Presentation to the

Radioactive and Hazardous Materials Committee of the New Mexico Legislature

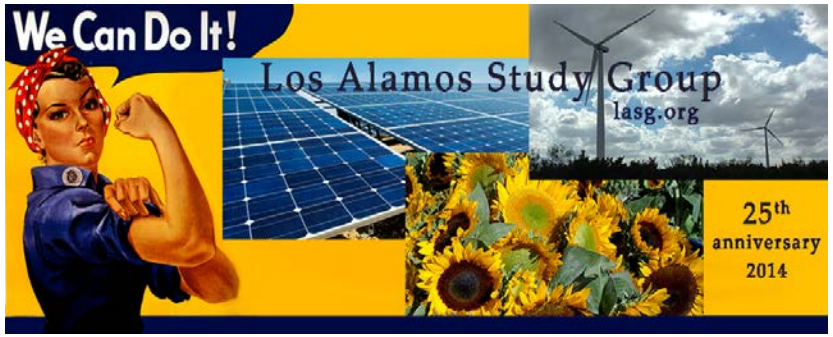
"Waking the Wolf" – Expansion of Nuclear Weapons Development and Production at Los Alamos National Laboratory (LANL) Will Lead to Economic, Social Stagnation and then Decline, Intractable Environmental Problems

Greg Mello, Executive Director, Los Alamos Study Group, September 9, 2020

Every gun that is made, every warship launched, every rocket fired signifies, in the final sense, a theft from those who hunger and are not fed, those who are cold and are not clothed.

This world in arms is not spending money alone. It is spending the sweat of its laborers, the genius of its scientists, the hopes of its children. The cost of one modern heavy bomber is this: a modern brick school in more than 30 cities. It is two electric power plants, each serving a town of 60,000 population. It is two fine, fully equipped hospitals. It is some fifty miles of concrete pavement. We pay for a single fighter plane with a half million bushels of wheat. We pay for a single destroyer with new homes that could have housed more than 8,000 people.

Dwight Eisenhower, *Address to the American Society of Newspaper Editors*, 4/16/53



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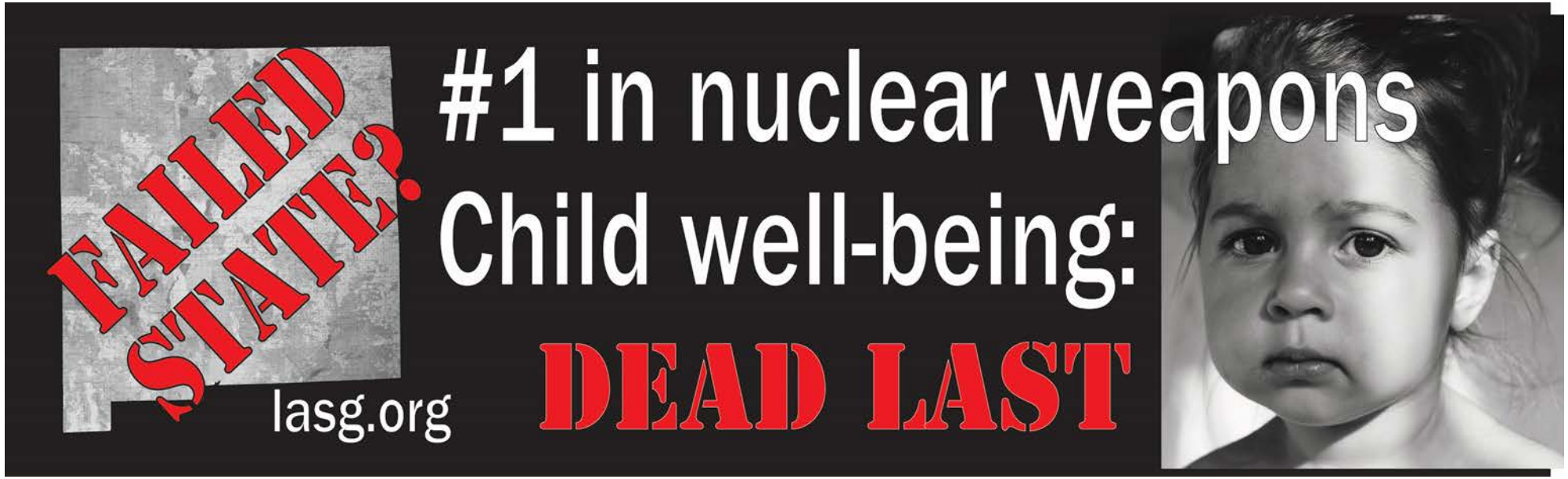
Blog: Forget the Rest

Los Alamos Study Group
2901 Summit Place NE
Albuquerque, NM 87106
www.lasg.org, 505-265-1200

Our main concerns in a nutshell

1. The proposed LANL expansion is huge – approximately twice as large as when I spoke to this committee two years ago (slides, summary, handouts). As one senior federal official said to us, we are "waking the wolf" of unbridled nuclear weapons production, with attendant safety and environmental problems.
2. LANL's expansion is being driven by industrial plutonium warhead core ("pit") production, the most dangerous and polluting nuclear weapons mission of all. LANL is to be a large-scale production site.
3. Pit production comes with a raft of intractable safety, environmental, and security problems, as well as a host of regional impacts that together will negatively mark northern New Mexico forever.
4. We concur with the concerned comments of the Environment Department (NMED) (also here).
5. The scale of work, required facilities, and resulting regional impacts of this expansion are now *secret*.
6. There is no useful, current, or accurate environmental and economic impact analysis.
7. Please see the list of major impacts and federal decisions in our Letter to New Mexico Environment Department re: Need for Site-Wide Environmental Impact Statement (SWEIS) at LANL, June 29, 2020.
8. Some senior federal and congressional officials, and the Los Alamos Study Group, find no evidence that LANL can safely and securely execute this growing program. Nor is it actually necessary for existing U.S. weapons.
9. New Mexico risks being left even farther behind states which invest in more useful technologies, careers, and infrastructure. This will worsen when – not if – the nation begins cutting useless weapons programs..



Current LASG billboard on I-40 westbound at San Jon. We are trying to get your attention. Don't shoot the messenger.

"While a recent jobs report painted a more positive employment picture nationally, White said New Mexico – **the only state to post a significant decline in its labor force in the last monthly update** – may have a long road to recovery." ("In 2020, A Labor Day like no other," *Albuquerque Journal*, 9/7/20, emphasis added)

What precisely makes New Mexico unique in its low political and economic performance? Several factors contribute, but a politics of nuclear mesmerization is certainly one: **"The labs will lead us." Wrong. The labs will *use* us.**

Unprecedented Concern from Los Alamos County Elected Officials

"LANL, DOE and NNSA must do better if they want to be viewed as a trustworthy institution or as a sincere regional partner. LANL consistently wants and takes from this community. Not only do they take, they expect us to give. We give up our downtown as they take our retail spaces and subject our few surviving businesses to ever-increasing rents and increased burdens – all the while complaining that this town doesn't offer enough for them to recruit the minds they so desperately want," Maggiore said.

He said it is increasingly clear that LANL and NNSA have no interest in being real partners with Los Alamos County or any of its surrounding communities.

"It is clear they don't have our best interest at heart – it's highly questionable that they even have their own long-term interests at heart. Scratch that – it's not even that they don't have their own best interests at heart – they don't even have them in mind," Maggiore said. "Their proposed solution to our housing shortage is to build a $1 billion, if not more, bridge across the Rio (Grande) so their employees who live in Albuquerque can have shorter commutes – local environment and existing residents be damned."

He said that's not partnership, that in fact it's the exact opposite.

"We have neighboring communities that with a far smaller investment would yield far higher returns on both the political goodwill front and the local regional economic impact front," Maggiore said.

He said if LANL should deal in good faith with anyone, it should be with Los Alamos County.

"I'm giving notice that anything that comes before us to benefit LANL without directly benefitting us or our surrounding communities at least twice as much as it benefits them, is a non-starter for me. Their bad faith dealings have gone on long enough," Maggiore said. "It's increasingly clear in all their actions that they don't care for us, our environment or our neighbors. I find it incomprehensible and utterly unnerving that an institution made a whole branch of government devoted to nuclear weapons and stockpile stewardship can be so shortsighted and selfish. It makes me question any decisions that come out of an organization so inadequately morally compassed."

("Los Alamos County Councilor Slams DOE/NNSA For Denial Of Land Transfer Request", Los Alamos Reporter 7/28/20). Two other councilors generally agreed with these comments. Video (10 minutes).

What can be done?

- **Require transparency**, including not just RHMC and NMED – which we don't have now -- but also local governments, tribes, other agencies, and the public.
- **Demand a new, open SWEIS process**, conducted by environmental and economic professionals, not weapons administrators and lawyers.
- **Require stronger oversight from NMED**. Throw burdens of proof back to LANL and NNSA. NMED cannot afford to do their work.
- On an emergency and long-term basis, **NM must train and employ young people and the unemployed in a different mix of jobs weighted toward essential human and environmental needs and community resilience in all its forms.** The State must place its thumb on the scale in preference for youth and families. There are enormous unmet needs in our communities. "High-paying" jobs that do not create useful goods and services in the NM civilian economy will hurt NM through inequality, emigration, despair, continued educational failure, lack of available services, and self-harming behaviors. The present two-tier economy will be perpetuated, with the lower portion (~80%, the source of most consumer demand) constantly eroding. LANL hasn't and won't fix this.
- NM, the US, and the world now face a "Long Emergency." There will be no return to "normal." **The greatest danger we face is being sold "a bill of (fake) goods"** – e.g. poor educational priorities – that places NM even farther behind in the work and careers that will sustain our communities and families in the years ahead.
- Making plutonium pits (at roughly $15-20 million each at LANL, about 100x their weight in gold), will do absolutely nothing for this state except bring pollution and poverty, and undermine the independence and creativity of our precious civil society institutions, from education to local and state government and all the rest. **We need to get our minds and hearts out of the labs.**

Los Alamos National Laboratory (LANL) spending, current and proposed, $ billions				
LANL M&O contractor: Triad, LLC	**FY 2020 enacted**	**% total**	**FY 2021 request**	**% total**
Weapons programs	1.93	59%	2.91	71%
Nonproliferation programs	0.29	9%	0.31	8%
Safeguards & security	0.15	5%	0.03	1%
Environmental Mgmt	0.03	1%	0.03	1%
DOE office of science	0.09	3%	0.06	1%
Energy & other programs	0.09	3%	0.02	0%
Work for others (WFO) (assumed unchanged)	0.35	11%	0.35	9%
Total Triad	2.93	89%	3.71	91%
LANL cleanup (N3B)	0.19	6%	0.19	5%
Los Alamos Site Office (LASO) (federal)	0.17	5%	0.18	4%
Total LANL	**3.29**	**100%**	**4.08**	**100%**

What does LANL do?

As of 8/20/20, LANL says it has 13,137 employees:

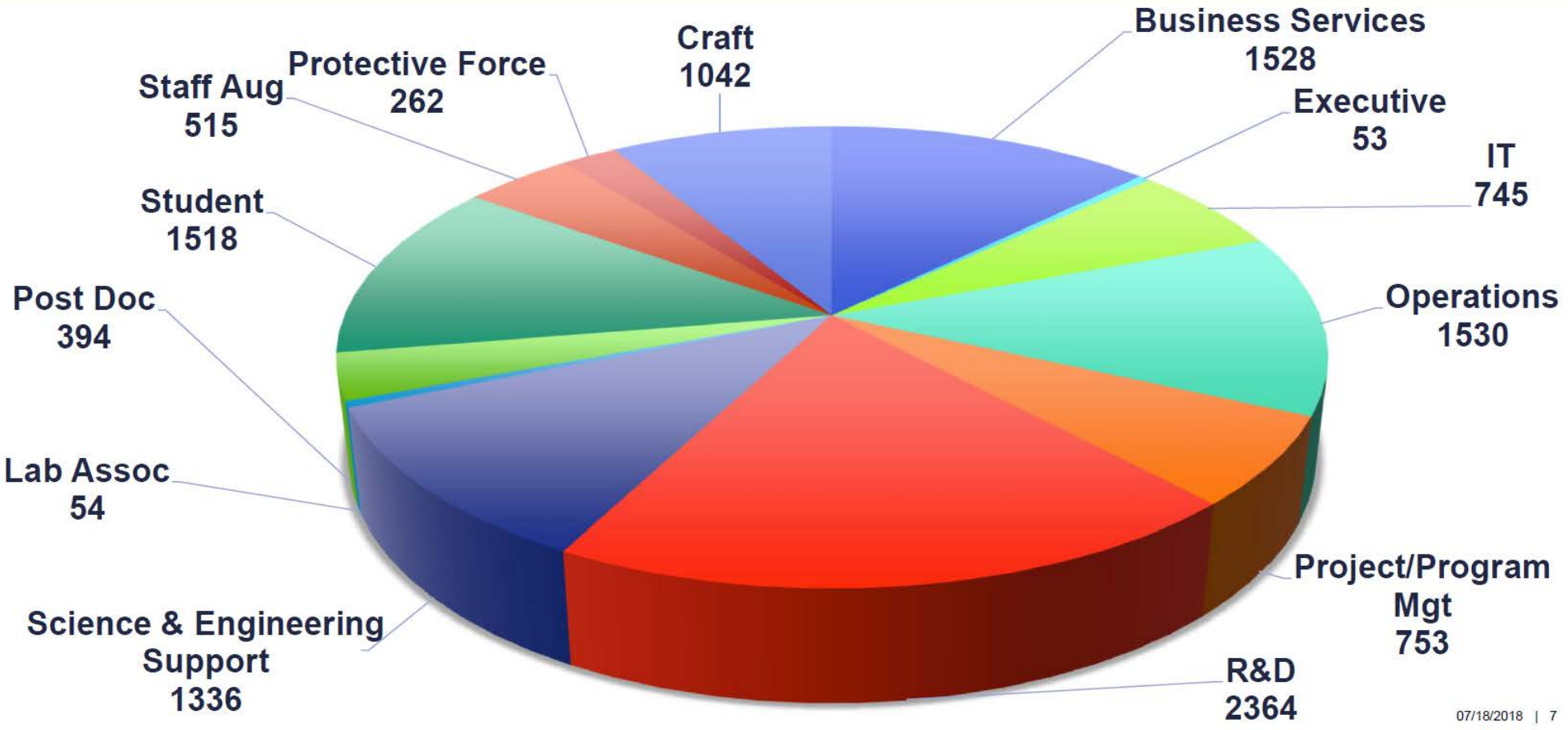
- Triad: 9,397 (67% university degreed, 21% PhD)
- Guard force (Centerra-LA): 281
- Subcontractors: 478 (part- or full-time?)
- Students: 1,323 (presumably few are full-time)
- Unionized craft workers: 1,160
- Postdocs: 498

This does not include N3B, its subcontractors, or LASO

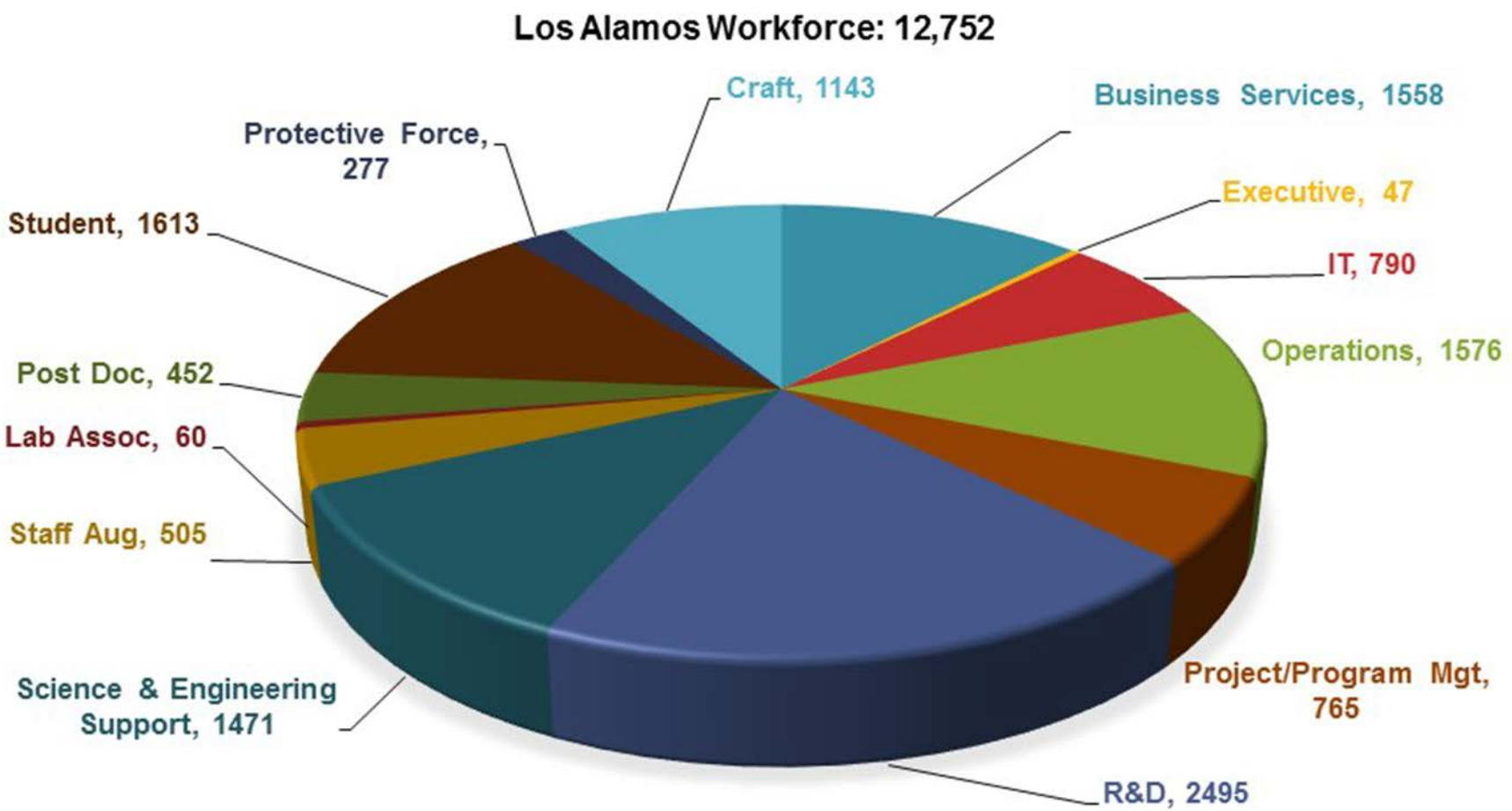
Sources:

- https://www.lanl.gov/about/facts-figures/index.php (retrieved 8/20/20)
- https://www.lasg.org/budget/FY2021/doe-fy2021-laboratory-table.pdf

12,094 People: Our strengths are the diversity and quality of our employees

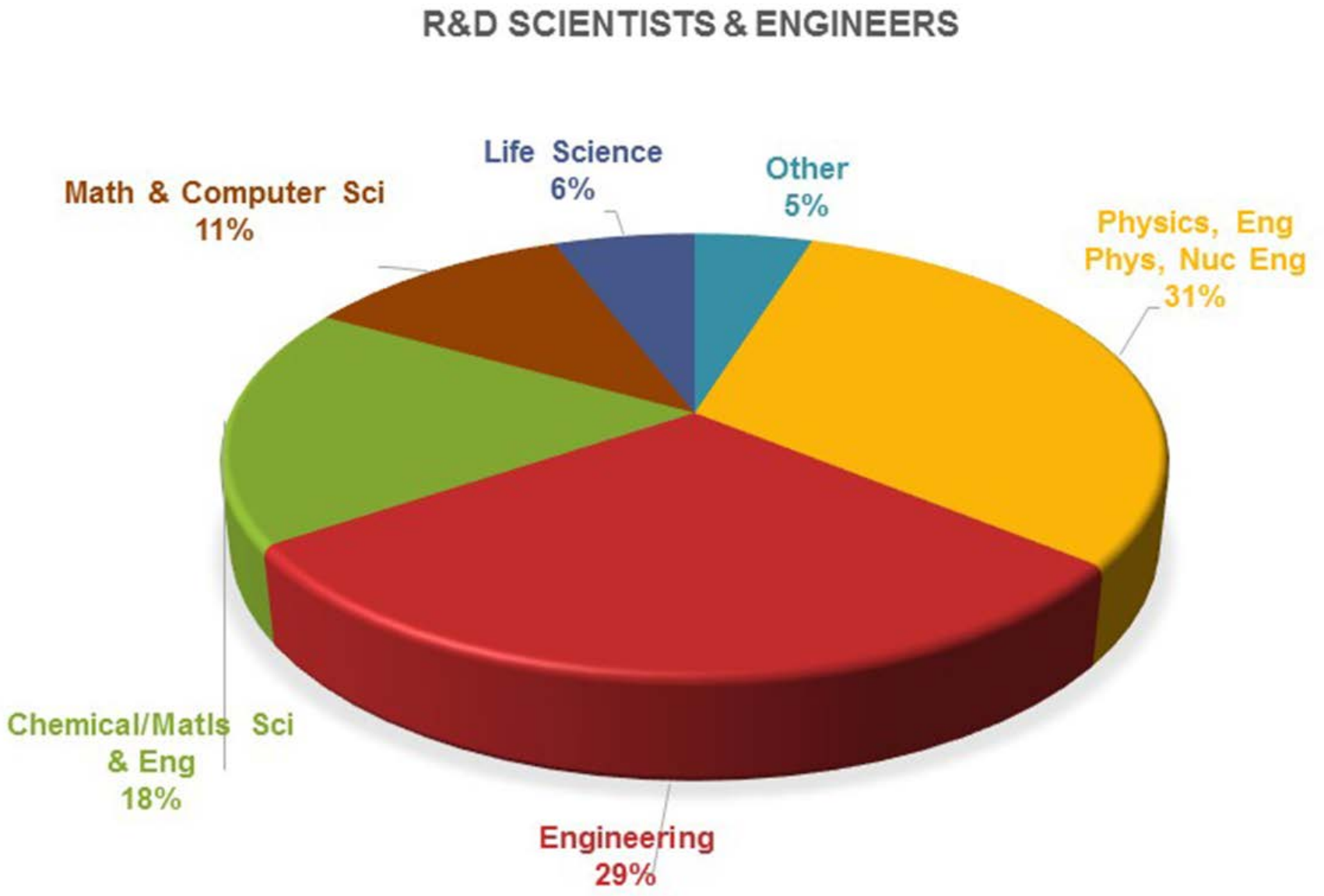


Breakdown of LANL workforce presented to RHMC August 2019. Employment figures were erroneous. See next slide.



Same breakdown, July 2019, one month earlier: 658 more employees.

From https://www.lanl.gov/about/facts-figures/talent.php



From https://www.lanl.gov/about/facts-figures/talent.php

There is no federal plan for pit production at LANL. There are only secret contractor proposals and reports. New Mexico can have no clear idea of what is proposed.

"However the committee remains concerned that NNSA has not prioritized the development of a resource-loaded integrated master schedule that includes all pit production-related, project-related and program activities as recommended by the GAO and does not appear to have plans to complete such a schedule until after it would have had to achieve certain pit production milestones" [in 2023-2025]…

"Given the NNSA's continuing challenges in constructing large complex nuclear facilities on time and on budget, coupled with the extremely constrained timeframe and planned use of expedited processes and procedures, the risk of not meeting pit production milestones is high." (House Appropriations Committee Report on FY21 Energy and Water Appropriations, p. 140)

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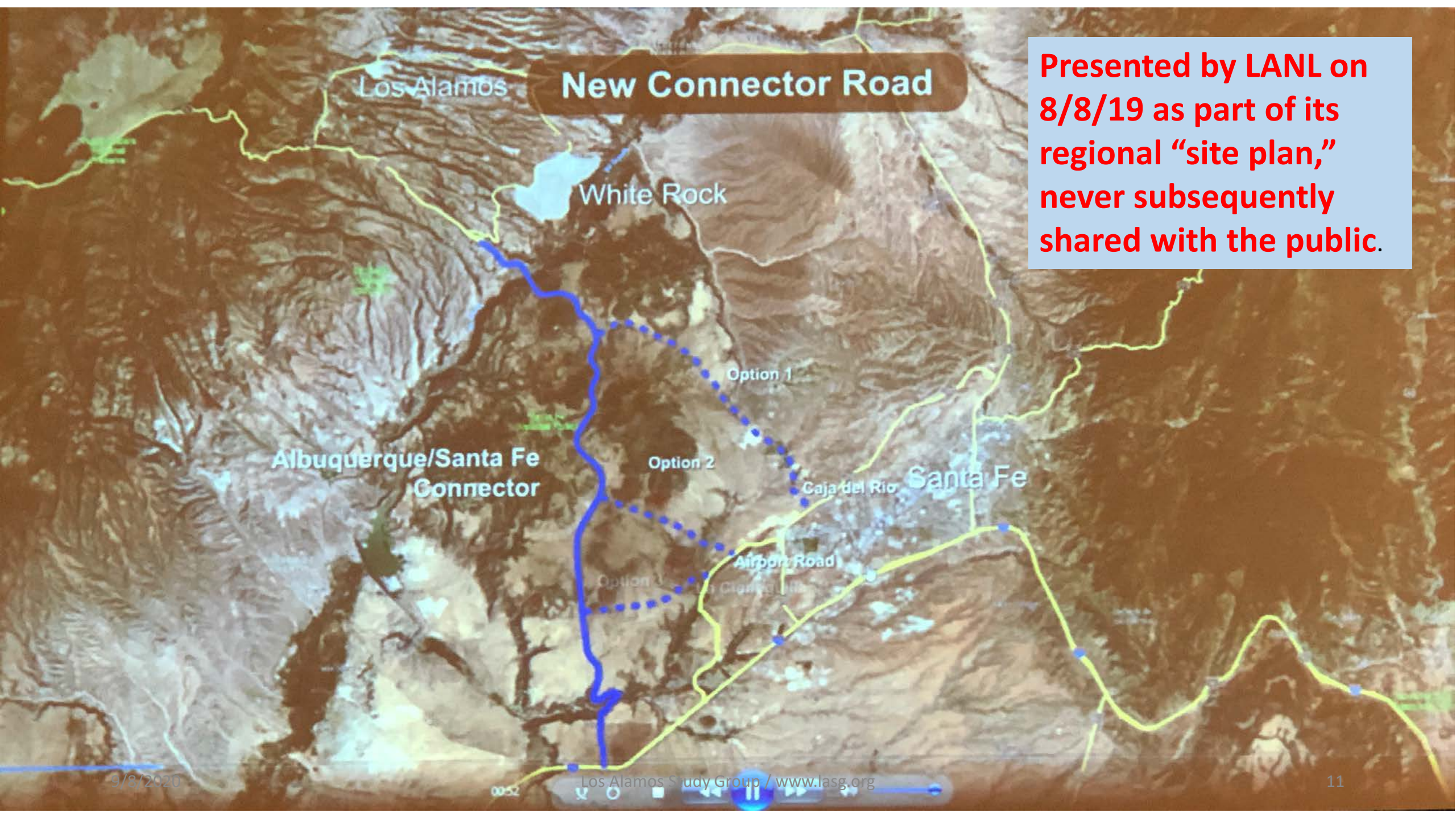
"The Los Alamos Reporter last week requested information from the NNSA Los Alamos Field Office as to what plan is being followed by NNSA with regard to pit production at Los Alamos and was told by a spokesperson that **LANL's proposal** to meet NNSA's mission for expanded pit production as well as a Pit Production Report submitted to Congress are Unclassified Controlled Nuclear Information." ("House Appropriations Committee Wants NNSA To Submit Plans, Schedules For Pit Production," *Los Alamos Reporter*, 7/13/20)

That is, **NNSA's "plan" is actually a contractor proposal, and it is effectively secret.** The Legislature might be able to see it in a special room after signing a statement not to reveal anything in it to the public. NMED might be able to get it under similar conditions. But what you be shown?



Presented by LANL on 8/8/19 as part of its regional "site plan," never subsequently shared with the public.

Seven months earlier…

New Mexico Department of Transportation
Major Investment Projects of Regional Significance
(dollars in millions)

District 5		
I-25	$ 250	Adding 3rd lane on I-25 between Bernalillo and Santa Fe.
NM 170	$ 20	Adding shoulders and performing pavement preservation on 18 miles from Farmington to the Colorado state line.
Los Alamos Bypass	$ 67	Construction of 15-16 miles of additional roadway and an additional crossing over the Rio Grande.
U.S. 64	$ 225	Improve 2-lane sections and widen shoulders on various segments from the Arizona state line to the District 4 boundary.
U.S. 491	$ 18	Pavement preservation and shoulder widening on 15 miles of roadway from Shiprock to the Colorado state line.

Source: NMDOT and LFC Files

*Project costs are based on formula calculations and are intended to provide an initial estimate only. Costs are not intended for programming or financing.

STATE OF NEW MEXICO
Report of the Legislative Finance Committee
to the Fifty-Fourth Legislature
January 2019
For Fiscal Year 2020
FIRST SESSION
Volume 3
https://nmlegis.gov/Entity/LFC/Documents/Session_Publications/Budget_Recommendations/2020RecommendVolIII.pdf

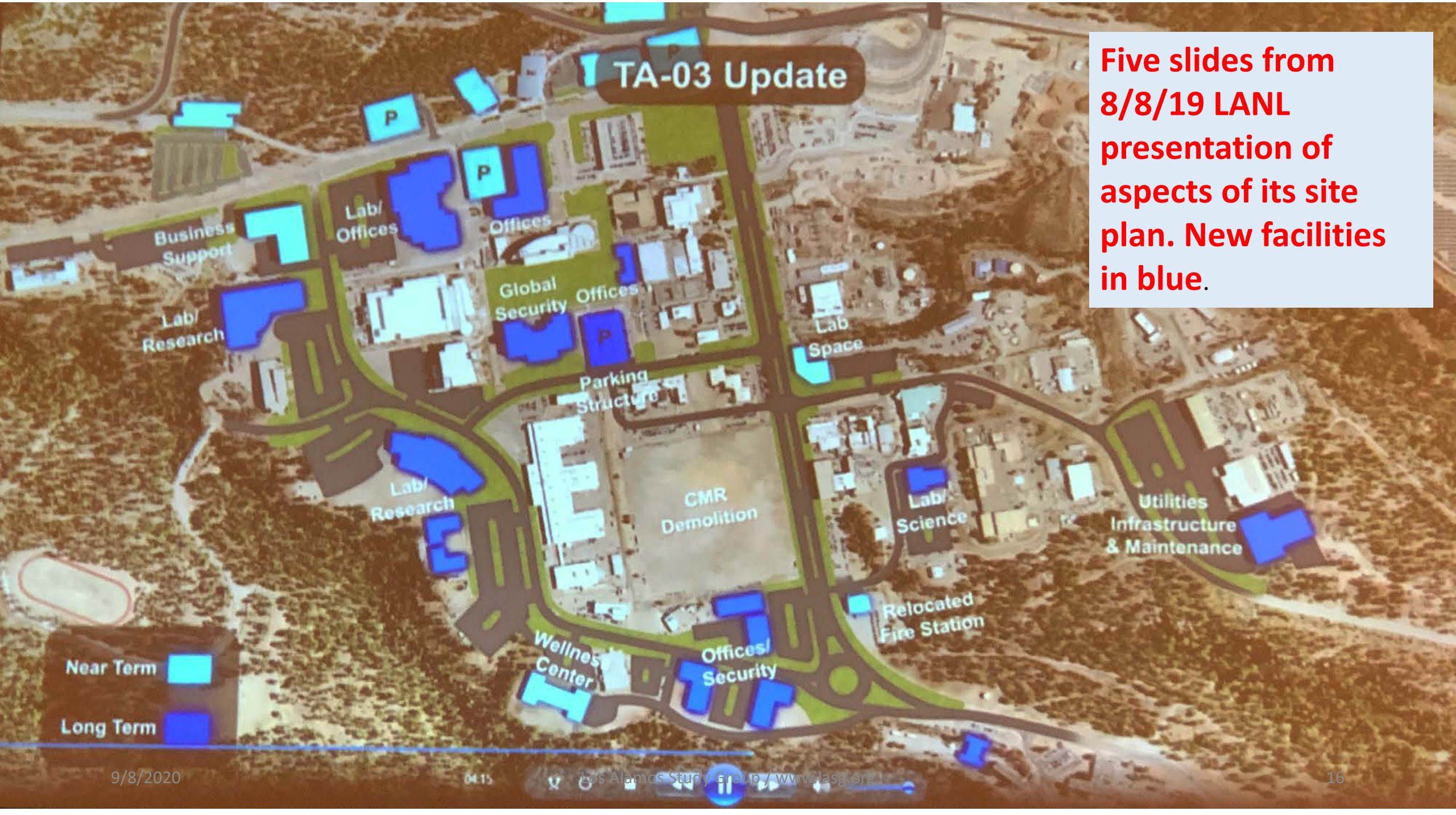
Proposed Rio Grande bridge crossing looking north, LASG photo 2012

Bigger

Same plan, 1990 version.

The workforce and congestion imperatives behind this wild plan are non-trivial, given LANL's proposed growth, low availability of skilled labor, and lack of local housing.

Nuclear materials convoy, main Hill road (photo: *Los Alamos Monitor*, Carol Clark)



Five slides from 8/8/19 LANL presentation of aspects of its site plan. New facilities in blue.


Research Park Update
Research Park Building 2 & 3 with Badging
New Bypass Road
Parking Structure
P
Research Park Building 4
Parking Structure
P
Research Park Building 5
New Parking
P
Near Term
Long Term


Shipping/Receiving Complex
EAST JEMEZ ROAD
DEPARTMENT OF ENERGY
BANDELIER NATIONAL MONUMENT (TSANKAWI)
Turning and De-Cell Lanes
Focused Traffic Intersection LANL / Public Vehicles Turning
Distribution 95,000 S.F.
Dog Kennel
Office Building 22,000 S.F.
Fleet Storage 197± Spaces
NEW MEXICO 4
PUEBLO DE SAN ILDEFONSO INDIAN RESERVATION


Future Campus Update
Near Term
Long Term


Pajarito Corridor Update
Realigned
Canon Rey
Office/Training/Cafeteria
Parking Structure
Office Building
P
Office & Parking
Trident
Renovation
New
Top Layer/
Parking
New Parking
P
Near Term
Long Term

New Mexico's largest public infrastructure investments In relation to LANL capital projects (LCPs) planned, FY2020 – FY2030 ($13 billion) (Costs are best available; dates mostly at completion)				
Project	Year	Cost Then ($M)	Cost in 2019 ($M)	Percent LCPs
Elephant Butte Dam, NM	1916	5.2	262	2%
(Golden Gate Bridge, CA)	1937	35	1,003	8%)
San Juan Chama Diversion	1964	>35	>321	>2%
Cochiti Dam, NM	1975	94.4	406	3%
LANL TA-55 PF-4	1978	75	251	2%
I-40 + I-25 + I-10 highways, NM (treated here as one project)	1956-1995	~7.4 M/mile, 2006 dollars	Ballpark 9,207	71%
Big I Interchange, Albuquerque	2001	290	455	4%
San Juan Chama drinking water project, Albuquerque [1]	2008	280	334	3%
Railrunner Heavy Rail Extension to Santa Fe (incl. track lease)	2008	~400	~477	4%
LANL DARHT (very approximate)	~2008	~ 400	~477	~4%
SNL MESA Complex	2008	516.5	616	5%

Make no mistake, do not be distracted by details: this is to be a huge expansion that will dominates all investment in NM.

It will dominate our politics, attitudes, and institutions, and limit our future possibilities in myriad ways.

The National Nuclear Security Administration's (NNSA's) August 20, 2020 final Supplement Analysis (SA)

- Not an environmental impact statement (EIS) or Site-Wide EIS (SWEIS)
- Written to justify not undertaking a SWEIS. Lawyers, not scientists and engineers, controlled content.
- Written to obscure and deceive, not reveal (see next slide for example)
- It is useless as real-world environmental analysis.
- Cursorily examines projected future impacts of one LANL program with while omitting all others.
- The proposed action is nowhere clearly defined; it has approximately doubled over the past two years. Impacts are to be minimized by the "honor system" only.
- No alternatives to the undefined action are proposed or analyzed.
- Environmental and LANL conditions and context that were assumed in 2008 no longer apply.
- Compares projected impacts of the (vague, evolving, partial) proposed action with projected impacts of obsolete, rejected alternatives from the now-distant past. Neither are in the real world. In NNSA's "Alice In Wonderland" approach, the Red Queen declares that today's impacts are not worth examining because estimates (not measurements) of one or two decades ago were…written in reports.
- There is no process of agency, tribal, legislative, or public input and peer review.
- No mitigation plan is proposed.
- With no well-defined action proposed, there is no basis for a well-defined decision.

What this means is that New Mexico is being assigned the dirty work of the nuclear weapons complex – with no say and no environmental analysis.

Despite this great scale and scope and magnitude of impacts, there is no SWEIS or any other EIS planned.

There *is* a SWEIS planned for the relatively benign Lawrence Livermore National Laboratory (LLNL), the "clean lab" that will supervise our "dirty" pit production.

There *is* also an EIS underway for pit production in that bastion of environmental progressivism, South Carolina.

The pit mission cannot be fully politically separated from efforts by the Department of Energy (DOE), contractors, and others to open a consolidated interim storage site for spent nuclear reactor fuel near Carlsbad. This is also a highly-impactful endeavor that would, if brought to fruition, gravely damage the future of New Mexico. For numerous reasons we believe that this waste, once brought, would never leave.

This state is being marked for nuclear production and pollution. It could become a nuclear colony.

The legislature, or the Governor, could effectively request a SWEIS, which would provide NMED, other cabinet agencies, and the RHMC some insight into the impacts ahead, as well as commit NNSA to fund mitigation measures, should these plans proceed.

Some specific impacts from the Study Group's letter to NMED re: Need for SWEIS at LANL, 6/29/20 (6 slides)

- NNSA seeks to hire thousands (net) of new staff at LANL over the coming five years. LANL is poised to dramatically change into something never seen before. Triad, NNSA's management and operating contractor, has publicly discussed the fact that impacts of these expansion decisions will be regional and significant -- in terms of traffic congestion, housing, possible new roads and bridges, and possible secondary LANL campuses.
- The road network and housing markets are already stressed. A powerful factor not present or foreseen in 2008 is the fact that many LANL retirees are staying in the Los Alamos community and so a much larger fraction of the LANL workforce now commutes. In other words, the retiring Cold War demographic bulge is consuming much of the available housing, with regional effects.
- A common phenomena across several kinds of environmental impacts is that the Pajarito Plateau is in many ways "full": increases in environmental pressures result in greater-than-linear impacts. Examples are traffic slow-downs stretching miles every day near White Rock; the relatively abrupt need for 5,000 additional housing units (according to Los Alamos County's latest housing report), greatly expanding the County's total housing stock and population; contemplated urban development in wildlife corridors and open space areas; planned construction almost adjacent to the Tsankawi portion of Bandelier National Monument, and much more). *Qualitative* changes in impact, and *kinds* of impacts, are reasonably expected to occur.

(Impacts, continued)

- LANL has described a $13 billion dollar construction program over the coming 10 years, which would nearly double the replacement value of LANL as a whole. This program is more than six times the size of the Manhattan Project in New Mexico, in constant dollars. Some $5.5 billion is already programmed over the coming five years. LANL's public presentations have shown dozens of new buildings. In constant dollars, planned LANL construction over the decade exceeds the original cost of the interstate highway system in New Mexico. Just one building now being outfitted as a nuclear facility -- formerly the Radiological Laboratory, Utility, and Office Building (RLUOB) -- will be more costly than any single construction project in the state. **It is almost incomprehensible that a brand-new program on such a scale -- involving processing, transporting, storing, and disposing tons of some the most dangerous materials known to humanity -- could proceed without an full environmental impact statement.**
- The plutonium warhead core ("pit") mission is particularly impactful. Yet as we heard again Thursday from a senior analyst for Congress, there has been no final (signed) agency decision as to what the plan for this mission actually *is*, in detail (despite a long-past statutory deadline requiring one). (This a theme of our comments on the DSA, as noted above.)
- In the 2008 SWEIS, NNSA assumed LANL's plutonium missions would have access to a large, brand-new, safer plutonium facility at Technical Area (TA-) 55. That building was never constructed. No firm plan for constructing any such building has been revealed since then.

(Impacts, continued)

- Despite this we believe, and sources in government also said to us this week, that there are plans for new nuclear facilities at TA-55, despite their conspicuous absence from the DSA. All options for pit production at LANL examined in NNSA's pit production Engineering Assessment involved new nuclear facilities at TA-55.
- As revealed in LANL's DSA, NNSA proposes to operate its plutonium facility on a 24/7 basis. This has important safety and indirect environmental implications, not discussed anywhere.
- The 2008 SWEIS failed to account for the incompetent lower horizon of Unit Three of the Tshirege Member of the Bandelier Tuff ("Qbt3L"), present across LANL and of signal importance in any plans to construct new or replacement nuclear facilities on the south portion of TA-55, the only portion available for construction. The geologic and seismic properties of this stratum necessitated a complete redesign of the then-proposed Chemistry and Metallurgy Research Replacement Nuclear Facility (CMRR-NF) to meet the nuclear safety requirements of 10 CFR 830. The proposed underground production modules (inexplicably absent in the DSA) would not meet those standards, according to NNSA's Engineering Assessment. That is why they would be underground. We believe NNSA has not taken the geologic situation at TA-55 or indeed at LANL as a whole on board.

(Impacts, continued)

- According to a December 2019 report of the Defense Nuclear Facilities Safety Board (DNFSB), Building PF-4 does not adequately protect the public. Existing environmental analyses (e.g. the 2008 SWEIS) assume it does. Is not adequately protecting the public an acceptable environmental standard?
- NNSA has formally applied to develop a 64-acre (or larger) parcel in central Santa Fe. While this proposal has seemingly been rejected, the City of Santa Fe says aspects of this proposal are still under active consideration (and hence cannot be revealed). It unclear whether parallel NNSA and LANL proposals for development off Hwy 599, or in Espanola, or elsewhere, are active. LANL and NNSA representatives are on record as considering them. If they are reasonable alternatives they need to be analyzed in a SWEIS.
- NNSA is formally considering giving approximately 3,500 acres of national park quality land in LANL, in a known wildlife migration corridor, for the purposes of mixed residential, commercial, and light industrial development. The purpose of this possible transfer and development is to facilitate LANL's overall expansion. As such, it needs to be examined in a SWEIS.

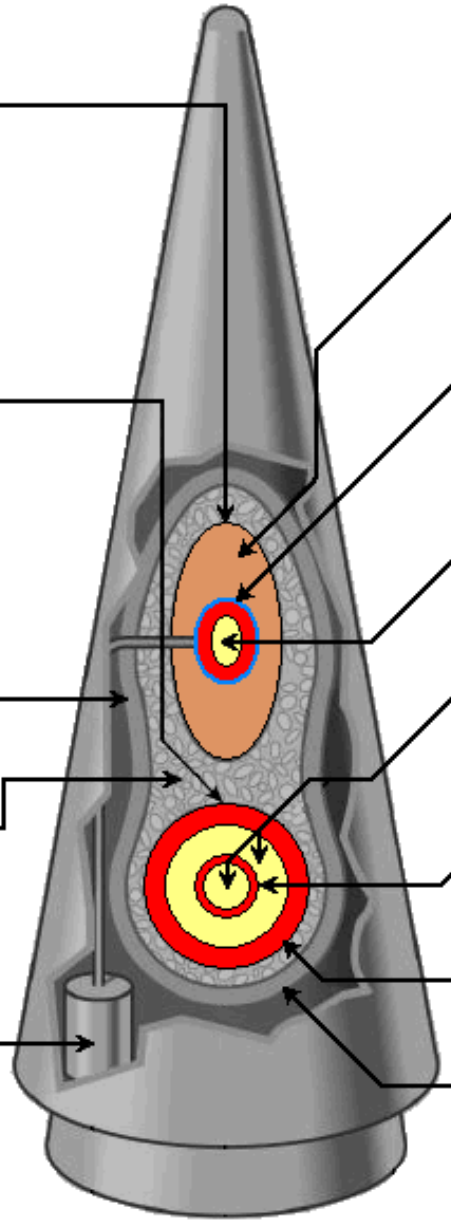
(Impacts, continued)

- It is not just pit production (the subject of the DSA) which is expanding at LANL; decisions to expand other programs are being made as well. It is impossible to judge the combined and cumulative impact of these decisions without a SWEIS.
- There are approximately 20,000 drums of transuranic (TRU) waste at LANL -- about 18,000 at Area G (buried and aboveground) and about 2,000 elsewhere. With the advent of pit production, there is no longer a clear disposal pathway for these drums. The indefinitely-continued presence of these drums adjacent to Indian sacred lands -- which drums are being managed with more than a 100-fold lower assumed accident release fraction than similar TRU drums elsewhere at LANL -- raises significant environmental justice concerns.
- The maximum electrical load at LANL has approximately doubled over that foreseen in the 2008 SWEIS, necessitating a planned $300 million capacity upgrade project, which began this year but is currently paused until the fall of 2023. The nature -- let alone impact -- of this project is nowhere publicly described. The relative environmental impacts of reasonable alternatives are nowhere discussed.

(Impacts, continued, final slide)

- LANL has pitched a new high bridge over White Rock Canyon, to be connected by roughly 25 miles of new highway, most of which would pass through the Caja del Rio lands of the Forest Service and Bureau of Land Management. At the moment, it appears that this project is on hold indefinitely, but the primary impetus for the project -- better tapping the Albuquerque-area labor market, especially for construction crafts, while also avoiding traffic congestion for Santa Fe area commuters -- is strong. At the moment, this audacious proposal stands as a reminder of the wide social and environmental impacts of LANL's proposed expansion. The proposed land transfer to Los Alamos County is part of an alternative solution to that same "mission need," in NEPA terms.
- The Senate Armed Services Committee and NNSA are now both contemplating a major change in plutonium missions housed in PF-4, namely to terminate surplus plutonium disposition activities there, in order to liberate the space those missions occupy to make room for additional pit production. (See: GAO: Surplus Plutonium Disposition: Processing of surplus plutonium warhead cores ("pits") at Los Alamos is uncertain, may conflict with production of new pits, Oct 28, 2019.) This and related transportation and storage of plutonium, and related TRU waste management, have significant environmental impacts. This set of decisions, involving multiple sites and states, merits examination under NEPA, including at LANL.
- In 2008, understanding of the climate crisis was far less mature than it is today. NNSA's plans -- far more extensive than considered in 2008 -- also have larger climate impacts than was known then.

W88 Warhead for Trident D-5 Ballistic Missile



1. The "Primary"
Two-point, hollow-pit, fusion-boosted high explosive implosion

2. The "Secondary"
Spherical, all-fissile, fusion-boosted radiation implosion

3. Radiation Case
Peanut-shaped, channels x-rays from primary to secondary

4. Channel Filler
Plastic foam plasma generator

5. Booster Gas Cannister
Periodic replace-ment as tritium gas decays

High Explosive Lens
Two lenses drive primary implosion

Plutonium-239 Pit
Beryllium-reflected hollow pit

Tritium & Deuterium
Booster gas, fusion makes neutrons

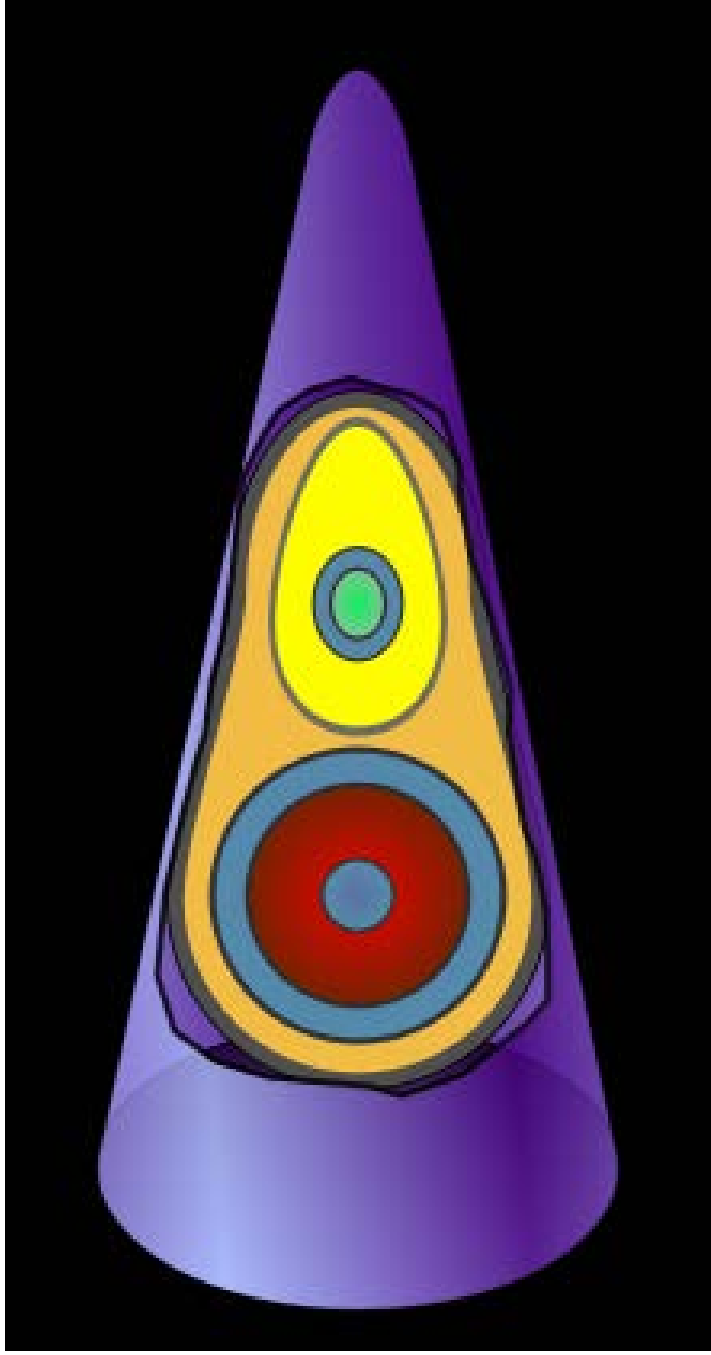
Lithium-6 Deuteride
Lithium becomes tritium, fusion makes neutrons

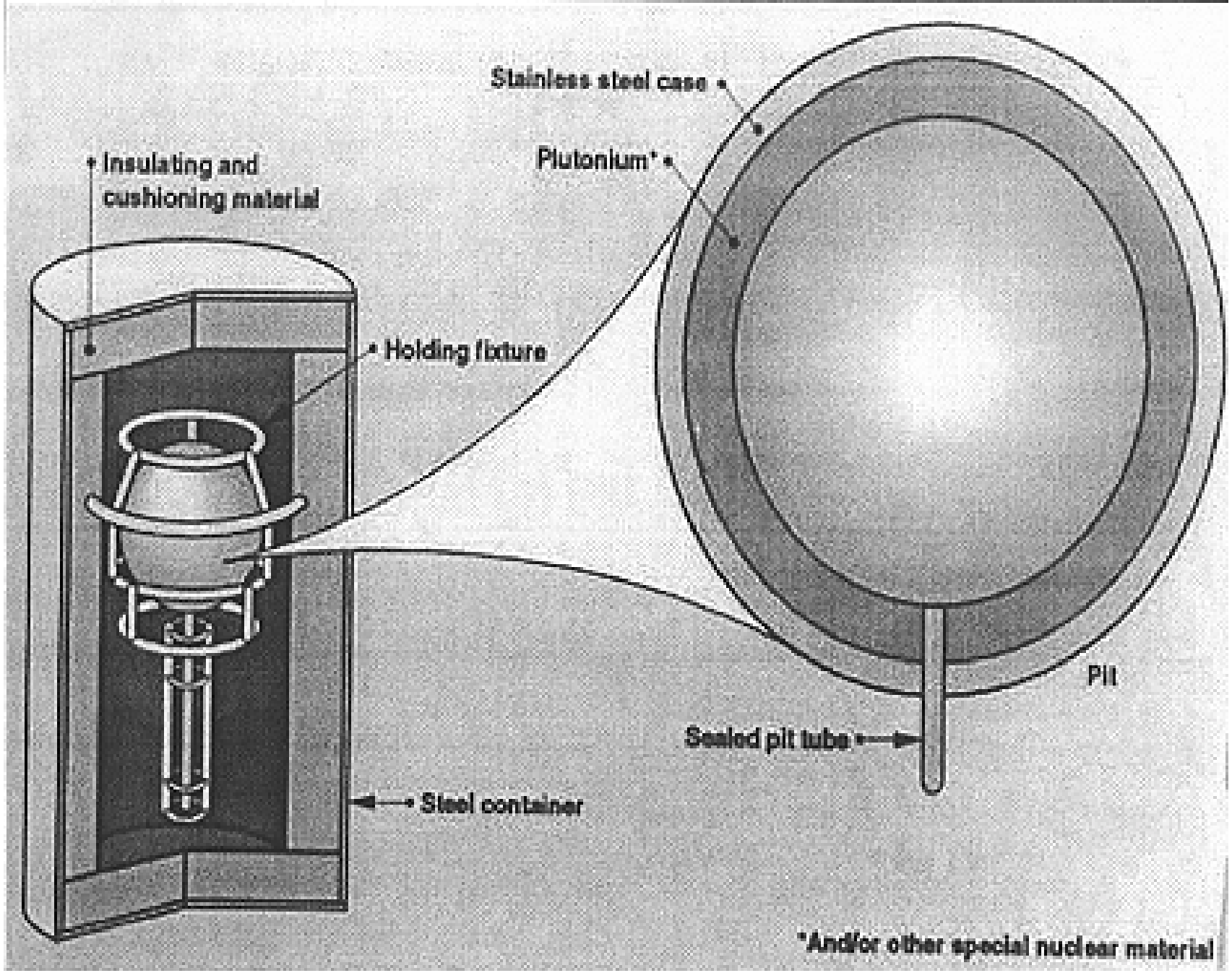
Uranium-235 "Sparkplug"
Starts tritium generation and fusion in the secondary

Uranium-235 "Pusher"
Heat shield, tamper, and fission fuel (fission by all neutrons)

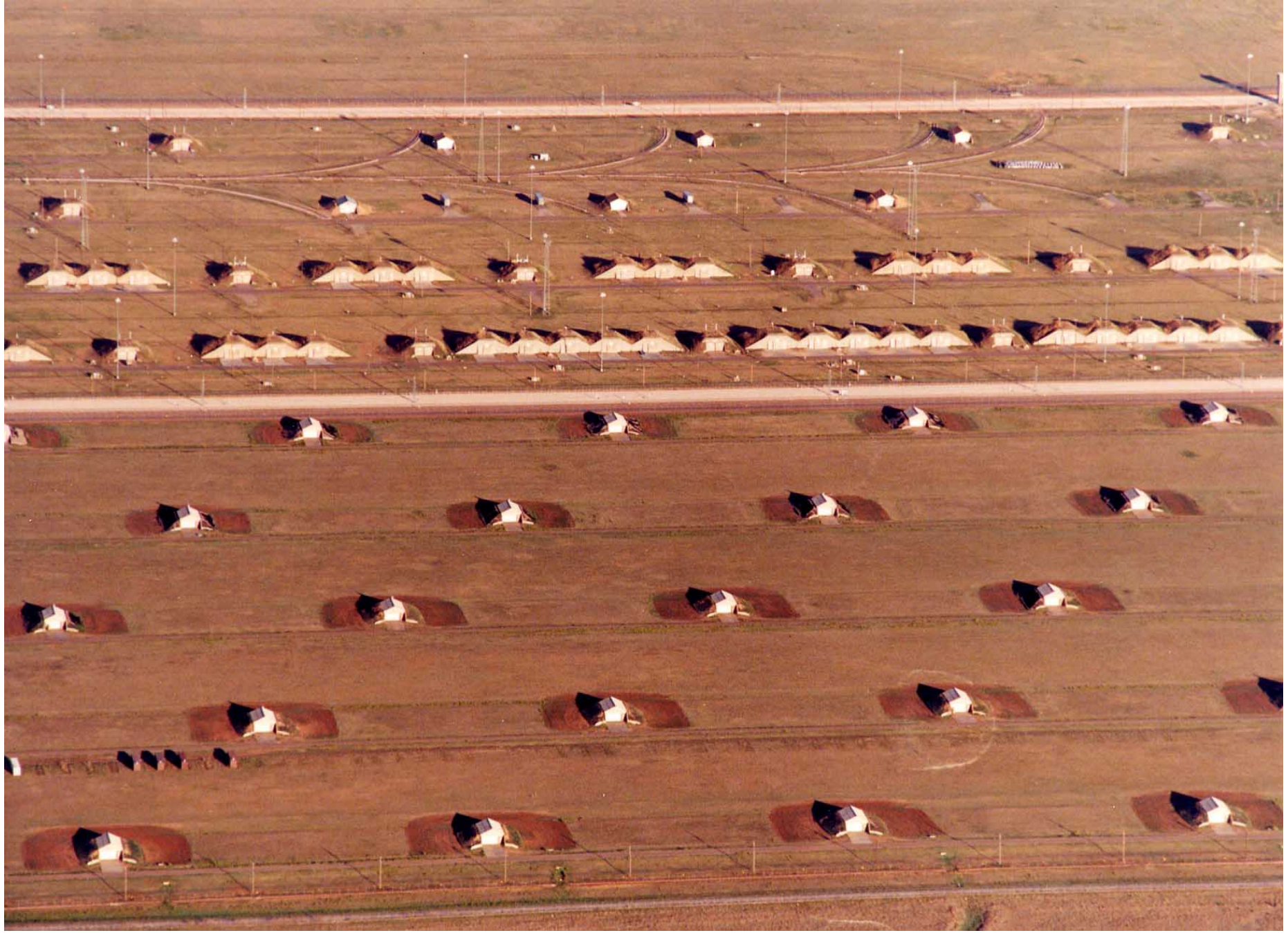
Uranium-238 Case
Fission by fusion neutrons only

Sources for illustrations: Wikipedia





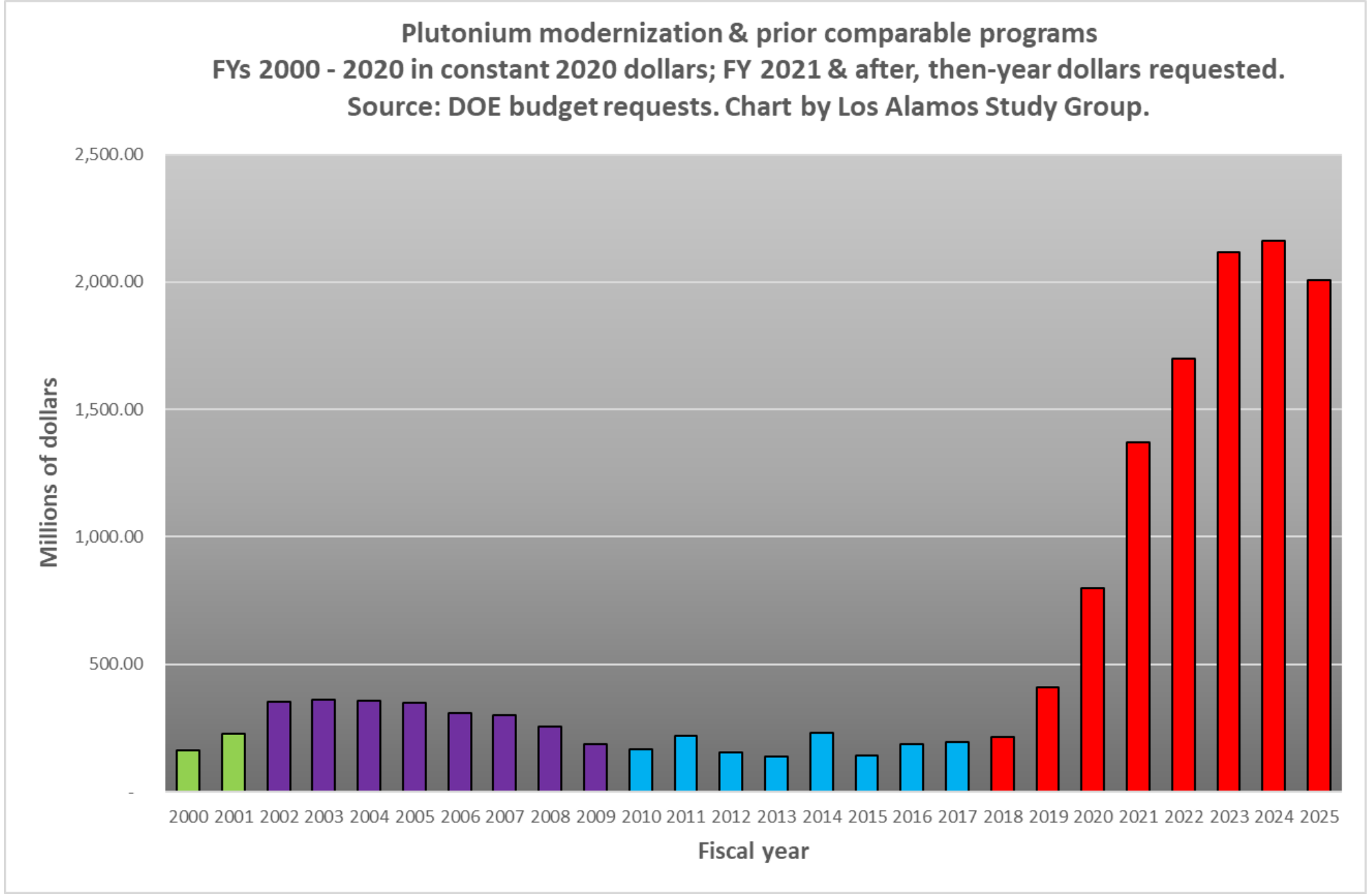
How pits are stored.



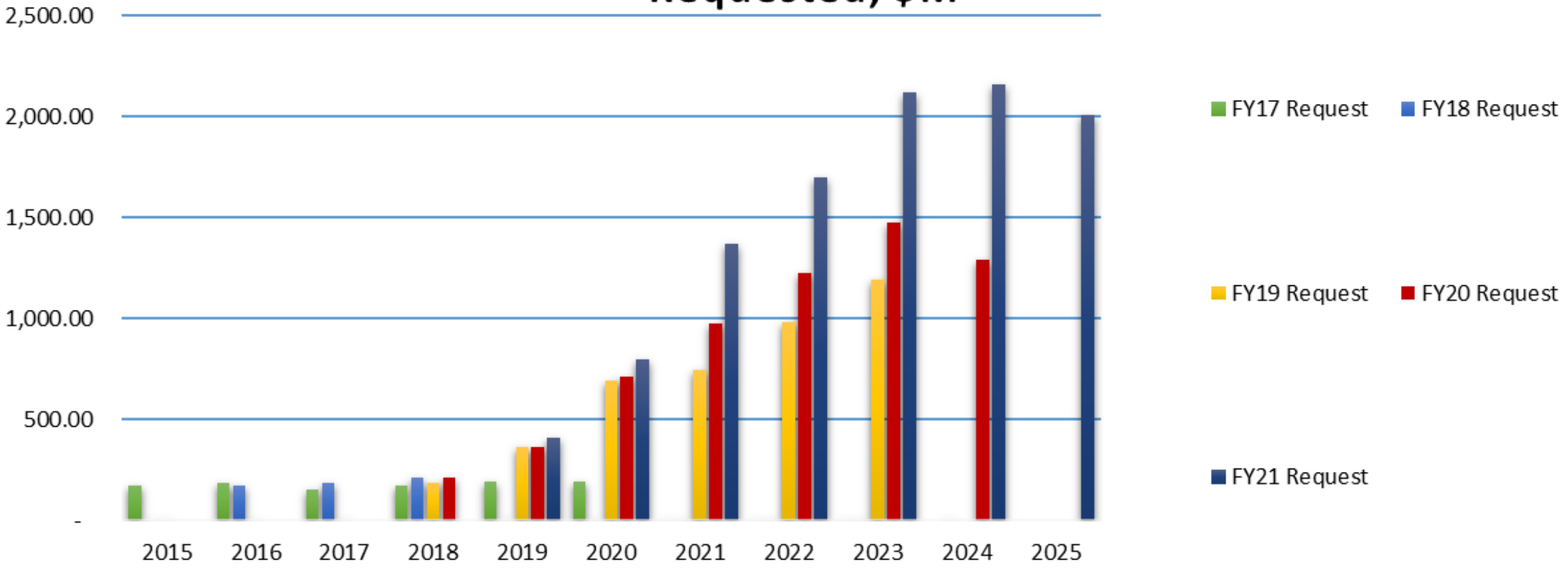
Pit (top section) and warhead storage at the Pantex Plant near Amarillo, TX (LASG photo, 2000).

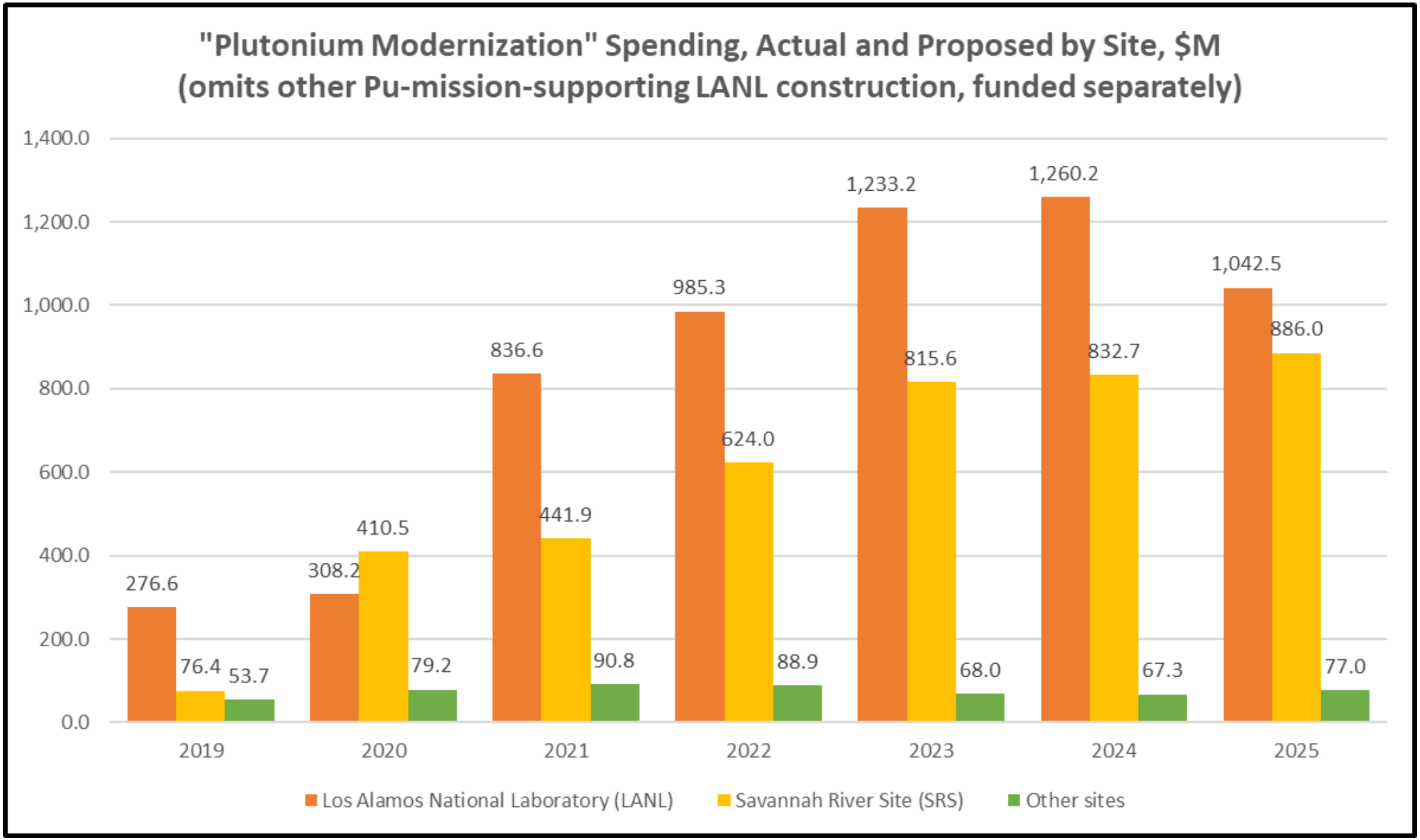
There are >5,000 usable pits here. With those in current and retired in warheads, there are about 11,000 usable pits.

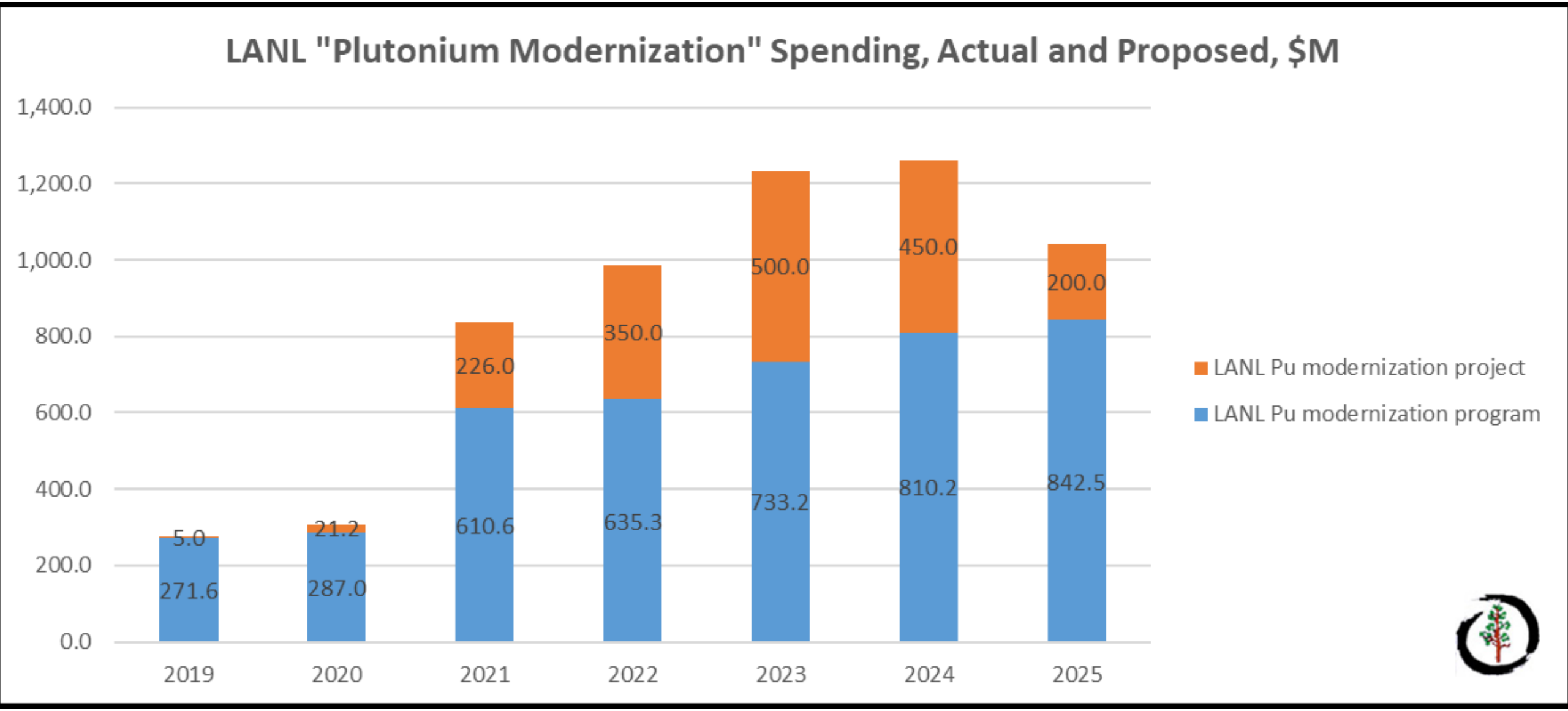
Pit storage, Pantex


Plutonium modernization & prior comparable programs
FYs 2000 - 2020 in constant 2020 dollars; FY 2021 & after, then-year dollars requested.
Source: DOE budget requests. Chart by Los Alamos Study Group.
Millions of dollars
2,500.00
2,000.00
1,500.00
1,000.00
500.00
-
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025
Fiscal year

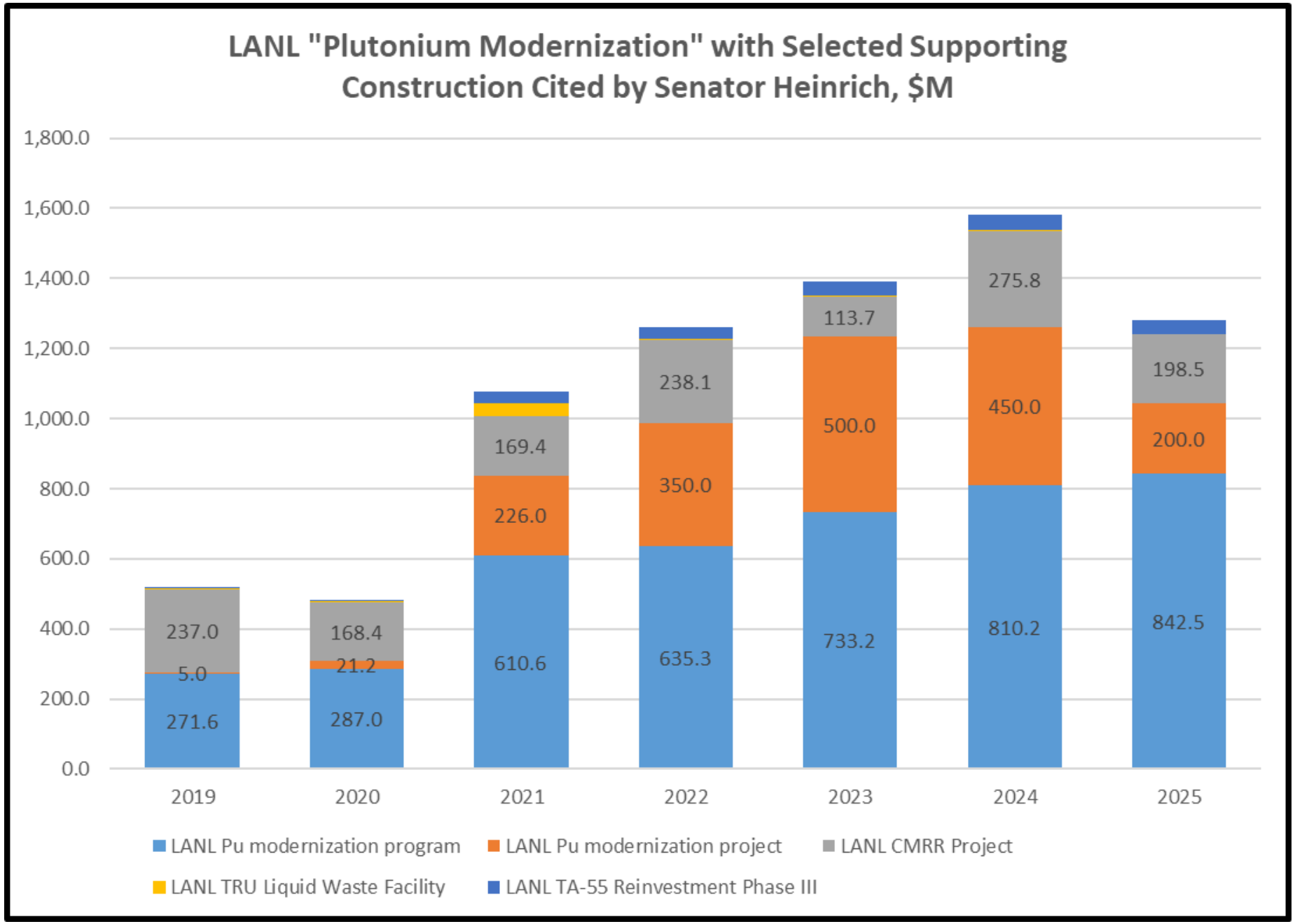
Plutonium Sustainment & Pit Production Spending, Actual & Requested, $M




"Plutonium Modernization" Spending, Actual and Proposed by Site, $M
(omits other Pu-mission-supporting LANL construction, funded separately)
1,400.0
1,200.0
1,000.0
800.0
600.0
400.0
200.0
0.0
276.6
76.4
53.7
308.2
410.5
79.2
836.6
441.9
90.8
985.3
624.0
88.9
1,233.2
815.6
68.0
1,260.2
832.7
67.3
1,042.5
886.0
77.0
2019
2020
2021
2022
2023
2024
2025
Los Alamos National Laboratory (LANL)
Savannah River Site (SRS)
Other sites



Does not include supporting construction projects.


LANL "Plutonium Modernization" with Selected Supporting Construction Cited by Senator Heinrich, $M
1,800.0
1,600.0
1,400.0
1,200.0
1,000.0
800.0
600.0
400.0
200.0
0.0
2019
2020
2021
2022
2023
2024
2025
237.0
5.0
271.6
168.4
21.2
287.0
169.4
226.0
610.6
238.1
350.0
635.3
113.7
500.0
733.2
275.8
450.0
810.2
198.5
200.0
842.5
LANL Pu modernization program
LANL Pu modernization project
LANL CMRR Project
LANL TRU Liquid Waste Facility
LANL TA-55 Reinvestment Phase III

CURRENT			NEAR FUTURE		
Delivery System		Nuclear Weapon (Bomb or Warhead)	Delivery System		Nuclear Weapon (Bomb or Warhead)
Platform	Vehicle		Platform	Vehicle	
SEA					
Ohio-class SSBN	Trident II D5 LE1 SLBM	W76-0, W76-1, W76-2, W88	Columbia-class SSBN	Trident II D5 LE2 SLBM	W76-1, W76-2, W88
			TBD	SLCM	TBD
LAND					
MMIII ICBM		W78, W87-0	GBSD		W87-0, W87-1
AIR					
B-2A Bomber		B83, B61-7/11	B-21 Bomber	LRSO	B61-12, W80-4
B-52H Bomber	AGM-86 ALCM	W80-1	B-52H Bomber	LRSO	W80-4
DUAL-CAPABLE AIRCRAFT					
F-15E DCA		B61-3/4	F-35A DCA		B61-12

Figure 3.8 Current and Near-Future Nuclear Deterrent

Overview of US nuclear weapons, current and planned, as of late 2019. A "W93" SLBM warhead was added in early 2020. The W93 would almost certainly be a LANL-led project.

Others such as hypersonic weapons (next slide), may also be in conceptual development.

From DoD, *Nuclear Matters, 2020 edition*

Air Force Eyes Adding Nuclear-Armed Hypersonic Boost-Glide Vehicles To Its Future ICBMs

At present, all other hypersonic weapons of this type that the US military is developing are conventionally armed.

By Joseph Trevithick

August 19, 2020, The War Zone

The U.S. Air Force is at least researching what it might take to develop a nuclear-armed hypersonic boost-glide vehicle with a range equivalent to a traditional intercontinental ballistic missile, or ICBM. This vehicle could potentially go on top of the service's future Ground-Based Strategic Deterrent ICBMs, which are now in development. Publicly, the hypersonic weapons programs now in progress across the U.S. military are all conventionally-armed. *Aviation Week* was first to report on this potential nuclear hypersonic weapon effort on Aug. 18, 2020, based on information the Air Force Nuclear Weapons Center had included in a request for information posted online six days earlier. That document, which was marked "For Official Use Only" and has since been taken offline, outlined seven potential upgrade tracks for an ICBM with a “modular open architecture."

Table 1: US Nuclear Weapons Modernisation, Costs & Schedule
as of 1 May 2020 (Los Alamos Study Group)

Bombs (B) or Warheads (W)	Fiscal year (FY) 2020 cost ($M)	FY 2021 requested ($M)	Total programme cost (billions of 2020 $)	First production unit or first deployment, estimated completion year (ECY)
B61-12 life-extension program (LEP)	792.6 (2, 111)	815.7 (2, 111)	9.9 (3, 8-37 & 11, 4)	2022; ECY 2026 (2, 120)
B61-12 Tail Kit Assembly	100.0 (7, 4-2)	50.0 (7, 4-2)	2.0 (6, 2)	2020 (6, 2)
B61-13 LEP	none	none	22.5 (3, 8-41)	2038
B83-1	51.5 (2, 111)	30.8 (2 p 111)	n/a	as of 2018, to be retained indefinitely (3, 1-5)
W76-1 LEP (for SLBMs)	n/a	n/a	4.2 (3, 8-36)	completed in 2019 (1, 8)
W76-2 Modification (Mod) (for SLBMs)	10.0 (2, 111)	n/a	.076 (3, 8-36)	Feb 2019 (3, 2-38); deployed Dec 2019
W80-4 LEP (for LRSO cruise missile)	898.5 (2, 111)	1.0 (2, 111)	12.0 (11, 4)	2026; ECY 2031 (2, 120)
W87-1 Mod for ICBM, former W78 replacement or W1 (3, 1-6)	112.0 (2, 111)	541.0 (2, 111)	14.8 (11, 4)	2030 (2, 121); ECY 2038 (11, 8)
Mk21A aeroshell for W87-1	65.7 (14, 22)	112.8 (14, 22)		2030
W88 Alteration (Alt) 370	304.2 (2, 111)	256.9 (2, 111)	2.75 (11, 4)	2021; ECY 2025 (2, 120-122)
W93/Mk7 SLBM Next Navy Warhead, former IW2 (3, 2-45)	0	53.0 (2, 111)	17.6 (3, 8-41)	2034 (3, 8-6); ECY 2041 (11, 8)
Future strategic missile warhead LEP, former IW3	0	0	18.6 (3, 8-41)	2037 (3, 8-6)
Bombers & Dual-Capable Aircraft (DCA)				
B-2A Spirit Defensive Management System Modernisation	3,057 (5, 143)	337 (7, 8-3)	1.91 (16, 763	June 2022 (5, 143)
B-21 Raider (Long-Range Strike Bomber, LRS-B)	3,000 (7, 4-2)	2,800 (7, 4-2)	102.8 (13, 53)	2025 (6, 2)
B-52H (replacing engines, upgrading radar, avionics, & NC3 systems)	2,116 (5, 167)	unknown	unknown	November 2025 (5, 167)
F-15 Eagle DCA (upgrade passive active warning & survivability systems - EPAWSS)	47.3 (16, 2)	170.7 (16, 2)	4.0 (17)	2019 (16)
F-16 DCA Mid-Life Upgrade	18.8 (10, 39)	57.6 (13, 43)	unknown	n/a
F-35A DCA (expected to replace F-15E)	70.0 (7, 4-8)	110 (7, 4-8)	unknown	Nuclear certification expected 2024 (7, 4-8), deployment 2025 (8, 40)
Missiles				
Ground-Based Strategic Deterrent (GBSD) (to replace MMIII ICBM)	557.5 (4, 5-19)	1,525 (4, 5-19)	85-150 over 30 years (19, 2)	2029; ECY 2036 (6, 2)
LRSO cruise missile - replaces AGM-86B ALCM	712.5 (4, 5-21)	474.4 (4, 5-21)	10.8 (6, 2)	2026 (14, 41)
Trident II D-5 Submarine-Launched Ballistic Missile (SLBM) Life-Extension (D5LE)	1,189 (4, 5-15)	1,191 (4, 5-15)	19.0 (13, 53)	February 2017 (7, 4-8); ECY 2040 (15, 3)
Sea-Launched Cruise Missile, Nuclear (SLCM-N) (19, 12)	5.6 (1, 10)	none	unknown	Analysis of Alternatives (AoA) currently underway. (12, 12)
Ballistic Missile Submarine				
Columbia class ballistic missile submarine (SSBN)	2,480 (7, 4-2 & 2, 694)	4,470 (7, 4-2 & 2, 694)	139.0 for 12 subs (6, 2)	2031 (6, 2); ECY 2043, if purchase one/yr
Nuclear Command, Control and Communications (NC3)				
NC3	3,500 (7, 4-8)	7,000 (18, 1)	195.0 over 30 years (13, 17)	ECY 2037 (14, 20)

Request for FY21: $44.5 billion (B) for nuclear weapons, not including $1.7 B for naval reactors and $5.0 B for environmental cleanup, $51.2 B in all.

This includes $15.6 B for warheads—a 25% increase over FY20 and a 40 per cent increase over FY19—as well as $28.9 B for nuclear weapons in DoD, a 32% increase over 2 years.

In 2017, CBO estimated the 30-year cost of US nuclear weapons at $1.24 trillion (T) ($1.32 T now). Of this, 28% ($352 B) was in DOE (for warheads) and 72% ($890 B) was in DoD (for everything else). Of the total, $400 B was for modernisation; the balance was for operations and sustainment of existing forces.

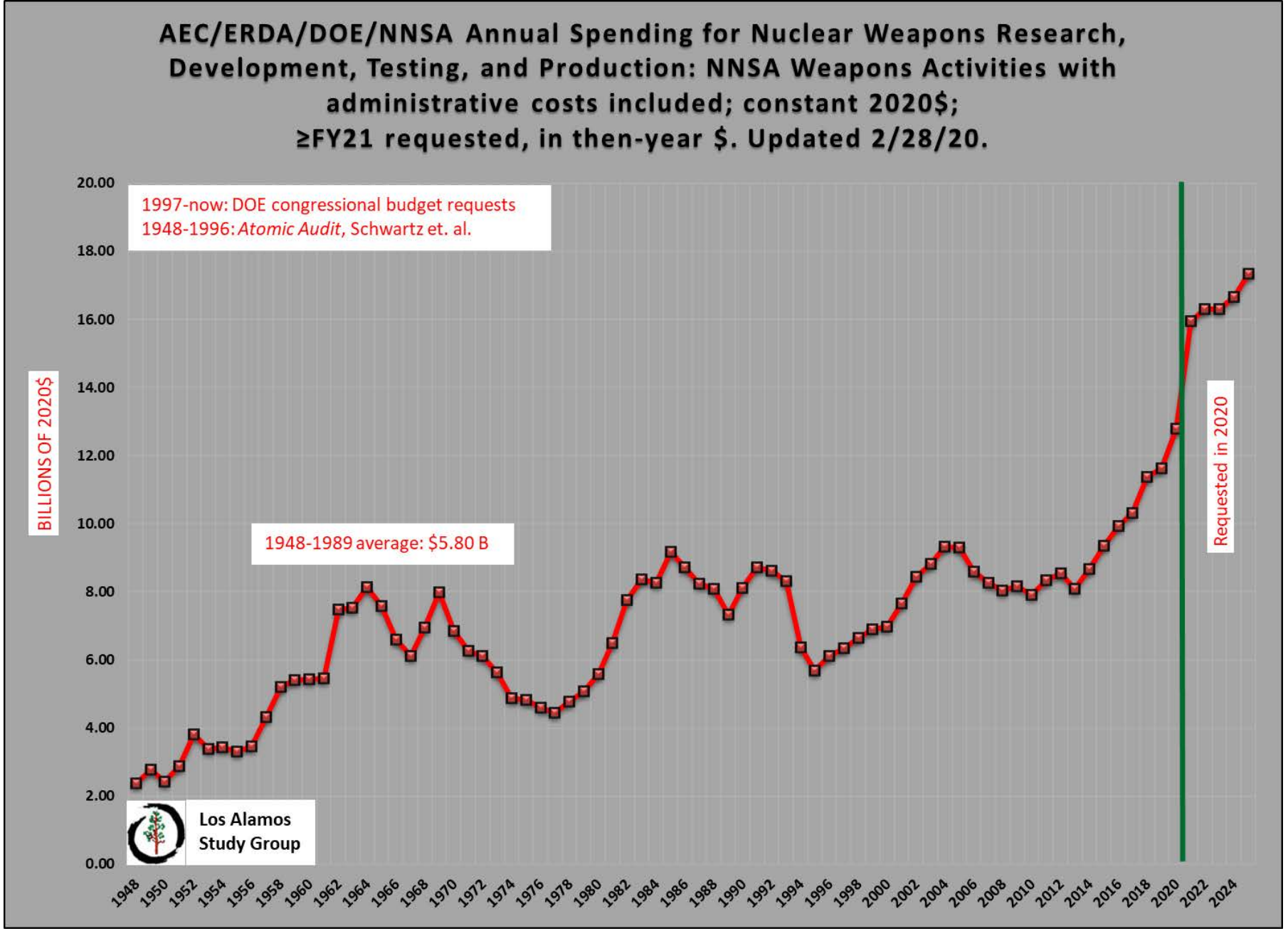
This figure did not include DOE's legacy environmental liabilities. In 2018, DOE estimated its warhead-related liabilities at $541 B ($573 B now). Despite cleanup investments, these liabilities have grown at an average rate of $31 B/year are roughly $600 B today.

With environmental costs, CBO's 2017 estimate of 30-year US nuclear weapon costs would expand to $1.92 T in 2020 dollars.

Considering the cost growth seen so far, the present-value cost of sustaining, deploying, and modernising US nuclear weapons over the next 30 years will be greater than $2 trillion.

This 30-year sum comes to more than US $15,460 per US household. The average annual cost of US nuclear weapons over the next 30 years is at least $67 B/year, including environmental costs, or at least US $44 billion/year—$5 million per hour, 24/7—without those costs, and without interest on the federal debt used to finance these programmes.

(condensed from: Update on US Nuclear Weapons Modernization for the International Disarmament Community, May 13, 2020).



Previous slide: DoD components of nuclear weapons modernization; general discussion of vast overall nuclear weapon expense.

This slide: Unprecedented expansion of NNSA warhead budget. Backstory: Trump was blackmailed by bomb advocates as possible impeachment loomed.

Cascading crises, in the U.S. and elsewhere

- "Normal" was illusory before the Covid-19 pandemic. Recession had already started.
- A tremendous transition is being forced upon us, right now. We have to pick which side we are on, *and get active or be washed away*.
  - Climate collapse (drought, storms, sea levels, fires, famines, refugees, oceanic collapse). These are certain.
  - Oil supply: provisionally peaked worldwide in Nov. 2018 (background) & in the U.S. in 2019. Both peaks will be permanent as depletion continues apace while demand and drilling collapse for 1+ years (at best).
  - No clear end to the current pandemic, which continues worldwide and in the U.S. It may get worse in the fall.
  - Permanent job and business losses, recession without recovery, financial predation and disaster capitalism, debt explosion, housing "apocalypse," stagflation (e.g. Roach) or depression (e.g. Morgan, Smith, Williams), more positive "degrowth," restructuring if "we" can seize the moment; *it is in these economic issues where the greatest political potential for change lies*, as unprecedented inequality is actually rising further and more dominoes fall.
  - Government failures, loss of legitimacy, ~~risk of~~ civil unrest.
  - Aggressive claims for federal priority and extra funding by the national security state, in the face of *forced* (sooner or later, no longer optional) reassessment of national priorities, selective failures in meantime. Rising demands for new national security and domestic priorities – but with what success, and when?
  - Risk of wars of all types including nuclear war as US empire wanes but still flexes muscle, resources grow scarcer.

Why we think the pit mission is incompatible with national survival and eventually will be abandoned.

The scale of the U.S. financial and political commitment to its military, and to modernizing its very large nuclear arsenal, are almost certainly incompatible with successful passage through the converging crises we face, which will ripen further and become more obvious to all in the 2020s.

To the extent our cascading crises affect citizens personally, the political consensus supporting nuclear weapons investments – especially what will be perceived as *excessive* investments – are likely to weaken.

If we imagine today that in addition to the thousands of warheads we have we need new ones, whether in 10 years or in 20 years, we imply national priorities which will very likely doom us even in the absence of major wars, the risks of which are rising rapidly precisely because of a mistaken militaristic paradigm of national security into which the U.S. has placed so much faith and investment.

Global warming, for example, threatens the very existence of the United States. A whole-of-government response is needed for national survival. Responding successfully to this crisis in the context of other crises we face will require a massive redirection of national security investments and attention.

Looking further ahead to 2060, when we expect the U.S. stockpile of pits to begin to age out, global warming, if not successfully mitigated, will be making large parts of the U.S. largely uninhabitable, including much of New Mexico. Selective abandonment of vulnerable coastal areas, including cities and parts of cities, will be underway. Other crises will have matured in the 2020s and 2030s, some widely anticipated and others less so. The upshot is that the U.S. and the world has only so long to eliminate nuclear weapons before the priorities they embody and represent seal our fate as a nation and civilization. In short, we must get rid of *our need for pits* long before 2060 or pits will get rid of us, one way or another.

Why pit production is unlikely to succeed

- During the (first?) Cold War, pit production was conducted in a "heroic" mode that sacrificed workers, public safety, and the environment. If the "heroic mode" is the only way pit production, and other plutonium processing missions, can be successfully conducted under real-world production pressures, it may be unsupported by society, and infeasible.
- Unlike during the Cold War, the nation, its people, and specific geographic locales (including most of New Mexico) now face crises, some of which are existential, that have nothing to do with nuclear deterrence. The patriotism that was once the "glue" of the nuclear weapons enterprise, despite the best efforts of NNSA and contractor management, may now be generally directed elsewhere even if nuclear weapons funding can be maintained – which may not be possible either or for long. Overall, it may not be possible to successfully pursue complex, dangerous, expensive missions for any length of time which are not highly valued by society generally.
- Rephrasing, the near-term budgetary and management crises faced by the nuclear weapons enterprise are the tip of a larger iceberg of troubles that is gradually drifting into view. The current program of record, not just in pit production but more broadly in nuclear weapons modernization, is likely to be inexecutable for coercive, magisterial reasons that may only be fully apparent in hindsight. It is not a question of if, but of when and how, nuclear weapons modernization programs, including pit production, go "off the rails."

(This slide and previous adapted from The Great Transformation: Nuclear Weapons Policy Considerations for the 116th Congress, May 6, 2019)

Realities of the LANL site: why LANL in particular can't do industrial plutonium

It will be very difficult or impossible for LANL to establish industrial plutonium missions, especially industrial pit production at *any* scale, for a multitude of reasons, all of which are largely independent of senior management. These factors are negatively synergistic in ways proven to be difficult to predict or prevent.

- The site's industrial, cultural, and educational isolation, which increases costs and creates program risks;
- LANL's dissected topography, which dramatically increases costs and places firm limits on construction;
- LANL's R&D culture and identity, necessary to protect in order to attract young scientists and engineers, especially given LANL's isolated location; LANL's identity is not one of a high-hazard industrial facility;
- LANL's culture of grandiosity, arrogance, and entitlement, a product of LANL's nuclear weapons mission and its lack of accountability, its secrecy, its isolation, its relatively high formal educational attainment, its large salaries and generous benefits, and locally, its relatively low taxes, splendid local government finance and therefore excellent schools and much else of genuine community accomplishment and value relative to its New Mexico surround; the point is that LANL's culture is one where "delusional optimism" (Flyvbjerg, op. cit.) and "normal accidents" have thrived, for fundamental reasons;
- The unconsolidated sediments that underlie TA-55 and other LANL sites, which together with the site's considerable seismicity (next bullet) increase costs and limit construction options;

Why LANL in particular can't do industrial pits or plutonium, continued

- LANL's high seismicity, a problem that is amplified by known active on-site faults and hence possible ground rupture, the shallow location and high acceleration of earthquakes from them, seismic amplification from unconsolidated sediments, and the structural incompetence of *all* the rock at LANL;
- LANL's legacy nuclear facilities, which were built for R&D and of limited size; most of these will soon (relative to this long mission) be at, or are already past, their reliable, safe, and useful lives; these include PF-4, the Main Shops, and Sigma, all of which are to have greater or lesser roles in pit production; tearing these facilities down will also be disruptive to a greater or lesser extent.
- The concatenation of difficulties and strain on various LANL support systems posed by multiple industrial plutonium missions at PF-4 (pit production, PuO_2, Pu-238); the challenge of the RLUOB-NLUOB conversion;
- A political environment conducive to corruption, partly of LANL's own making as we see in the case of the Regional Coalition of LANL Communities (RCLC), again contributing to a lack of accountability;
- A very high incidence of drug use and associated crime linked to systemic poverty and inequality ("the aura of apartheid") in the region;
- The relative lack of a qualified regional workforce and the relative lack of post-secondary educational and vocational institutions in the region;
- The reality of prior, living Pueblo traditions and religious claims to "LANL" lands and waters; and
- The incompatibility of industrial plutonium operations with powerful local cultural aspirations and values.

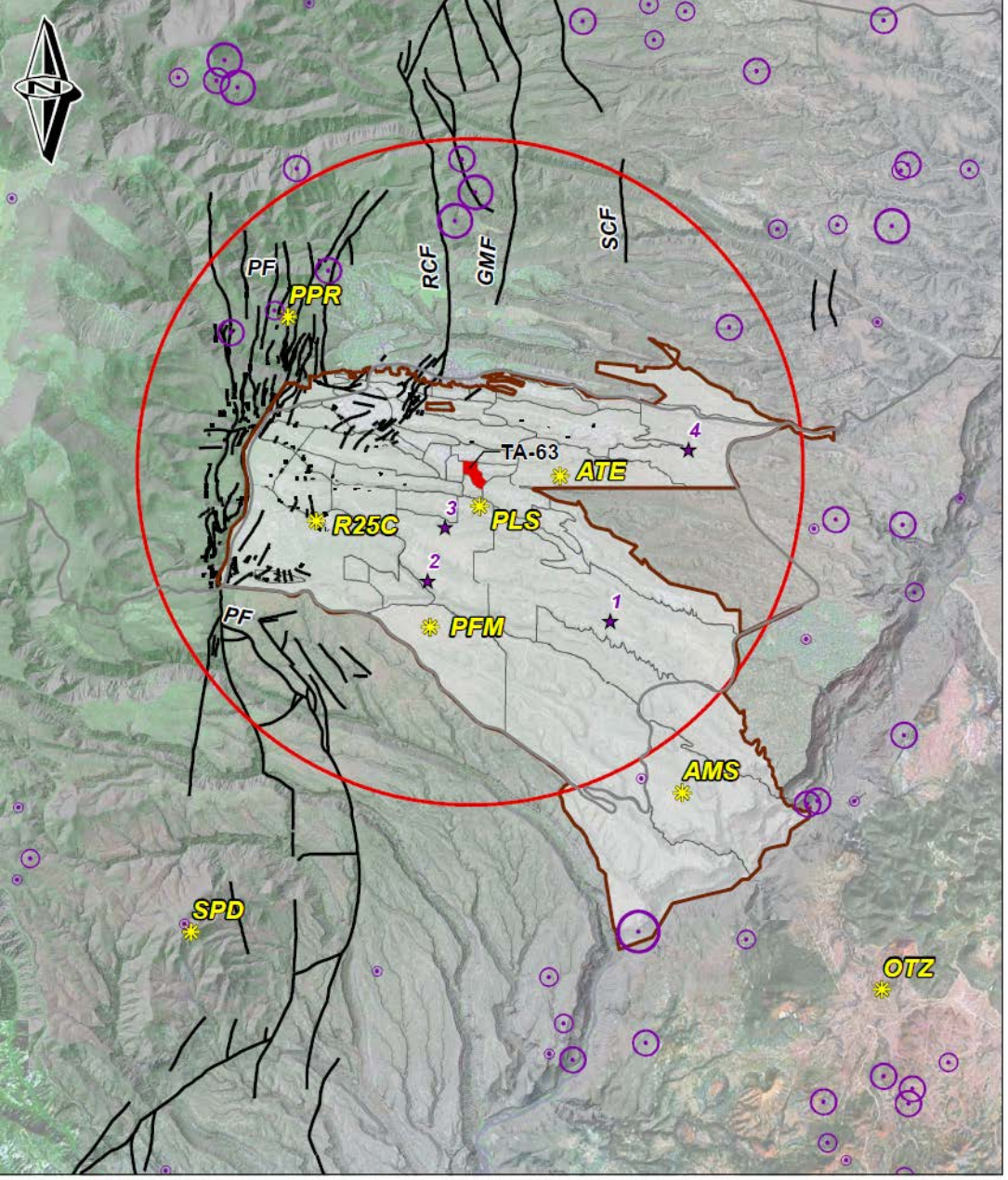


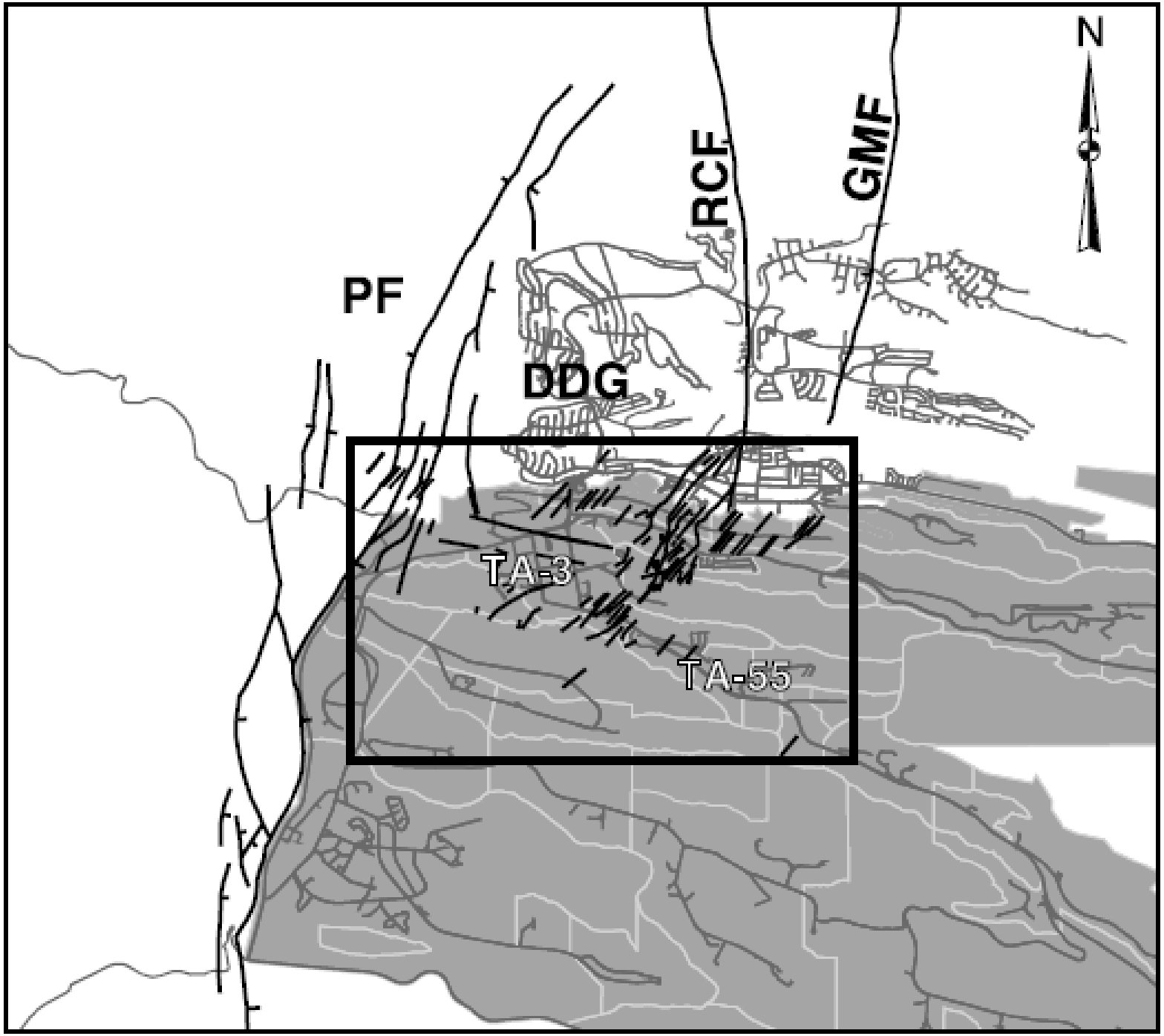
Figure 3.

Three slides on LANL's seismic situation:

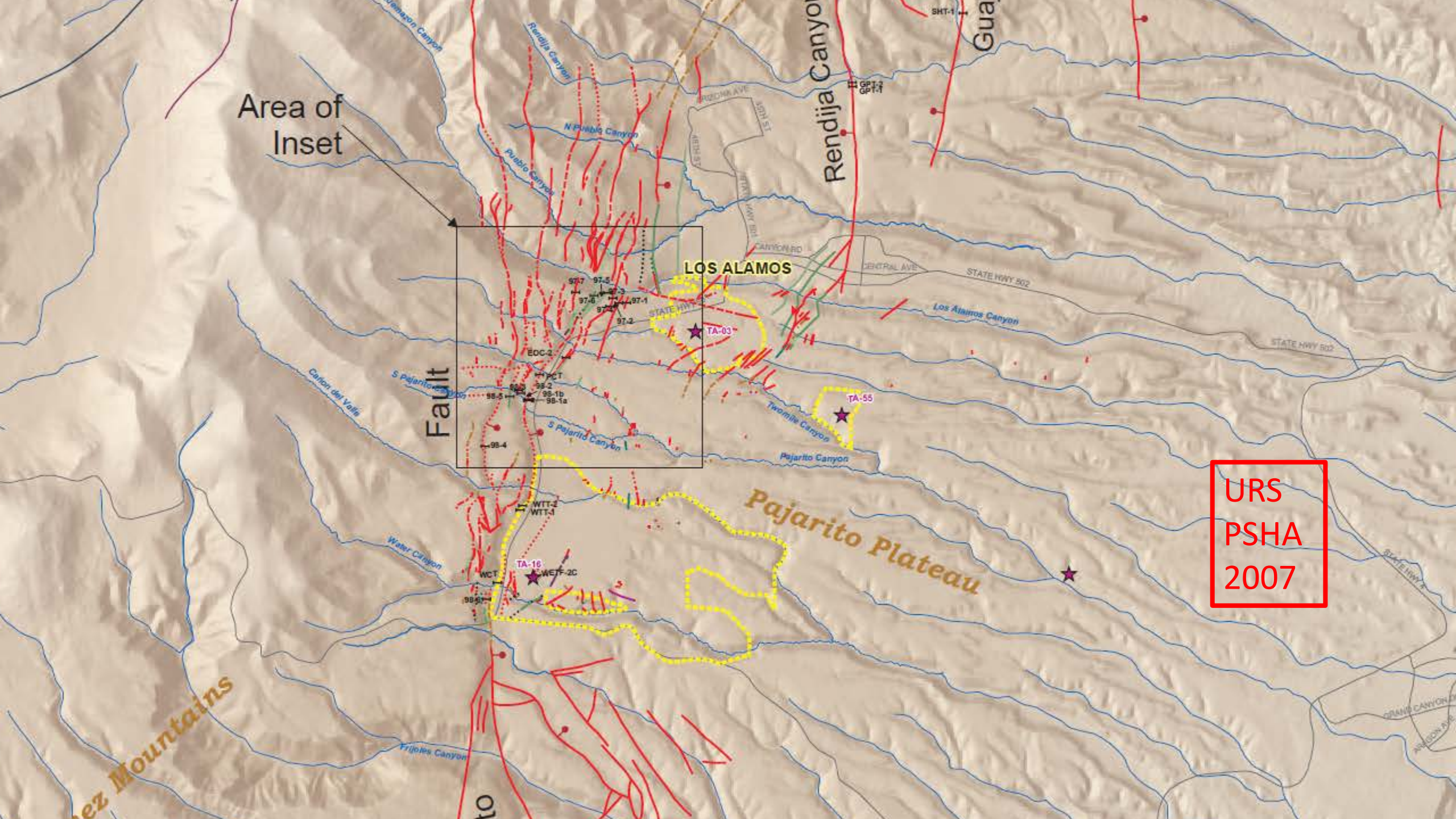
LANL sits on the western edge of the Rio Grande Rift, a graben bounded by more or less vertical faults. The Pajarito Fault System runs N-S along the western edge of LANL.

Faults also run through the LANL site and town. I do not believe that the relatively high density of faults mapped N and S of the lab magically becomes much lower beneath the lab itself. Other LANL publications do show faults (Guaje, Rendija) crossing the entire laboratory from N to S.

There is strong evidence of three earthquakes of 7.0 magnitude or greater in the Holocene. This system has shallow earthquakes (~ 1 mile), with relatively great acceleration (>1 g vertically), comparable to accelerations experienced at Fukushima. Unconsolidated ash layers (pumice) amplify acceleration, including at TA-55. The rhyolite tuff of the Plateau may fracture almost anywhere, posing risks to cliff-side structures (e.g. the hospital) and to access roads, neither of which can be expected to remain open in any major quake.



Gardner et al 1999, LANL


Area of Inset
Fault
LOS ALAMOS
Rendija Canyon
Guaje
Pajarito Plateau
Sierra de los Valles
Jemez Mountains
Rendija Canyon
N Pueblo Canyon
Pueblo Canyon
Los Alamos Canyon
Twomile Canyon
Pajarito Canyon
S Pajarito Canyon
Canon del Valle
Water Canyon
Frijoles Canyon
CENTRAL AVE
STATE HWY 502
TA-03
TA-55
TA-16
EDC-2
WCT
WETF-2C
WTT-2
WTT-1
SHT-1
GPT-2
GPT-1
97-7
97-5
97-6
97-3
97-1
97-2
98-5
98-2
98-1b
98-1a
98-4
98-6
URS
PSHA
2007

LANL worker safety: on a collision course with powerful other agendas

- Historically LANL, like the rest of the nuclear warhead complex, has not been a safe place for workers. Thousands of workers died nationwide, tens of thousands sickened, and hundreds of thousands died from the fallout from nuclear testing ("US nuclear tests killed far more civilians than we knew," *Quartz*, 12/21/17). Tens of thousands of soldiers, sailors, and airmen were exposed as well, with many deaths.
- Nationwide, the Department of Labor has approved 93,353 claims so far, out of 128,207 unique worker cases, under the Energy Employees Occupational Illness Compensation Program Act (EEOICPA).
- At LANL, claims have been filed for 6,557 unique individual workers; 5,102 of these cases have been paid. As of July 2015, claims on 1,599 unique worker death cases at LANL had been paid. (Energy Employees Claimant Assistance Project, personal communication). $1.08 billion has been paid to former and current LANL workers under EEOICPA, out of more than $18.4 billion nationwide.
- These deaths and morbidity result from what University of Chicago sociologist Joe Masco has called "the heroic mode of production." Right up to the present day, the "efficiency" of nuclear weapons production during the Cold War is a model and a standard in many influential governmental and advisory minds.

LANL worker safety (continued)

- There is no external regulation of worker safety at DOE facilities, nor is any contemplated; imposing "ordinary" regulation of worker safety in the nuclear weapons industry has always been and still is widely seen as threatening national security.
- Nuclear-complex-wide, current trends in nuclear safety are not positive. This is also true at LANL, the recent history of which has been one of periodic shocking disregard to the most elementary safety procedures and rules.
- LANL is subject to "normal accidents" (cf. Charles Perrow) – it is the kind of institution where such accidents occur.
- LANL does not and *cannot* fully self-identify as a high-hazard nuclear or industrial facility.
- We believe changing LANL's basic identity and culture will neither be successful nor enough despite the best will in the world. There are too many determinants – geographic, political, geotechnical, social – that lie outside LANL's institutional control.
- The highly-professional Defense Nuclear Facilities Safety Board (DNFSB) is not a regulator, does not have an explicit worker safety mandate (neither nuclear nor otherwise), has been under sporadic attack from without and within for almost two decades, and is too small to even visit most LANL facilities.

***** Presentation ends here. ******