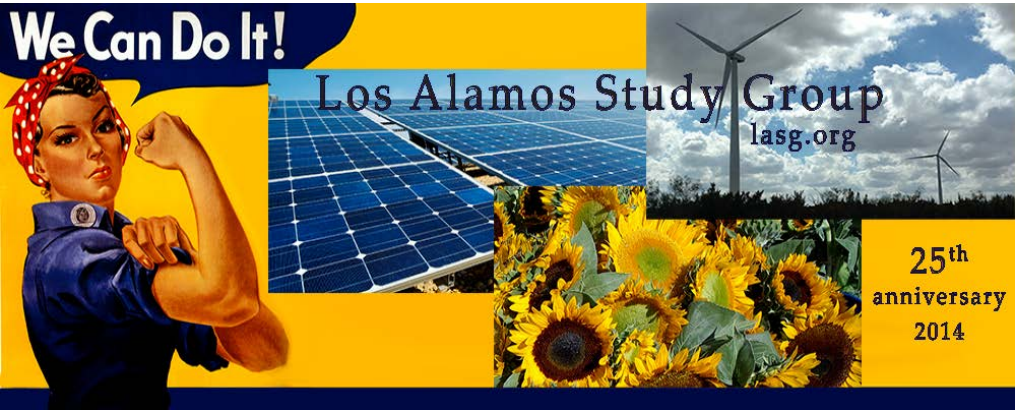
Northern New Mexico in the Nuclear Crosshairs

LANL's proposed expansion and plutonium warhead core ("pit") plans in context

May 19, 2020

"Thus it is that those to whom destiny lends might, perish for having relied too much upon it….Only he who knows the empire of might and knows how not to respect it is capable of love and justice."

Simone Weil, "The Iliad, Poem of Might"



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Agenda

- Introduction (2 minutes, no Q&A)
  - First in a series; other experts will be involved. your feedback is important.
  - Our spirit guide for today: Wile E. Coyote
  - Good ideas are useless without good, active people.
  - We seek in these meetings an R >1, preferably >>1.
  - Use anything valuable to you, but acknowledge us as appropriate, please.
- Ours is a uniquely tragic but powerful moment and place in history. “Man’s extremity is God’s opportunity” (2, no Q&A).
- Overview of US nuclear weapons programs: the arsenal, modernization, costs, schedules, locations. (3, Q&A)
- Proposed expansion of Los Alamos National Laboratory (LANL) for warhead core ("pit") production and warhead design: LANL’s role in planned nuclear weapons; our senators’ role in expanding Trump’s pit plans. Why no pits are needed. (7, Q&A)
- Why LANL is the worst place to make pits. Why pit production is unlikely to succeed. Santa Fe’s role. (7, Q&A)
- Why we think the pit mission is incompatible with national survival and eventually will be abandoned. (7, Q&A)
- What citizens in New Mexico can do right now to halt this folly before more damage is done. (15, Q&A)

Cascading crises

- "Normal" was illusory ~~before Coyote realized he was over the cliff~~ the Covid-19 pandemic
- A tremendous transition is being forced upon us. What we see:
  - Climate (drought, storms, sea levels, fires, famines, refugees)
  - Oil supply (provisionally peaked in Nov. 2018, now permanent as depletion continues while demand, price collapse)
  - No clear end to the current pandemic
  - Permanent job and business losses, recession without recovery, financial predation and disaster capitalism, debt explosion, degrowth
  - Government failures, loss of legitimacy, risk of civil unrest
  - Aggressive claims for federal priority by national security state
  - Forced reassessment of national priorities, selective failures
  - Wars and risk of wars
  - Rising demands for new national security and domestic priorities – but with what success?

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, without glossy pictures

From DoD, *Nuclear Matters, 2020 edition*

Table 1. US nuclear forces, 2020.

Type/Designation	No.	Year deployed	Warheads x yield (kilotons)	Warheads (total available)[a]
ICBMs				
LGM-30G Minuteman III				
Mk12A	200	1979	1-3 W78 x 335 (MIRV)	600[b]
Mk21/SERV	200	2006[c]	1 W87 x 300	200[d]
Total	**400**[e]			**800**[f]
SLBMs				
UGM-133A Trident II D5/LE	**240**[g]			
Mk4A		2008[h]	1-8 W76-1 x 90 (MIRV)	1,486[i]
Mk4A		2019	1-2 W76-2 x low (MIRV)[j]	50[k]
Mk5		1990	1-8 W88 x 455 (MIRV)	384
Total	**240**			**1,920**[l]
Bombers				
B-52H Stratofortress	87/44[m]	1961	ALCM/W80-1 x 5-150	528
B-2A Spirit	20/16	1994	B61-7 x 10-360/-11 x 400 B83-1 x low-1,200	322
Total	**107/60**[n]			**850**[o]
Total strategic forces				**3,570**
Nonstrategic forces				
F-15E, F-16 DCA	n/a	1979	1-5 B61-3/-4 bombs x 0.3–170[p]	230
Total				**230**[q]
Total stockpile				**3,800**
Deployed				1,750[r]
Reserve (hedge and spares)				2,050
Retired, awaiting dismantlement				**2,000**
Total Inventory				**5,800**

Hans Kristensen & Matt Korda, "United States Nuclear Forces, 2020," *Bulletin of the Atomic Scientists*, 76:1, 46-60.

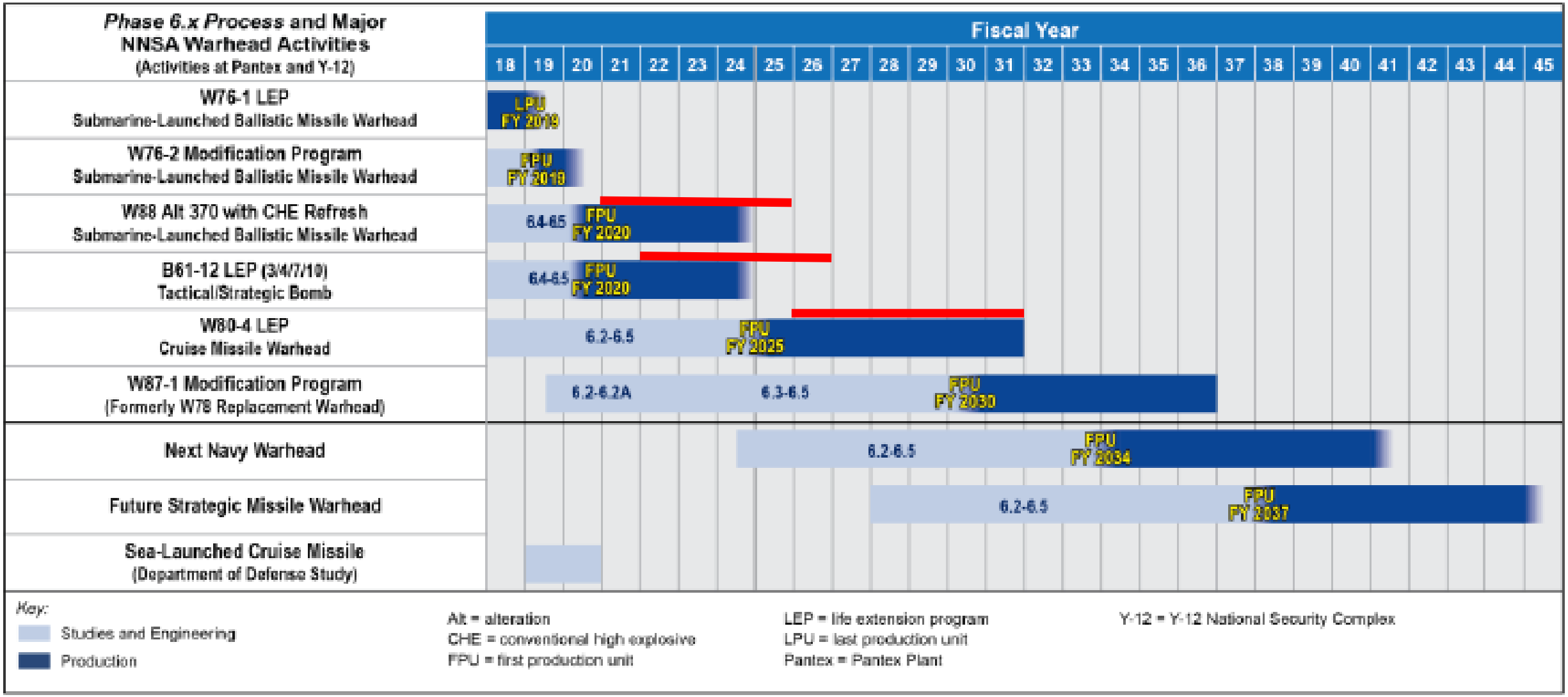
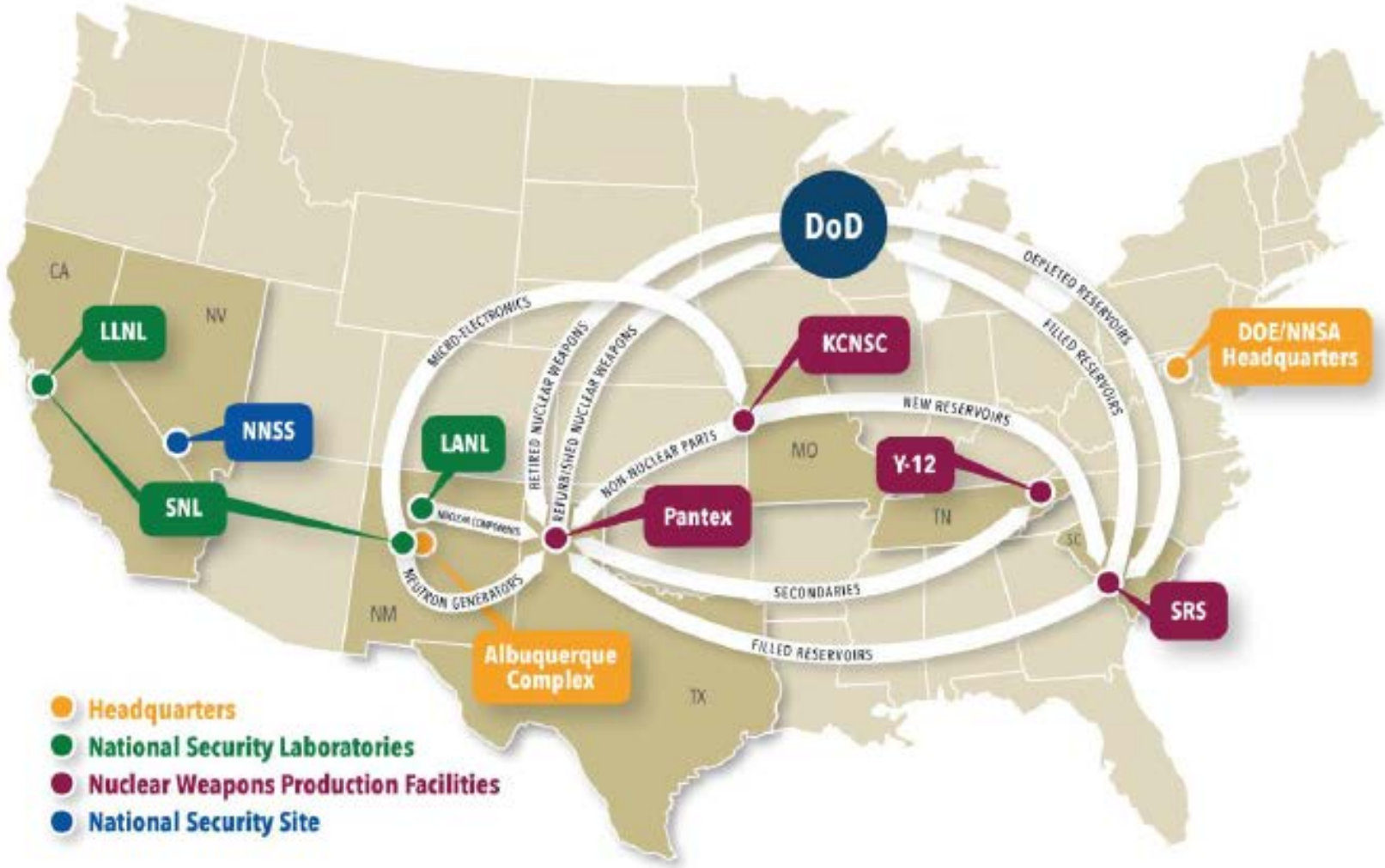


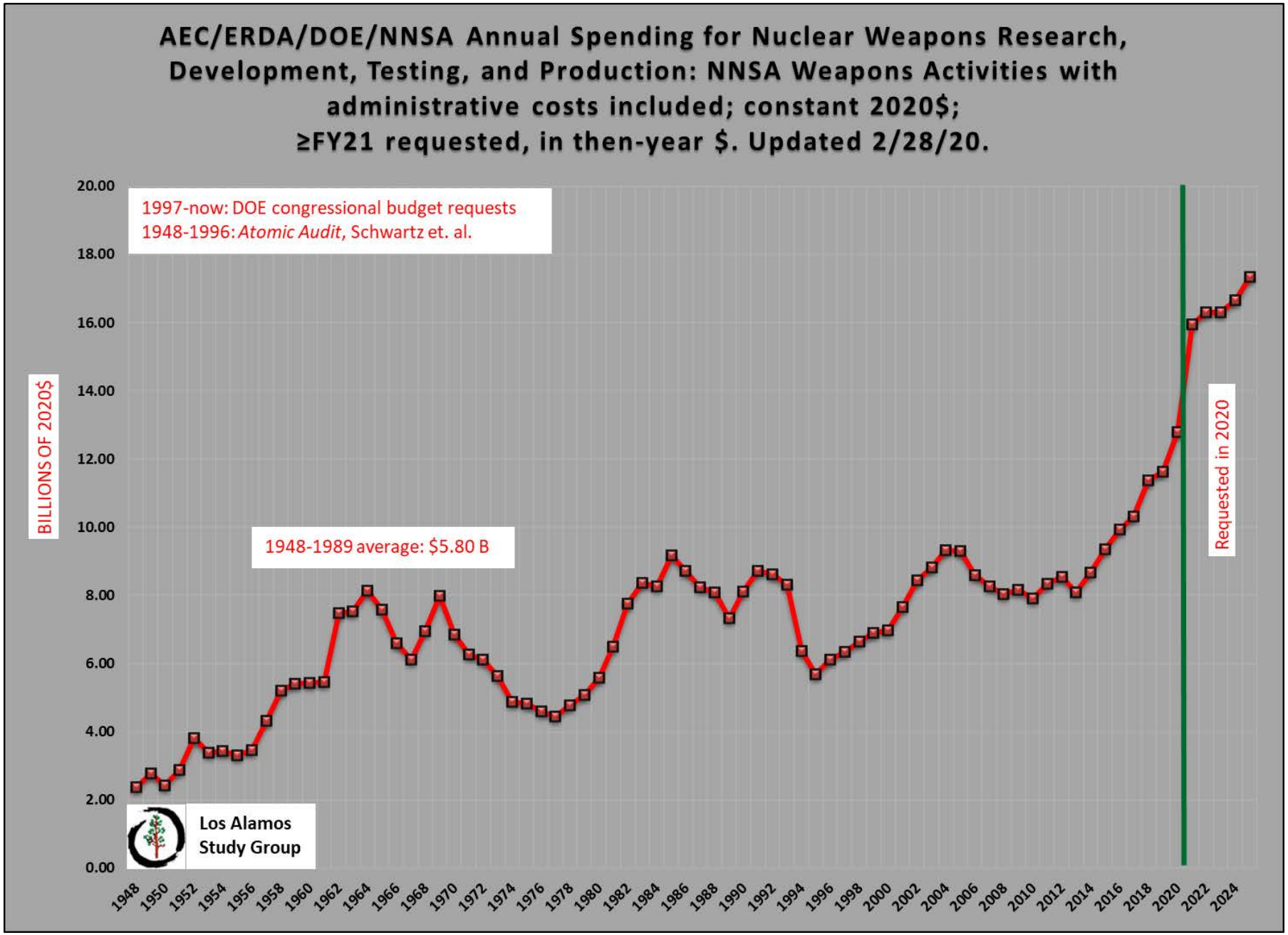
Figure 2–2. NNSA warhead activities[2]

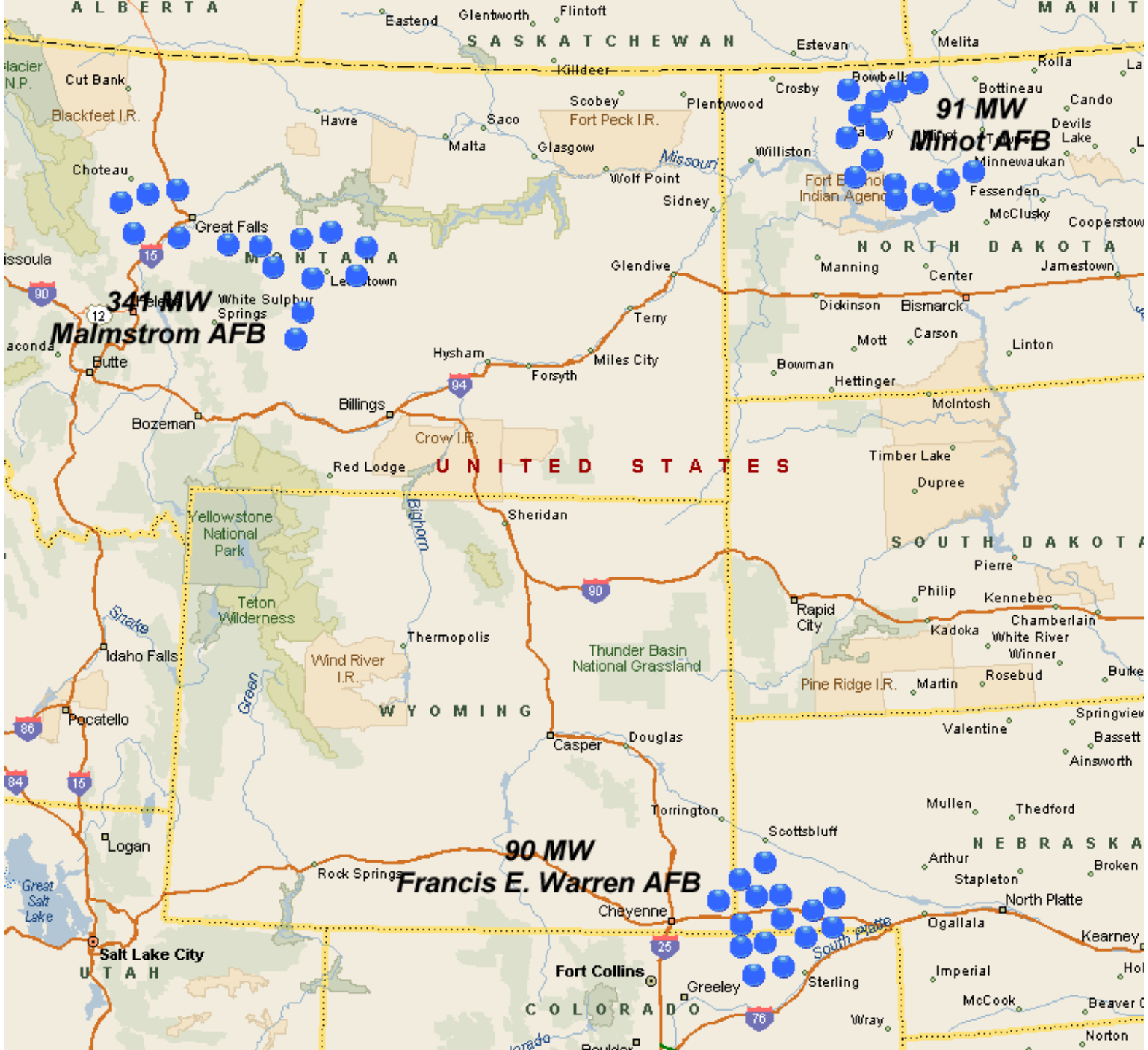
From NNSA FY2020 Stockpile Stewardship and Management Plan. Red bars are the current schedule as of May 2020



DoD = Department of Defense
KCNSC = Kansas City National Security Campus
LANL = Los Alamos National Laboratory
LLNL = Lawrence Livermore National Laboratory
NNSS = Nevada National Security Site
Pantex = Pantex Plant
SNL = Sandia National Laboratories
SRS = Savannah River Site
Y-12 = Y-12 National Security Complex

Figure 1–4. Site nuclear weapon product flow


AEC/ERDA/DOE/NNSA Annual Spending for Nuclear Weapons Research, Development, Testing, and Production: NNSA Weapons Activities with administrative costs included; constant 2020$; ≥FY21 requested, in then-year $. Updated 2/28/20.
1997-now: DOE congressional budget requests
1948-1996: Atomic Audit, Schwartz et. al.
1948-1989 average: $5.80 B
Requested in 2020
BILLIONS OF 2020$
Los Alamos Study Group
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
1948 1950 1952 1954 1956 1958 1960 1962 1964 1966 1968 1970 1972 1974 1976 1978 1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024

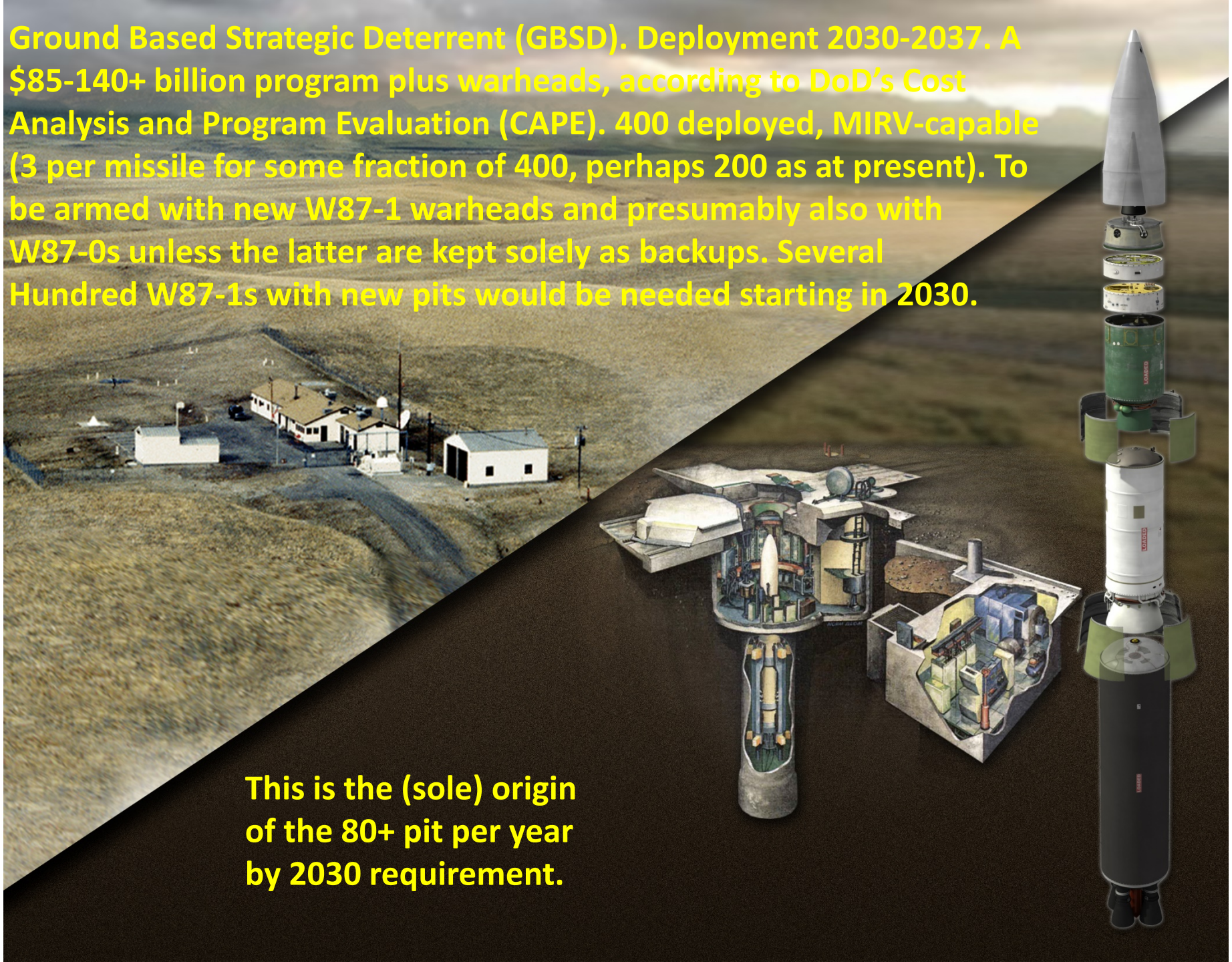


For the coming decade at least, a talk about new pits is also a talk about intercontinental ballistic missiles (ICBMs), both the existing Minuteman III's and the planned Ground-Based Strategic Deterrent (GBSD), a roughly $80-140 billion program.

MM IIIs are deployed in 3 bases spread over 5 states. There are 150 silos at each base, divided into 3 wings of with 50 missiles apiece.

50 silos are in "warm standby," without missiles in them. Thus 400 missiles are deployed.

Ground Based Strategic Deterrent (GBSD). Deployment 2030-2037. A $85-140+ billion program plus warheads, according to DoD's Cost Analysis and Program Evaluation (CAPE). 400 deployed, MIRV-capable (3 per missile for some fraction of 400, perhaps 200 as at present). To be armed with new W87-1 warheads and presumably also with W87-0s unless the latter are kept solely as backups. Several Hundred W87-1s with new pits would be needed starting in 2030.



This is the (sole) origin of the 80+ pit per year by 2030 requirement.

Mark 21/W87 on single RV MM III bus, the present deployment configuration.

This RV is too wide and heavy for MIRVing MM III.

Accelerated, massive hiring is occurring across the nuclear weapons enterprise.

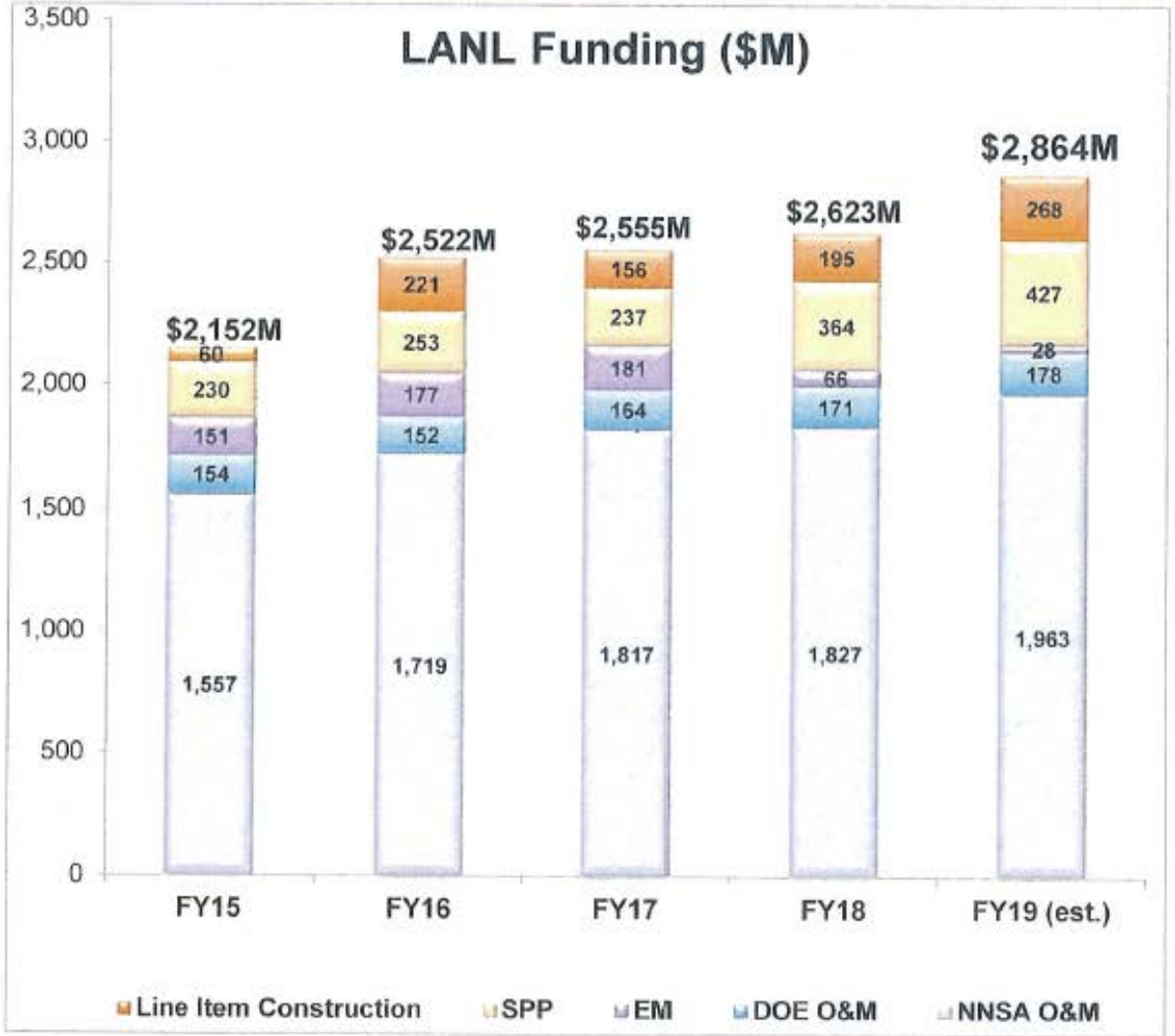
> We have … in excess of 41,000 people working on the NNSA mission today…. Since March of 2019 we've added more than 4,700 employees in that group of federal employees and labs, plants, and sites. We're going to need to add another 20,000 people by 2025…Los Alamos for instance in the coming year is going to have to hire 2,000 people to have a net increase of 1,200

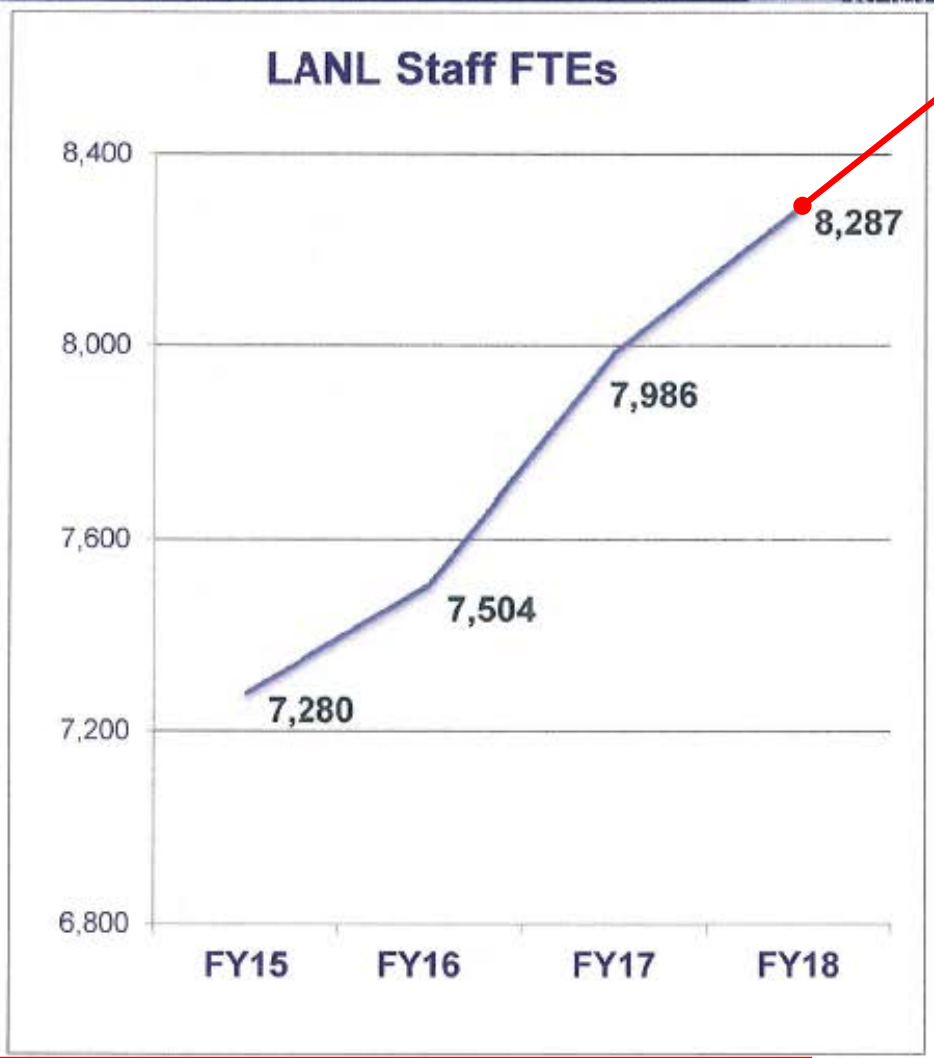
(William Bookless, NNSA Principal Deputy Administrator, speech before the Secretary of Energy Advisory Board, 2 October 2019, http://www.lasg.org/videos/Bookless-speech_2Oct2019.mp4, partial transcript at https://www.lasg.org/MPF2/Bookless-quotes_2Oct2019.html.)

LANL currently has ~2,000 people preparing for pit production, not counting construction workers. Some 1,600 more are said to be needed to achieve 20 pits/year (ppy), which requires 24/7 operations, and another 400 to reach 30 ppy. LANL is under statutory obligation to implement >30 (“41”) ppy and to prepare for >80 (“103”) ppy.

The Lab has a steady budget and a growing staff

Los Alamos NATIONAL LABORATORY

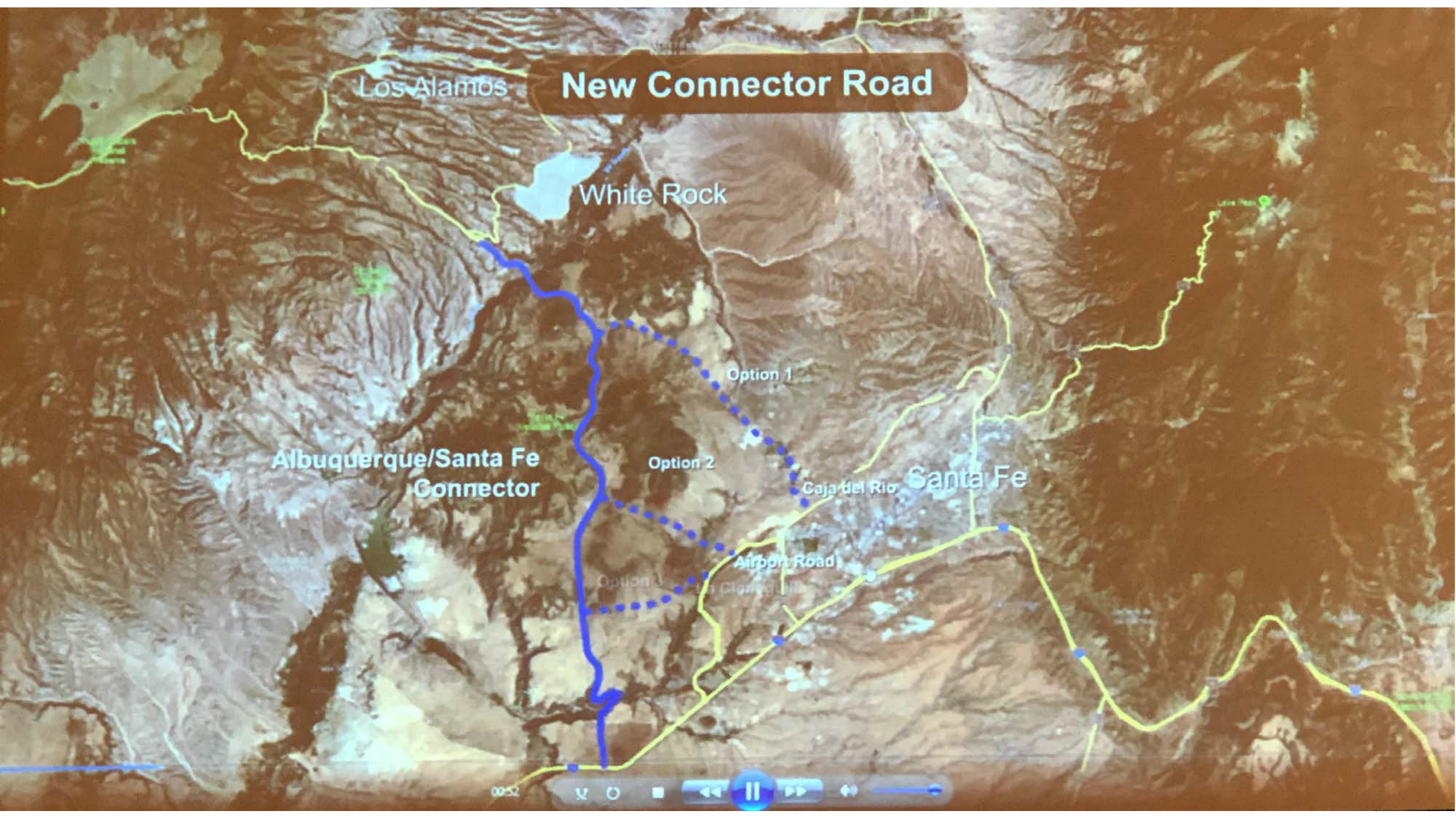


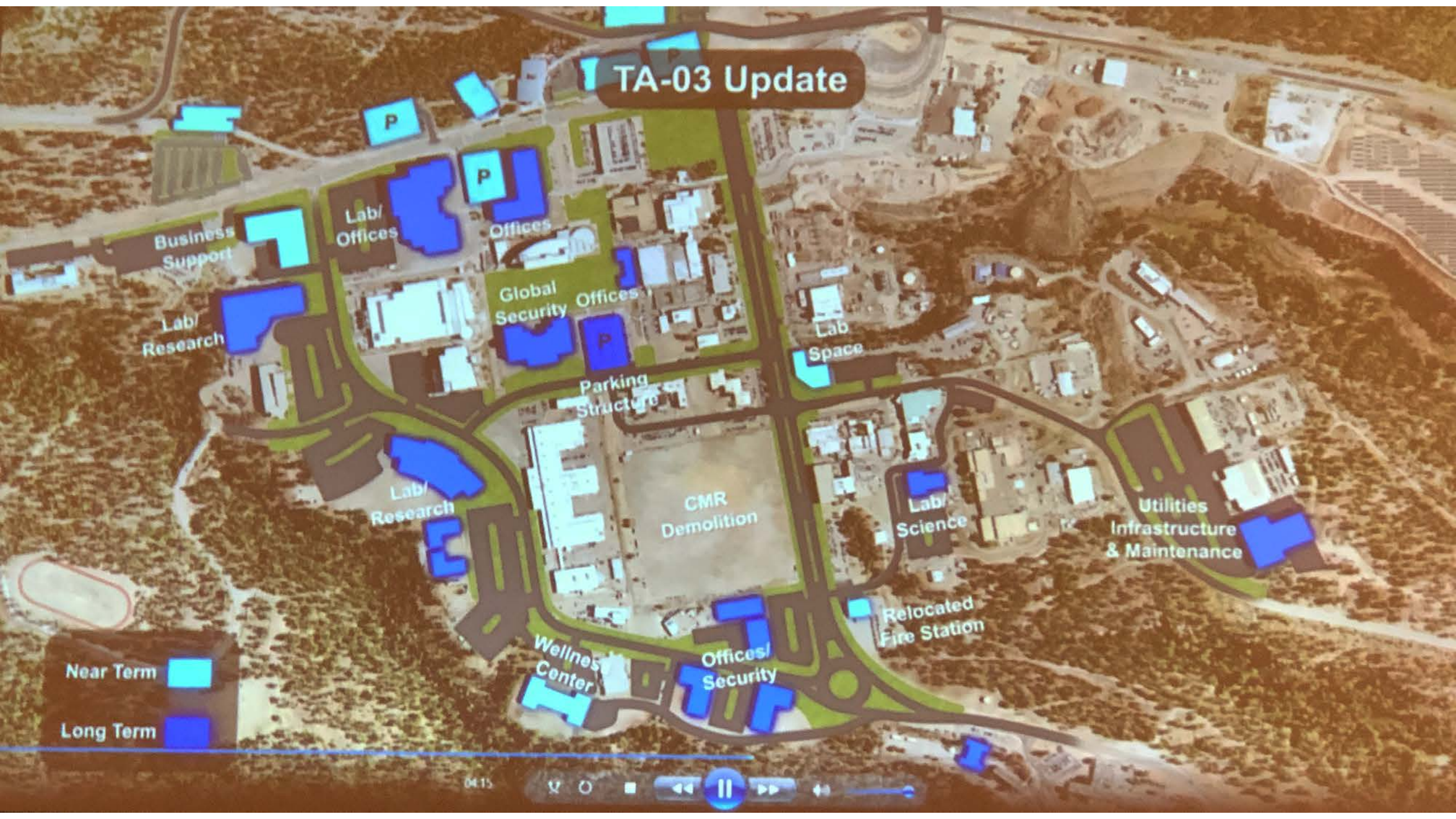


(from LANL's web site 9/16/19)

[Does not include all EM, which is $220 M in FY19. LANL is now a $3.06 B/year operation.]

Significant Growth Projected over the next five years

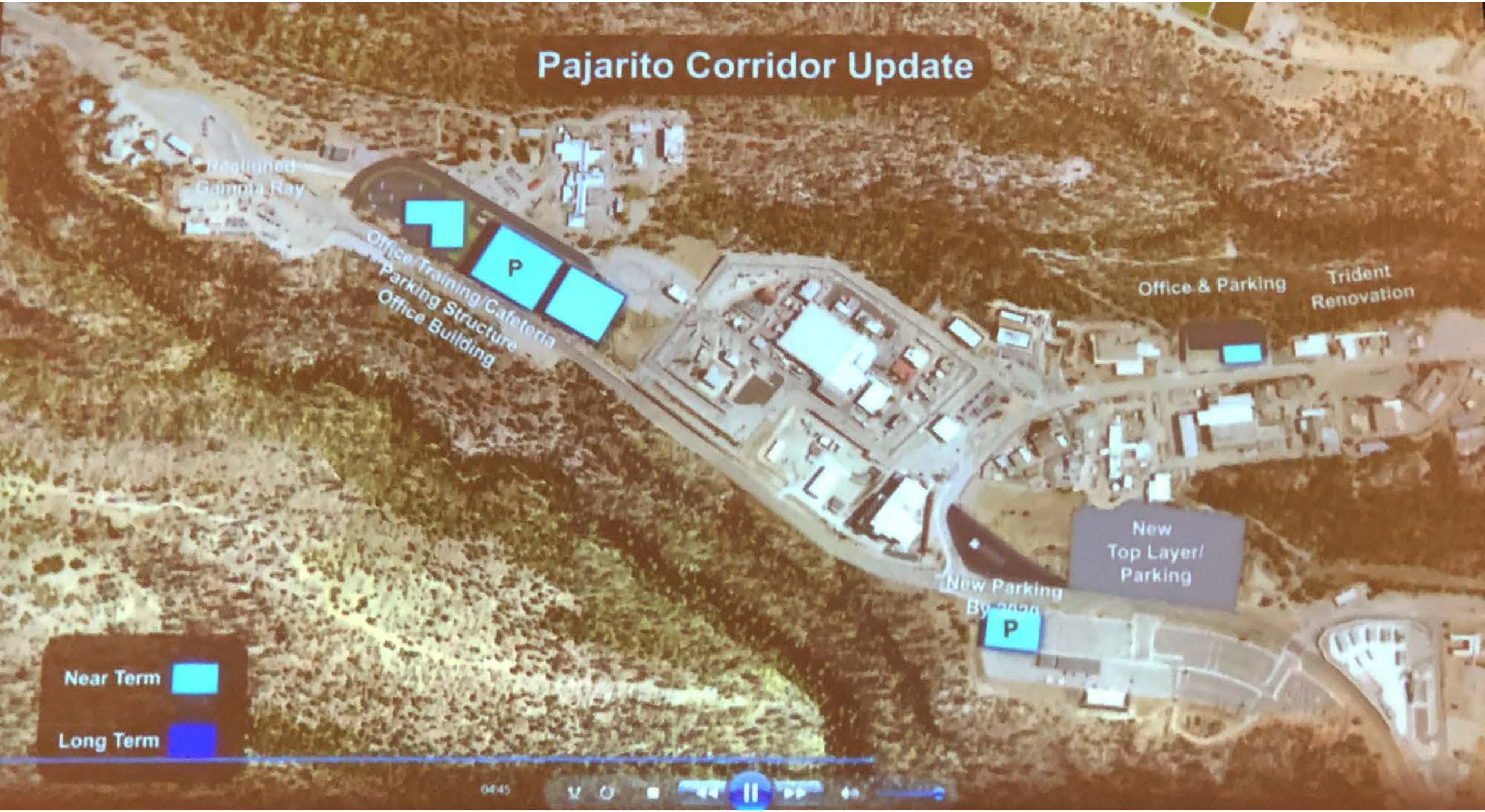

New Connector Road
Los Alamos
White Rock
Option 1
Option 2
Albuquerque/Santa Fe
Connector
Caja del Rio
Santa Fe
Airport Road


TA-03 Update
Business Support
Lab/ Offices
Offices
Global Security Offices
Lab/ Research
Parking Structure
Lab Space
Lab/ Research
CMR Demolition
Lab/ Science
Utilities Infrastructure & Maintenance
Relocated Fire Station
Wellness Center
Offices/ Security
Near Term
Long Term


Research Park Update
Research Park Building 2 & 3 with Badging
New Bypass Road
Parking Structure
Research Park Building 4
Parking Structure
Research Park Building 5
New Parking
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
Office/Training/Cafeteria
Parking Structure
Office Building
P
Office & Parking
Trident
Renovation
New
Top Layer/
Parking
P
Near Term
Long Term

Los Alamos Study Group, artist's conception of proposed plutonium modules

Los Alamos Study Group, artist's conception of proposed plutonium modules

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	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%

Warhead Type	Date of Entry into Stockpile	Planned LEP[1]	First Prod. LEP	Planned Repl.[2]	Projected FPU[5] for Replacement	Nuclear Component Age at Initial Replacement[6]
B61-3/4*	1979	B61-12 LEP	2020	FAW[3]	~2040–2050	~60–70 yrs
B61-7/11**	1985/1997	B61-12 LEP	2020	FAW	~2040–2050	~60–70 yrs
B83-1**	1983	Retired by 2025	n/a	n/a	n/a	n/a
Cruise Missile W80-1	1982	W80-4 LEP	2025	FAW	~2040–2055	~60–75 yrs
SLBM W76	1978	W76-1 LEP	2008	FBW[4]	~2045–2047	~65–70 yrs
ICBM W78	1979	n/a	n/a	W87-1	~2030	~50 yrs
ICBM W87	1986	Partial LEP	1999	FBW	~2035–2040	~50–55 yrs
SLBM W88	1989	Alt 370 Refresh	2022	FBW	~2035–2040	~45–50 yrs

* Non-strategic bomb ** Strategic Bomb [1] Life extension programs (LEP) reuse nuclear components
[2] Replacement requires nuclear component production [3] Future Air-Delivered Warhead (FAW) timeframe identified; characteristics to be determined [4] Future Ballistic Missile Warheads (FBW) initial studies planned; diversity and characteristics to be determined [5] First Production Unit [6] Replacement dates are notional

From DoD, *Nuclear Matters, 2020 edition*

The sordid story of how Trump's single 80+ ppy pit factory became two factories, both seeking 80+ ppy capacity

starring

Senator Martin Heinrich

and

Senator Tom Udall

Why do we say that industrial pit production is virtually impossible at LANL?

- Isolation, lack of housing, congested roads
- Dissected topography, e.g. at TA-55 – no good building sites except greenfield sites ($$)
- R&D culture
- Institutional arrogance
- Unconsolidated sediments, combining with dissected topography to create instability
- High seismicity
- Aging, unsafe facilities, such as PF-4 *and others*; inadequate waste handling capacity
- Uncertainties at the essential Radiological, Utility, and Office Building (RLUOB)
- Negative social attributes of New Mexico (e.g. high inequality, addiction rates)
- Lack of qualified workforce, long commutes for skilled craft labor

Is there a window of practical, safe pit production at LANL's PF-4? It is unlikely. (Los Alamos Study Group, 18 May 2019)

Year	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Needed TA-55 and TA-50 infrastructure tests, analysis, and upgrades, not all-inclusive																						
Column testing, seismic analysis; could be fatal to PF-4 operation as HC II Nuclear Facility; analysis may also limit MAR	(DNFSB WSR 12/28/18)			Necessity, feasibility, scope, and duration of possible PF-4 alterations are unknown at present				If needed, design and construction of a greenfield PF-4 replacement could begin in ~2022, with 30 ppy ops in ~2035. There is no room for a PF-4 replacement at TA-55. A separate 30 ppy production facility could not be built at TA-55 without massive disruption & risk. See other slides.														
PC-3 fire suppression system upgrade	(DNFSB WSR 1/4/19)							PF-4 replacement, which is unlikely to be possible for a number of reasons, would be vastly expensive (>$10 B).														
Internal firewall upgrade to 2 hours	(DNFSB WSR 1/4/19)																					
PC-3 active ventilation, fire alarm upgrade	(DNFSB WSR 1/4/19)																					
Fire water loop integrity	(DNFSB WSR 1/4/19)																					
CMRR subproject REI2	(DOE CBR)																					
CMRR subproject PEI1	(DOE CBR)																					
CMRR subproj. PEI2 (to Pu Pit Prod. Project, PPP)	(DOE CBR) Scope, cost, & duration of Pu Pit Proj. (PPP) unknown; purpose is to take LANL from 10 to 30 ppy so duration shown accordingly																					
CMRR subproj. RC3 (to PPP)																						
TA-55 Reinvest. Project III	Duration: >2024 (CBR) by ~2 yrs (estimate)																					
TRU liquid waste (TA-50)	Duration unclear but >2024 (CBR)																					
War reserve (WR) pit production expected (pits per year, ppy)																						
1	(funded by Pu Sustainment Ops)				X																	
10						X																
20	(funded by Pu Pit Production Project, scope TBD)						X															
30 (average)								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
≥30 (NNSA: 41 average)	Infeasible (AoA p. 2)	We believe multi-shift production would lead to fairly prompt and repeated pauses and shut-downs due to single-point failures and overwhelmed chokepoints. Inadequate and inappropriate facilities, management, training, and institutional culture would be exposed. Existing PF-4 missions would be threatened, as would worker and public safety. Recovery could be difficult and might not be successful.																				
≥50 (NNSA: 84 average)	Infeasible (AoA p. 2)																					
≥80 (NNSA: 103 average)	Infeasible (AoA p. 2)																					
Cumulative WR pits (theoretical, 30 ppy average)					1	11	31	61	91	121	151	181	211	241	271	301	331	361	391	421	451	481
Model (heuristic only): probability of effective PF-4 end of life (EEOL) by given year assuming normal distribution, 10 year standard deviation																						
2039 est. EEOL (NNSA, FY2014 CBR p. WA-211)	.02	.03	.04	.04	.05	.07	.08	.10	.12	.14	.16	.18	.21	.24	.27	.31	.34	.38	.42	.46	.50	.54
2034 est. EEOL (assumed earlier EOL with 30 ppy)	.07	.08	.04	.04	.05	.07	.08	.21	.24	.27	.31.	.34	.38	.42	.46	.50	.54	.58	.62	.66	.69	.73


2026
PIDAS (Perimeter Intrusion Detection and Assessment System)
Repurposed
Future
226-2F
Training Development Center
ES
221-21F
221-22F
221-12F
Vehicle Inspection
ES
ES
ECF-Vehicle
ECF-Pedestrian
706-4F
226-F
Environmental Storage (ES)
706-3F
731-2F
Replacement 706-7F
706-5F
N
19PPF00032-04

NNSA, October 2017 *Analysis of Alternatives for Pit Production*:

reflected in the cost estimating section. Although the complexity analysis indicated a 2030 schedule is achievable under ideal circumstances, the associated cost analysis demonstrated that executability risk would delay achievement of 80 WR ppy to 2033 at the earliest for any alternative.

Institute for Defense Analyses, May 2019, "Independent Assessment of the Plutonium Strategy of the National Security Administration"

Summary of Main Findings

1. Eventually achieving a production rate of 80 ppy is possible for all options considered by the EA, but will be extremely challenging.
2. No available option can be expected to provide 80 ppy by 2030. DoD should evaluate how to best respond to this requirement shortfall.
3. Trying to increase production at PF-4 by installing additional equipment and operating a second shift is very high risk.
4. Effort to identify and address risks is underway, but is far from complete.
5. Strategies identified by NNSA to shorten schedules will increase the risks of schedule slip, cost growth, and cancellation.

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 next adapted from Mello, The Great Transformation: Nuclear Weapons Policy Considerations for the 116th Congress, May 6, 2019)

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.