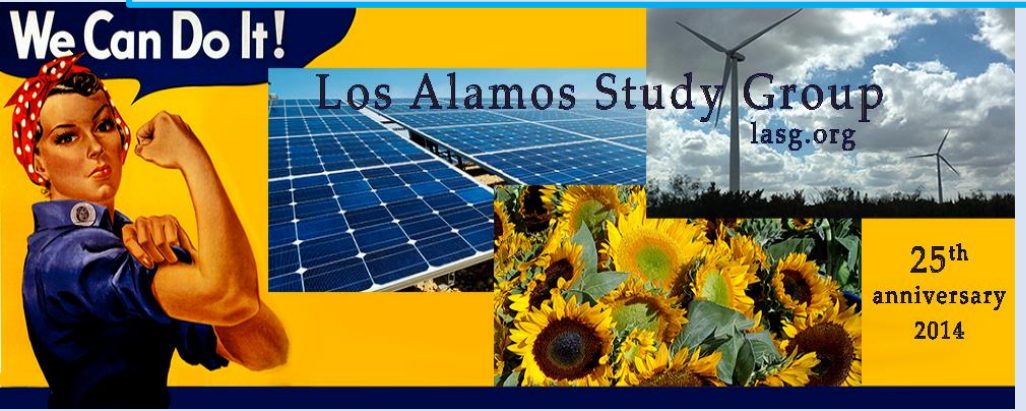
Summary of factual overview (1. & 2.) and proposed policies (3. & 4.)

1. Pit production options (four remain) and constraints (heavy at LANL), given current requirements

2. A changing national security context will compel dramatic policy shifts toward climate mitigation/adaptation, economic/fiscal sustainability, conservation of scarce resources, resilience

3. Progressively eliminate needless, unrealistic weapon/warhead requirements; level workload by selected delays; provide fiscal restraint; require thoughtful planning; require safety, accountability

4. Accept real engineering constraints and plan realistic schedules; avoid excessive and premature commitments; steward skills; follow laws (NEPA, 10 CFR 830); D&D excess facilities; dismantle warheads; conserve physical assets; respond to changing national security circumstances as above.



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Facts matter (1 of 2)

We aim to present facts (sections 1 and 2) as objectively as possible, and separately from our real-world policy prescriptions (sections 3 and 4).

There are actors in the pit production drama for whom the pit production policy answers are predetermined. We aren't those people. Representative policy camps want, *a priori,* one of these policies:

1. ***("LANL small"): At Los Alamos National Laboratory (LANL) only*, build and operate a factory for 30 War Reserve (WR) pits per year (ppy), with the "30" ppy either an average or a minimum. The latter gives an average of 41 ppy (Analysis of Alternatives [AoA], p. 13). How the present inadequacies in safety basis will be overcome (e.g. here and here), or how production will be maintained as PF-4 becomes (more) unreliable and ages out, is never explained. Some say PF-4 is fine now, and will last forever. Sure.**
2. ***("LANL big"): At LANL only*, build and operate a factory for >30 ppy, typically 50+ to 80+ ppy (i.e. 84 and 103 W87 ppy on average, respectively; ibid.). NNSA has recently said this is "very high risk," i.e. virtually impossible.**
3. ***("SRS big"): At the Savannah River Site (SRS) only*, remodel the Mixed Oxide Fuel Fabrication Facility (MFFF) for 80+ ppy, which has the advantage (unique among these four) of being realistic.**
4. ***("Two factories"):* Build and operate two factories, one at LANL for ≥30 ppy and one at SRS for ≥50 ppy.**

Our analysis leads us to this option: *("Stewardship"):* Conserve assets; do National Environmental Policy Act (NEPA) process; don't rush into (re)building or operating any factory right now at *any* level; above all *learn*.

Facts matter (2 of 2)

It is important to recognize that *physical limits and laws* cannot be changed by legislation or administrative decisions. Neither does denial make these and other real constraints go away.

This is by no means obvious in a society that unconsciously believes in what amounts to technological magic, and openly professes its faith in American Exceptionalism.

In the same way, neither fiat nor wishful thinking can quickly overcome deep-seated *historical and social realities and constraints* either. These patterns can be remarkably enduring. Even the turnover of generations may be insufficient to change or remove them.

On a smaller scale *institutional cultures* can be surprisingly resistant to change, as the National Nuclear Security Administration (NNSA) and the Department of Energy (DOE) have discovered.

The idea that the nuclear weapons industry can design, legislate, administer, and execute "against the grain" of permanent significant physical, social, and institutional constraints, in a government-contractor milieu characterized by weak accountability, has led to repeated failures.

Large NNSA programs are objectively prone to fraud, waste, and abuse, as the Government Accountability Office (GAO) has officially and repeated found. For some 22 years, many of DOE's pit production decisions have been based on denial, deception, and incompetent planning.

After NNSA's analyses to date, these four pit production options remain

1. **Options involving LANL's main plutonium facility (PF-4) to a greater or lesser extent. These include options 2a, 2b, and 2c in NNSA's Engineering Assessment (EA). Notably, none of these options were supported by the AoA, in part because PF-4 is not an enduring physical asset – or at this point, even a *known* asset – and because the space requirements for larger-scale pit production didn't pencil out. The safety and longevity of the PF-4 structure itself, as well as the viability of its safety systems, are "works in progress" that will not be fully understood until the 2021-2026 timeframe (NNSA estimates).**

2. **LANL options at TA-55 *not* involving PF-4, therefore involving large new construction at TA-55. This option was not analyzed in the EA. TA-55 has limited area and this option is likely unrealistic but could in theory eventually provide an enduring (i.e. 50-year) asset.**

3. **"Greenfield" LANL construction, elsewhere than at TA-55). This option was not analyzed in the EA. The "New Construction at LANL" option in the AoA was either this option or the preceding one.**

4. **Options involving repurposing the MFFF at SRS (Option 1 in the EA). Simplifying, both the AoA and EA rate this option as having the fastest schedule, lowest risk, greatest flexibility, and lowest capital cost.**

Filtering options by factual constraints: summary (2 pages)

Constraints	1. LANL PF-4 -dependent options, all capacities	2. LANL TA-55 options independent of PF-4	3. LANL Greenfield options, all capacities	4. MFFF at SRS options, higher capacity
Land area	Too tight for meaningful, low-risk expansion	Tight, unsure if realistic; high impacts to programs, environ.	Not limiting	Not limiting
Vertical depth of any new construction	Either shallow and inefficient (modules) or deep (large building)	Either shallow (large flat building, inefficient) or deep; great disruption of missions	Probably either shallow (large flat building) or deep, not in between	No new HazCat II construction needed
Earliest start date (AoA)	2026 (small, unstable production); impossible to expand production	2037 at the earliest, a slow or the slowest option	2037 at the earliest, a slow or the slowest option	2035, the earliest option
End of life	Unknown, 2020s earliest to 2040s latest, all ppy FATAL PROBLEM	Not limiting	Not limiting	Not limiting
Risk to other missions	Medium to high, depending on ppy, facility age, condition, missions	Very high. Other missions would probably pause. FATAL PROBLEM	Not limiting	Not limiting
Capital cost	Low for < 30; high for >30 ppy; impossible for 80 ppy	Very high	extremely high FATAL PROBLEM	Least

Constraints	1. LANL PF-4 -dependent options	2. LANL TA-55 options independent of PF-4	3. LANL Greenfield options, all capacities	4. MFFF at SRS options, higher capacity
Production Capacity, flexibility	Low capacity, flexibility, resilience; poor/no ability to augment with new construction; FATAL PROBLEM	Presumably not limiting but possible inherent site limitations for some functions	Not limiting	Not limiting
Safety	Impaired: substandard, old building and systems; repairs may not last; status of safety unknown at present	Presumably not limiting for new construction but site is crowded and geotechnically poor, compromises necessary	Not limiting; new construction	Not limiting; best construction
Workforce competence	Initial small workforce OK?; growth potential unknown; LANL issues	Unknown due to greater acquisition time lag; LANL cultural issues	Unknown due to greater acquisition time lag; LANL cultural issues	Initial workforce from/trained by LANL; growth potential good
Mission compatibility	Low	Low	Low	High
Overall results	Uncertain at 30 ppy, temporary at best, impossible for 50+ppy	Highest risk, high cost, slow or slowest	Highest cost, risk high but lower than TA-55 options; slow/slowest	Fastest, cheapest, least risk, enduring, flexible if competently pursued