

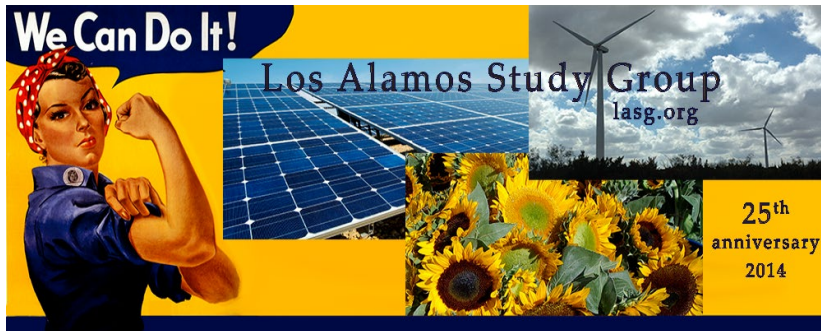
Sentinel, pit production, and a bit more

Why the US is losing the new arms race it started

Greg Mello, Executive Director, Los Alamos Study Group, Seminar talk for discussion July 15, 2024

Format: 30 minutes initial presentation, followed by discussion, then further presentation, then further discussion. No questions will be considered “dumb.” We are all just seeking truth here. Key takeaways:

- **The Sentinel silo-based intercontinental missile program is in serious trouble and is unlikely to be completed as currently scoped.**
- **The Los Alamos National Laboratory (LANL) plutonium warhead core (“pit”) production program is unlikely to “succeed” and is “necessary” only for deploying multiple NEW warheads on Sentinel missiles.**
- **More broadly, the National Nuclear Security Administration (NNSA) warhead modernization program is in trouble with cost, schedule, scope, and production milestones. It cannot be quickly expanded, in any case.**
- **Contrary to neoconservative hopes, the U.S. nuclear weapons enterprise has no “higher gear.” The U.S. cannot “win” (absurd), or even keep up in, a nuclear arms race with Russia and China combined.**



To subscribe to the Study Group's main listserve send a blank email to lasg-subscribe@lists.riseup.net. See especially our pages for [plutonium pit production](#), the [Ukraine War](#), [nuclear weapons modernization](#), NNSA [plans](#), the [Call for Sanity](#). Detailed [home page](#).



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Vignette: [“Reporter’s Notebook,”](#) February 17, 2023

During a question-and-answer session with four senior managers from NNSA’s production and test sites, an audience member took advantage of the ability to ask anonymous questions via mobile device and put the panel on the spot about how the government’s nuclear-weapon factories might return to a Cold War footing — or something even more severe.

“As we look at the geopolitical context,” the unidentified summit-goer asked in fluent strategic jargon, “if the nation has to upload the hedge to accommodate roughly doubling the number of counterforce targets, at least partially rebuild the hedge and deploy some hundreds of new theater nuclear weapons all in the next five to 10 years, how could the sites posture themselves for that?”

The room abruptly went the kind of quiet rooms usually only go when they’re empty.

On the stage, the NNSA’s production-site managers glanced around without speaking. They had spent the last hour discussing some of the challenges of coping with the agency’s current program of five serial nuclear-weapon modernizations — the largest workload of the 21st century by far, but nothing remotely approaching the frenzy of the Cold War.

It was anyone’s guess who would break the nervous silence weighing down the room, and if no one would have guessed that it would be Eric Wollerman, the president of Honeywell Federal Manufacturing and Technologies in Kansas City, Mo., who had just finished quite a detailed story about polymers, anyone would have understood.

“We don’t have any requirements to do that,” Wollerman matter-of-factly answered the anonymous questioner. “We don’t have any funding to do that. But we can stand ready to serve whenever we need to,” said the man in charge of the NNSA’s factory for non-nuclear nuclear-weapon parts.

The pulse returned to the room.

Laughter broke out. Then applause.

“That sounds like a national emergency!” someone said from the stage.

(Old slide, just to give you an idea of the cascade of NNSA modernization programs. The W93 and SCLM-N are now statutory.)

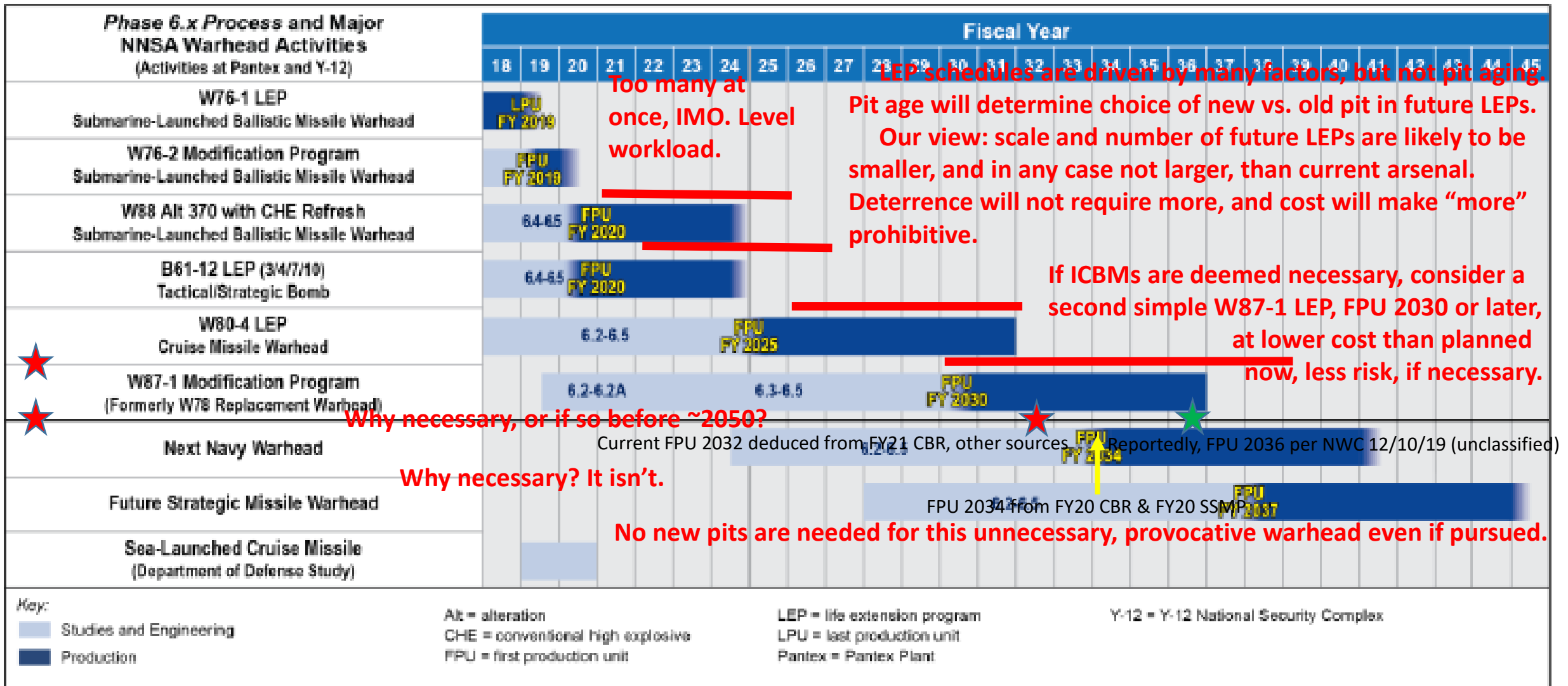


Figure 2–2. NNSA warhead activities²

From NNSA [FY2020 SSMP](#), July 2019 (update expected – when?). Red bars are production schedule as of May 2020, from LASG sources and [GAO-20-573R](#) (p. 16). (Some) FPU dates (not W87-1) are apparently now classified.

Failure looms. Look at the big picture.

- Sentinel is going to be delayed “several years,” a momentous official comment with long “coat-tails”. The actual situation on the ground is going to be worse than has currently been absorbed in the official mind, at least openly.
- LANL cannot make enough pits to fully outfit Sentinel with MIRVs, even if LANL succeeds.
- LANL has failed in the pit mission four times already. Success is hardly assured, as there are numerous adverse circumstances. Successes in halting SNML (1990), MPF (2008, SRS) and CMRR-NF (2012) were highly consequential.
- Numerous NNSA [delays](#) and extended [schedules](#) for production modernization run afoul of crammed production schedules. NNSA does not have, and is not close to getting, a modern production infrastructure for the current program of record, let alone more. Many current facilities are old and ailing.
- NNSA does not have, and is not retaining, the trained, skilled, motivated workforce it needs. The “heroic mode of production” won’t happen. The workforce problems won’t go away.
- NNSA cannot just “add shift work” for nuclear weapons work.
- The delays and cost increases we are seeing are providing important data that NNSA management, in response to statutory requirements, is struggling to acknowledge. Congress is providing “bad oversight.” More of a *whip*.
- The labor and supply-chain issues comprise logistical problems for which there are no apparent solutions at scale.
- Then come various *forces majeure*:
 - The federal debt bomb, made worse by high interest and gradual de-dollarization. Hidden financial land-mines.
 - Deteriorating environmental conditions under climate change. See LANL and other VARP.
 - Undiscovered/unappreciated major environmental issues (e.g. PFAS, VOCs at missile silos)
 - Safety “hiccups” *will* (not may) *lead* to shutdowns, scrutiny, and lower morale
 - Economic decline, social instability – not if, but when

(Apologies for the sketchiness of this outline. These are my opinions.)

2022 Climate Change Vulnerability Assessment and Resilience Plan Summary

Example VARP results from Los Alamos National Laboratory (LANL)

Wildfire risk in particular remains high at LANL. A crown fire in forested canyons under high wind conditions might be impossible to stop. Habitat concerns prevent drastic forest thinning.

Table 1. VARP Risk Score and Color Key.

VARP Risk Score and Color Key	
High	>7
Medium	3.5 - 7
Low	<3.5
No	Zero Calculated Risk

Table 2. LANL Summary Risk Matrix of Average VARP Risk Scores for High Impact Hazards across Asset Type.

Asset Type	Hazards				
	Increased Extreme Heat Events	Increased Extreme Precipitation Events	Increased Thunderstorms	Increased Flooding Events	Increased Wildfire Frequency
Specialized or mission-critical equipment	8.5	8.8	8.4	7.7	8.4
Energy Generation and Distribution Systems	7.5	7.5	7.5	7.5	7.8
Onsite Waste Processing	8.6	8.0	7.8	7.6	8.1
Site Buildings	7.2	8.2	7.8	7.4	7.7
Water and Wastewater Systems	6.4	7.9	7.9	6.8	7.6
IT and Telecommunication Systems	7.2	7.2	4.7	6.7	7.7

(slide from 6/20/24 talk) If we want disarmament we are going to need peace. To win that peace we are going to have to make it an actual political priority – which I don't see happening in the anti-nuclear community or much of anywhere else.

What is the current situation in nuclear weapons policy?

- There has been no significant nuclear disarmament in the last decade.
- The nuclear weapons modernization program is growing and evolving. More new warheads and bombs are being proposed; more are being funded than the National Nuclear Security Administration (NNSA) can even build, on schedule. Four new and reconditioned delivery platforms are proceeding despite politically-minor criticism; another (SLCM-N) has now been funded.
- Congress tends to add money to the already-extravagant requests, not trim them. There is almost no oversight. For pits, a \$22 billion temporary factory is being built in Los Alamos to deliver additional (MIRVed) warheads for Sentinel, ASAP.
- [MANY provocative nuclear policy steps are proposed](#), some are likely to be adopted.

(slide from 6/20/24 talk) Highlights of the current situation, continued:

- **The Russian Federation, for good reason, considers the U.S. “non-agreement capable” and is fielding advanced nuclear systems (e.g. Poseidon). Russia is no longer interested in most arms control and won’t be for many years to come. Real arms control is dead. *We are at war with Russia, for crying out loud!***
- **In February of 2026 there will no quantitative limits on U.S. and Russian strategic nuclear arms.**
- **China is expanding its nuclear arsenal fairly rapidly. (Don’t panic.)**
- **Russia has a new mutual defense treaty with the DPRK, which has a new ICBM (from Russia?) and is also expanding its nuclear arsenal.**
- **The U.S. has helped carry out attacks on strategic nuclear targets inside Russia.**

What do these and many other related facts tell us? They tell us we have lost the battle for nuclear disarmament for a generation. Our immediate job now is to prevent wider war, which might well mean *nuclear war* – twin catastrophes that we are approaching.

(slide from 6/20/24 talk) Finally,

- **We are in a whole new world, which challenges us to change our mentality as well as our foreign and domestic policies. Yesterday's verities may not apply today.**
 - **The vast sums given to the national security state have created a powerful second government, which in effect controls our constitutional institutions.**
 - **Internationally, the U.S.-led international order is crumbling. This is a tremendous opportunity.**
 - **Various *forces majeure*, including the need to service debt or else default, are coming to the fore. This means many things for us, politically.**
 - **One is that there will never again be a successful mass movement for nuclear disarmament in the U.S. There are now, and will be, too many other things going on requiring attention, including being able to live indoors and eat food.**
 - **Another is that the military and nuclear weapons establishment will not get all they want. Their present domination is incompatible with national survival.**

Sentinel warhead deployments scenario, full production of 50 upgraded silos/yr by 2035														
Option One: Maximize deployed warheads in 450 silos (requires W78 LEP, MMIII missile and silo LEP, and Sentinel bus for W78s)														
		2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	...	2055
Sentinel														
Deployed Missiles		1	11	51	101	151	201	251	301	351	401	450		450
Warheads	W87-0	3	33	153	273	390	501	501	501	501	501	501		501
	W87-1			1	30	99	102	228	264	300	336	372		849
	W78							24	138	252	366	477		0
	Total	3	33	154	303	489	603	753	903	1053	1203	1350		1350
MMIII														
Deployed Missiles		449	439	399	349	299	249	199	149	99	49	0		0
Warheads	W87-0	200	200	200	228	111	0	0	0	0	0	0		0
	W78	750	750	750	750	750	747	597	447	297	147	0		0
	Total	950	950	950	978	861	747	597	447	297	147	0		0
Total warheads deployed		953	983	1104	1281	1350	1350	1350	1350	1350	1350	1350		1350
W87-1 pits (made at LANL only, per NNSA)														
	Made	36	36	36	36	36	36	36	36	36	36	36	...	36
	Inventory, EOY	142	178	213	219	156	90	0	0	0	0	0		0

- Surveillance units and spares are also needed in the W87-1 inventory, extending the timeline 1-2 years
- If LANL production averages 40 pits/year (ppy), vs. 36 ppy, it makes no material difference in these timelines
- Regardless of warhead loading, doesn't the announced Sentinel delay incur a MMIII missile life-extension program (LEP) and a silo LEP for some silos, *either or both of which may not be possible*.
- Obviously, absent multiple independent reentry vehicles (MIRVs) for Sentinel, W87-0s can populate all Sentinels.

Sentinel costs are currently being understated, even assuming a successful program

DoD: \$141 billion (B) total acquisition costs (see [this page](#) for this and more). Though we lack details (please help if you can), this appears to omit:

- A. Silo maintenance/LEP for some silos and missiles during the Sentinel program. Post-Sentinel silo longevity?
- B. If a high degree of MIRVing is required, LANL pit production will not be able to satisfy that need until the 2050s, implying:
 - In all likelihood, a W78 LEP to keep that warhead, and
 - In the late 2030s, “bus” (final missile stage) modifications to accommodate not just W87-0s and W87-1s but also W78s.
- C. If continued, the W87-1 warhead costs money (from outside the DoD budget):
 - NNSA’s current estimated cost of the W87-1 program: \$16 B exclusive of pits but inclusive of DoD costs
 - NNSA total cost for 400-450 pits through FY2039, assuming a) complete success at LANL and b) no further cost increases, large capital costs, or site-wide costs: \$35 B (or \$27 B excluding sunk costs). Bear in mind that quantity pit production at LANL is proceeding ONLY to serve the W87-1, and LANL production is temporary.

DoD’s \$141 B implies \$313 million (M) per deployed missile at 450 silos used, or \$353 M with 400 silos used. The unit (per pit) cost of W87-1 pits through FY2039 is \$77-89 M (see next slide). At two W87-1s per missile (assuming W87-0s are kept, and are cost-free), that’s \$166 M for pits + ~\$40 M for the rest of the 2 warheads, or about \$200 M more per deployed missile than DoD is counting, just for MIRVing with 2 W87-1s. MIRVing with 3 W87-1s would increase the cost per deployed missile by ~\$309 M, i.e. doubling the current estimated cost.

(from [here](#)) Cost per LANL pit under assumptions of complete success

	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY39
Low	1	5	10	15	20	25	30	36	36	36	36	36	
Σ	1	6	16	31	51	76	106	142	178	214	250	286	394
High	1	10	15	20	25	30	35	40	40	40	40	40	
Σ	1	11	26	46	71	101	136	176	216	256	296	336	456

	FY32	FY35	FY39	Total operating cost without further investment, \$B, FY32-FY39, same assumptions:
Total cost, \$B, <i>no further cost escalation</i>	22.1	27.2	35.1	
Lower bound, \$M/pit	126	92	77	
Upper bound, \$M/pit	156	109	89	
Forward cost from FY24, \$B, <i>no escalation</i>	13.6	18.6	26.6	7-year total cost: 13
Lower bound, \$M/pit	77	63	58	Low marg. cost: 46
Upper bound, \$M/pit	96	74	68	High marg. cost: 52

(This slide is [from here](#).) NNSA estimates a total cost for the W87-1 program at \$15.9 B (in then-year dollars), which we may take as a minimum cost. (GAO's 2020 [estimate](#) was \$9-15 B.) *Both estimates are exclusive of pit production.*

To provide an average of two MIRV warheads to 450 Sentinel missiles to supplement the available 500 W87-0 warheads (leaving 30 W87-0 surveillance units), plus 30 surveillance units plus just 20 spares would require a production run of 900 W87-1 warheads. Many people assume (why?) that NNSA's requirement is for 800 W87-1s. This would give a unit cost of \$20M, exclusive of pits.

NNSA has [said](#) the lifetime of PF-4 could be extended to as late as 2045. Assuming all goes perfectly (it won't) LANL could make as many as 700 W87-1 pits by then; 600 is a more realistic best case.

LANL pit production is temporary, even in the most optimistic case.

W87-1 pits are to be the exclusive province of LANL for at least the 2030s. (["Los Alamos to make plutonium cores \("pits"\) for new ICBM, Savannah River to make pits for new submarine missile warhead"](#)). The total per-pit cost of these LANL pits would be about \$83M, assuming total program success (forward-looking per-pit costs: \$63M).

Were pit costs included, W87-1 unit costs would rise to \$103M (using total pit cost), 5x the current estimated cost, or \$83M (using forward pit cost), 4x the current estimate. Early termination of the LANL pit production program would save most of these costs.

Sentinel options include:

- The current program of record including 450 silos and an unspecified number of W87-1s, W87-0s, and possibly W78s. Pits from LANL alone, as the SRPPF at SRS is assigned to make pits for the W93.
- (Nota bene: what pit will be used for the SLCM-N? If new, there is no place to make it. FYI, IMO there are ~2,075 W80-X pits available for LRSO [W80-4] plus SLCM-N)
- Omit W87-1; use W87-0 only (~530 available). Eliminates MIRV option.
- Omit W87-1, use W87-0 plus W78 (~774 of the latter available)
- Redesign the W87-1 to use an (older) recycled pit (e.g. W62, ~560 available)
- Drop the W93 and have SRPPF make W87-1s, using all recycled pits in the W93 – or else drop it altogether for now.
- Decrease the number of deployed Sentinel missiles
- Stretch out the Sentinel program greatly, allowing MMIII to die out, resulting in a “trough” in the number of deployed missiles
- Replace Sentinel missiles with MMIII LEPs, upgrading silos only and as needed
- Retire silo-based missiles entirely
- develop road-mobile missile
- Upload additional SLBM warheads

Figure 2: Sites Associated with the National Nuclear Security Administration's Production Modernization Effort

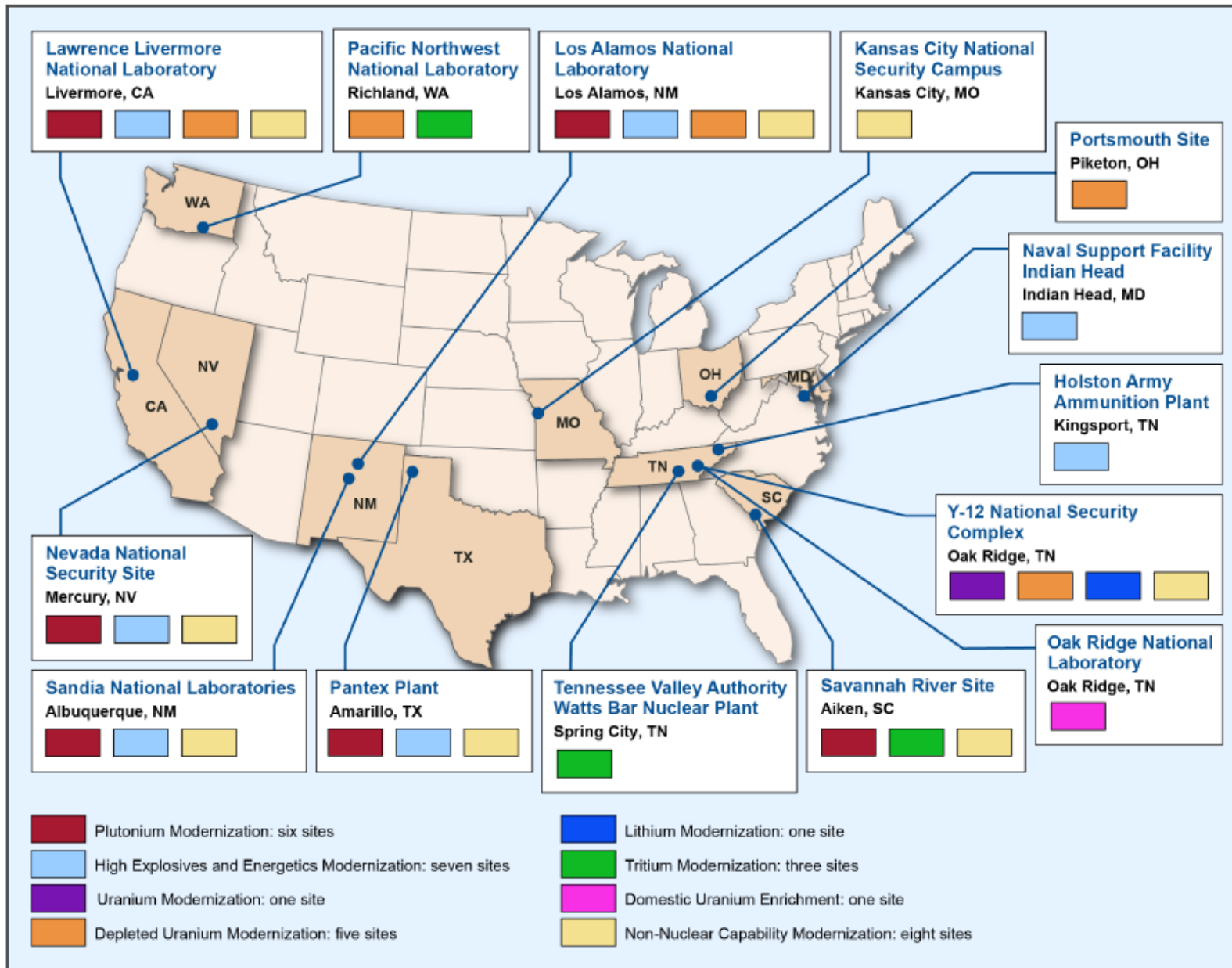


Table 6: Major Capital Asset Projects Associated with the National Nuclear Security Administration’s (NNSA) Production Modernization Programs, as of January 2024 (from [GAO-24-106342](#))

Production Modernization Program	Major Project (Location)	Planned construction completion date
Plutonium Modernization	Los Alamos Plutonium Pit Production Project, Los Alamos National Laboratory, LANL	March 2032
	Chemistry and Metallurgy Research Replacement Project PF-4 Equipment Installation, Phase 2 - LANL	Fiscal Year (FY) 2029
	Chemistry and Metallurgy Research Replacement Project Radiological Laboratory Utility Office Building to Hazard Category 3 – LANL	NNSA did not provide a planned completion date
	Transuranic Liquid Waste Treatment Facility Upgrade Project - LANL	August 2027
	Technical Area-55 Reinvestment Project, Phase III, LANL	FY 2027
	Savannah River Plutonium Processing Facility, Savannah River Site, Aiken, SC	FY 2032-FY 2035
High Explosives and Energetics Modernization	High Explosives Science and Engineering Facility, Pantex Plant, Amarillo, TX	March 2028
	High Explosives Synthesis, Formation, and Production Facility ^b , Pantex Plant	FY 2034
	Energetic Materials Characterization Facility ^b , LANL	FY 2034
	Radiography and Assembly Capability Replacement ^c , LANL	FY 2030–FY 2035
Uranium Modernization	Uranium Processing Facility, Y-12 National Security Complex, Oak Ridge, TN	February 2029 ^d
	Electrorefining Project, Y-12	February 2025
	Direct Chip Melt Bottom Loading Furnace, Y-12	FY 2029 – FY 2032
Lithium Modernization	Lithium Processing Facility, Y-12	FY 2031 ^e
Tritium Modernization	Tritium Finishing Facility ^b , Savannah River Site, SC	FY 2034
Non-Nuclear Capability Modernization	Power Sources Capability facility, Sandia National Laboratories, Albuquerque, NM	FY 2030

Source: GAO analysis of NNSA documentation and NNSA officials’ statements. | GAO-24-106342

(A big project omitted by GAO because it is not a big congressional item)

[KCNSC begins first phase of \\$6.4 billion project with \\$199 million construction deal](#)

July 12, 2024, By Sarah Salem, *Exchange Monitor*

The National Nuclear Security Administration announced this week it entered into a multi-year agreement in May to expand operations and office space at the Kansas City National Security Campus in Missouri.

The National Nuclear Security Administration (NNSA) made the agreement with Promontory 150 LLC in May to purchase both land and what a spokesperson for the Kansas City National Security Campus (KCNSC), in an email to the Monitor, called a “build-to-suit” facility.

KCNSC is NNSA’s factory for non-nuclear nuclear-weapon parts. The new facilities will aid with designing, testing, and production of non-nuclear weapons components, according to the press release announcing the real-estate deal.

The KCNSC spokesperson told the Monitor that this first phase of the project, called the Kansas City Non-Nuclear Expansion Transformation (KC NExT), is “envisioned to be the first of several purchase agreements under this project.” The cost for phase one would be \$199 million, paid upon completion of the building, which is set to be completed in the summer of 2026, the spokesperson said.

KC NExT aims to add around 2.5 million square feet of manufacturing and office space to accommodate growth in KCNSC, according to the release.

“KCNSC has experienced significant growth in workload and personnel to support NNSA’s planned modernization of the nuclear deterrent,” the NNSA wrote in the release.