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Build Warhead Factories Now, Worry about Weapons Policy Later

Will Congress Take Back the Reins?

2/12/08 version; comments and suggestions welcome
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> Proceeding with the CMRR project as currently designed will strongly prejudice any nuclear complex transformation plan. The CMRR facility has no coherent mission to justify it unless the decision is made to begin an aggressive new nuclear warhead design and pit production mission at Los Alamos National Laboratory....The Committee is concerned the NNSA is proceeding with large expenditures for this project while there are significant unresolved issues, and recommends the fiscal year 2007 funding be held in reserve....[1]

1. Building factories means you want the product; infrastructure commitments make policy.

On January 15 the *Wall Street Journal* published an opinion piece written by George Shultz, William Perry, Henry Kissinger, and Sam Nunn and endorsed by 37 other national security experts. Entitled "Toward a Nuclear-Free World," it was the second such essay in the same outlet by these authors in as many years.[2] Both essays concern the claimed benefits, some immediate and others long-term, of specific nuclear policies the authors believe would be best advanced under an overall banner of nuclear disarmament.

Though these authors do not mention it, the U.S. and four other nuclear states (Russia, the U.K., France, and China) are already legally bound to "pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament..." by Article VI of the Nuclear Nonproliferation Treaty (NPT). The opinion of the International Court of Justice and subsequent U.S. diplomatic agreements has confirmed the binding character of these twin commitments to end the arms race and achieve nuclear disarmament.[3] Most observers would strongly agree that the collective unwillingness of the five NPT nuclear weapons states to persuasively implement these Article VI obligations has harmed the NPT and the law-based nonproliferation regime it founds.[4]

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[1] House Appropriations Committee, House Report 110-185 – Energy and Water Development Appropriations Bill, 2008, H.R.2641, search at http://thomas.loc.gov/.

[2] Available at http://online.wsj.com/article/SB116787515251566636.html. The prior essay, "A World Free of Nuclear Weapons," which was endorsed by 17 other experts, was published by the *Wall Street Journal* on January 4, 2007, at http://online.wsj.com/article/SB116787515251566636.html.

[3] The U.S. reiterated its commitment to nuclear abolition in the consensus statement of the 2000 NPT Review Conference, agreeing to a set of thirteen detailed "practical steps for the systematic and progressive efforts to implement Article VI." See http://www.basicint.org/nuclear/NPT/2000revcon/finaldoc-advance.htm#13%20Steps. Prior to this the International Court of Justice (World Court) unanimously ruled in 1996 that "There exists an obligation to pursue in good faith *and bring to a conclusion* negotiations leading to nuclear disarmament in all its aspects under strict and effective international control." Emphasis added. See decision paragraph "F" at http://www.lcnp.org/wcourt/opinion.htm.

[4] The author speaks from personal observations at several NPT preparatory and review conferences but also see, for example, the formal conclusions of Lewis Dunn et. al., Science Applications International Corporation, "Foreign Perspectives on U.S. Nuclear Policy and Posture," December 4, 2006, prepared for the Defense Threat Reduction

If the disarmament aspiration expressed in these two essays means anything at all, it means refraining from long-term investments in the specialized infrastructure needed solely to make novel kinds of warheads, especially if that infrastructure is "responsive."

More broadly, nuclear weapons infrastructure investments that require large and long-term commitments of capital and skilled technical labor – scarce resources in any country – are good indicators of national nuclear intent. In other words, infrastructure investments make – and are – nuclear policy.

The U.S. government thinks so, and says as much. The President's January 2002 Nuclear Posture Review elevated what it called "responsive infrastructure" to an element of its overall strategic "triad."[5] These "responsive" infrastructure investments were to be integral to a "capabilities-based force" designed to assure allies and friends, dissuade competitors, deter aggressors, and "*decisively defeat any adversary* if deterrence fails"[6] (emphasis added).

Thus, according to the White House, "responsive infrastructure" for nuclear weapons means infrastructure that can support global military dominance. This is a different and more aggressive mission for NNSA than merely maintaining a nuclear arsenal.

The capability to "defeat any adversary" is also unachievable, assuring an endless appropriation treadmill for contractors, with each program inadequacy or project failure serving as a potent justification for the next.

Linton Brooks, Administrator of the National Nuclear Security Administration (NNSA) in 2006, has emphasized the decisive nature of long-term manufacturing investments as a foundation of nuclear policies a "couple of decades" hence, which he envisions being more aggressive than those at present and accordingly supported by a different stockpile.

Agency (DTRA), at http://www.dtra.mil/documents/asco/publications/ForeignPerspectivesUSNuclearPolicyCompleteReport.pdf.

Another recent testimony to this view is the speech delivered by Mohammed ElBaradei on February 11, 2008. Audio as delivered at http://www.securityconference.de/konferenzen/rede.php?menu_2008=&menu_konferenzen=&sprache=en&id=210&. Unofficial transcript at http://www.presstv.ir/detail.aspx?id=42679&sectionid=3510302.

[5] Department of Defense, "Findings of the Nuclear Posture Review," Slides 7 ("assure, dissuade, deter, defeat") and 9 ("responsive infrastructure") at http://www.defenselink.mil/news/BriefingSlide.aspx?BriefingSlideID=120. See also these excerpts from Nuclear Posture Review:

"…U.S. strategic forces need to provide the President with a range of options to defeat any aggressor.

"DEFEAT" – Composed of both non-nuclear systems and nuclear weapons, the strike element of the New Triad can provide greater flexibility in the design and conduct of military campaigns to defeat opponents decisively…Nuclear weapons could be employed against targets able to withstand non-nuclear attack, (for example, deep underground bunkers or bio-weapon facilities).

"The need is clear for a revitalized nuclear weapons complex that will: ...be able, if directed, to design, develop, manufacture, and certify new warheads in response to new national requirements…

"…One glaring shortfall is the inability to fabricate and certify weapon primaries, or so-called "pits"…. For the long term a new modern production facility will be needed to deal with the large-scale replacement of components and new production."

(At http://www.globalsecurity.org/wmd/library/policy/dod/npr.htm).

[6] White House, National Security Strategy of the United States, September 2002, at http://www.whitehouse.gov/nsc/nss.html.

> We can change our declaratory [nuclear] policy in a day. We can make operational and targeting changes in weeks or months. In a year or so we can improve integration of nuclear and non-nuclear offense. By contrast, the infrastructure and the stockpile it can support cannot change as quickly. Full infrastructure changes may take a couple of decades.[7]

Brooks didn't explicitly mention, though he could have, that decisions in the short run about proceeding with the Reliable Replacement Warhead (RRW) are not on the critical path to actually deploying the RRW or any other new warhead. Warhead design and engineering development are short-term activities compared with designing and constructing the facilities needed to actually build RRWs in any quantity. The new buildings needed are orders of magnitude more complicated than the warheads.

As we shall see, the factory complex at Los Alamos National Laboratory (LANL) needed to produce the fissile plutonium cores "("pits") for RRW (or another new warhead) is not expected to be completed prior to at least 2017. These facilities are necessary, and they are the rate-determining step, for RRW manufacture. Thus delaying the decision to develop the RRW, a mature design, by 4 or 5 years – past the upcoming administration, in other words – would make little or no difference as to when RRWs would first enter the stockpile in any quantity. As long as design and construction of production facilities proceed, Congress could "halt" RRW for a few more years, as it did in late 2007, without significantly affecting its final delivery schedule, assuming it were eventually approved. And if sunk costs for RRW *factories* are allowed to grow much further, RRW will become hard to stop. The reins will have slipped from Congress' hands.

Sometimes NNSA gives the impression that production "capacity" could be somehow created without using it. This makes no sense. One cannot build, equip, and stand up highly-specialized factories costing billions of dollars, or hire and train hundreds of highly-specialized technicians over a period of many years without actually making the very things these costly arrangements were meant for – RRWs, or some other novel warheads not currently in the stockpile.

To the extent the U.S. constructs "responsive" nuclear weapons factories not actually needed to maintain U.S. nuclear weapons for several decades to come, the U.S. expresses not just a clear intent to keep nuclear weapons "forever" (as one Department of Energy briefing put it[8]) but also a commitment to continued innovation in the stockpile. As we have seen, such investments, if continued, will (continue to) undermine *both* NPT Article VI nuclear commitments.

2. The proposed Chemistry and Metallurgy Research Replacement (CMRR) Facility at Los Alamos: building a "Modern Pit Facility" (MPF) one piece at a time

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[7] Linton Brooks, speech to the East Tennessee Economic Council, March 3, 2006, at http://www.nnsa.doe.gov/docs/speeches/2006/speech_Brooks_East-Tenn-Economic-Council-03Mar06.pdf.

[8] A. E. Whiteman, NNSA Albuquerque, "DOE Nuclear Weapons Complex Production Facilities and Technologies," March 2000 briefing slides, Study Group files.

The U.S. has now begun to invest heavily in the specialized manufacturing infrastructure needed for new nuclear weapons, pivotally at Los Alamos National Laboratory (LANL).[9] The flagship of this manufacturing complex is the "Chemistry and Metallurgy Research Replacement" (CMRR) project, currently at least a $2.2 billion project that is likely to cost even more than this, to be built at LANL's Technical Area (TA)-55.[10]

The CMRR consists of two buildings, the Nuclear Facility (NF), comprising in dollar terms roughly seven-eights of the project, and the Radiological Laboratory, Utility, and Office Building (RLUOB). Together the two buildings would comprise some 400,000 square feet of new interior space. The CMRR would be the largest single construction project in the history of LANL in inflation-corrected dollar terms. The NF's 6-metric ton vault would approximately triple LANL's plutonium storage capacity.[11]

The two CMRR buildings are to be linked by tunnels to each other and to LANL's existing 30-year-old plutonium facility ("PF-4"), which is slowly being modified using operational funds. NNSA has also begun renovating PF-4 in a series of open-ended long-term construction line items collectively called the "TA-55 Re-Investment Project" (TRP) (see Table 1, below).

At present pit production utilizes approximately 1/4 of PF-4's 59,600 square feet of nuclear floor space;[12] the CMRR NF would add at least 22,500 additional square feet of "Security Hazard 1/

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[9] Important new manufacturing infrastructure is also under design at the Y-12 plant in Tennessee, namely the circa $3 billion Uranium Processing Facility (UPF). The author knows little about the UPF and specifically I do not know the extent to which it would add brand-new capabilities to the U.S. nuclear weapons complex, which these LANL projects would do.

[10] DOE, FY2009 Congressional Budget Request, NNSA (Vol. 1), pp. 298-307. http://www.cfo.doe.gov/budget/09budget/Content/Volumes/Volume1a.pdf.

The original budget estimate submitted to Congress in February of 2002 for the project (then Project 03-D-103-01) was "$350-500 million" (Total Estimated Cost and not including any Other Project Costs, which were not mentioned), that is, less than one-fourth of what it is today. See DOE, FY2003 Congressional Budget Request, NNSA Readiness in Technical Base and Facilities, p. 42. At http://www.cfo.doe.gov/budget/03budget/content/weapons/rtbf.pdf.

Then, "[t]he CMRR CD-1 was approved on June 17, 2005 with a preliminary cost range of $745,000,000 - $975,000,000, although costs could be greater." (DOE FY20009 CBR, Vol 1., op. cit, p. 298.)

Then, "[i]n late 2006, Los Alamos National Laboratory completed an independent review of the planned CMRR and the revised cost estimate for the [CMRR] Nuclear Facility approximately doubled." (NNSA Response to Senator Domenici, 4/18/07 Senate Energy and Water Development Appropriations Subcommittee Hearing, in Study Group files). Doubling the then- roughly $750 million CMRR Nuclear Facility cost and retaining the ~$200 million Radiological Facility budget without inflation results in a total project cost in the $1.7 billion ballpark. This response indicates the CMRR budget submitted to Congress in February of 2007 was already known by NNSA to be too low – by a factor of approximately 75% – when submitted.

Project costs are very likely climb further because the CMRR Nuclear Facility has not completed Preliminary Design (i.e. reached "Critical Decision 2" in DOE project management argot). As later noted in the text, basic variables such as building size, seismic design, and safety design have not been finalized. Costs of concrete, steel, and other materials are also inflating rapidly; see for example William Yardley, "Building Costs Deal Blow to Local Budgets," January 26, 2008 *New York Times*, http://www.nytimes.com/2008/01/26/us/26build.html?scp=15&sq=local+infrastructure&st=nyt. The CMRR is now projected to be completed in 2017 or 2019, 9 or 11 years away.

[11] LANL, CMRR briefing slides p. 8, no date.

[12] See note 33.

Hazard Category 2" space, some with greater ceiling height and including capability for handling large vessels to be used for plutonium-containing subcritical explosions at LANL.[13]

As of January 18, 2008 the RLUOB was under construction and approximately 30% completed. It is not yet clear when or even if preliminary design for the CMRR NF will be completed, or when construction might at the earliest begin. Physically, the staging yard for RLUOB construction now occupies the 90,000-cubic-yard pit dug at the CMRR NF site, ostensibly to investigate seismic conditions there. For this reason alone the earliest possible date for the onset of construction is not until at least the spring of 2009.[14] Such a schedule seems very optimistic, however, as a number of significant design issues remain unresolved, including seismic and overall safety design – even the basic size of the building.[15] As of March of 2007, roughly four years into the project, conceptual vault design, including provisions for fail-safe cooling of plutonium stores, had not been finalized.[16]

As we will see in a moment, it is not easy to predict the ultimate capacity of a LANL pit production complex anchored by a renovated PF-4 and the two CMRR buildings – especially if additional production space or additional production annexes are subsequently added, as NNSA is currently suggesting might happen.[17]

From a managerial perspective there would be no need or motivation to build multiple plutonium facilities at the same time, were that desired. A staged strategy would be far more attractive, allowing "lessons learned," supplier relationships, design teams, and skilled installation crews to migrate from one facility to the other, minimizing overall risk, leveling workloads and appropriations, and staggering training requirements. At one time NNSA proposed that a Modern Pit Facility (MPF) could be constructed in exactly such a modular way.

Whether built with just the RLUOB, with the RLUOB plus the NF, with the RLUOB plus a "super-sized" NF, or with a CMRR doubled all around (i.e. with two RLUOBs and two NFs or their near-equivalents), the CMRR is not needed to maintain the present nuclear arsenal or any subset of it for several decades. When the expected 50-year life of the CMRR is drawing to a close in 2067, stockpile pits may (or may not) be just drawing toward the end of their "shelf life," as noted below.

In the meantime the Pantex nuclear weapons facility near Amarillo will have "produced" fully-certified, long-lived backup pits for stockpile systems to the tune of a couple of hundred per year, starting now. By that time it will have "produced" several thousand pits overall of the precise kinds that could be used if needed to rebuild stockpile systems, having operated for many years without any additional capital investment or increase in operating cost whatsoever. Pantex can

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[13] LANL CMRR briefing slides, author's interpretation of the purpose of "large vessel handling" capability.
[14] Steve Fong, NNSA CMRR project staff, personal communication, 1/18/07.
[15] NNSA has said it may expand the footprint of the CMRR NF by 9,000 square feet, a 40% increase from the existing plan of 22,500 sq. ft of Category I/II space. NNSA, "Draft Complex Transformation Supplemental Programmatic Environmental Impact Statement" (DCTSPEIS), Summary, December 2007, p. S-36. At http://www.complextransformationspeis.com/Summary.pdf.
[16] Oral response to author's questions, CMRR public meeting, Fuller Lodge, Los Alamos, March 2007.
[17] See NNSA, DCTSPEIS Summary, pp. S-34, 35. Similar plans have been internally available at LANL since at least 2001, e.g. LANL 2001 Comprehensive Site Plan, "TA-55 Pre-conceptual Plan," Study Group files.

"produce" *better* pits[18] much *faster*, far *cheaper*, *without program risk* and, since they are produced by dismantlement, *with highly-positive nonproliferation benefits.*[19]

Under this scenario, the practical and politically-viable alternative for TA-55 would be to put pit production on "warm standby," making a very small number of pits each year and subjecting them to destructive testing. This is not greatly dissimilar from what NNSA was doing at LANL in the 1996-2006 timeframe. This approach would retain expertise and skilled workers and provide a "right-sized" skill-preservation program. The author believes that such a program could solve a host of management, safety, and morale problems as well. Perhaps most importantly, it would provide a much better basis – even a "good-faith" basis, in the words of Article VI of the NPT – for nonproliferation negotiations.

The CMRR *is* needed, however, to manufacture significant quantities of pits for novel nuclear explosives.[20] Given that even the hawkish Bush Administration believes that by the time the CMRR is completed each warhead type in the arsenal will be present to surfeit, manufacturing novel kinds of nuclear weapons is the only reason to build these facilities.[21]

Construction of the CMRR and the appurtenant facilities necessary to make the LANL production complex work is expected to take approximately a decade. While the production complex is to be centered in and around TA-55, important subsidiary elements are also planned for LANL's nuclear waste disposal and storage site, TA-54.

Several other construction projects are functionally required to make the production complex work. A list of these projects is provided in Table 1. A somewhat more detailed presentation of the same information provided in Table 1.1. In both tables the items underlined are those associated, in the author's view, with increases in manufacturing capacity. The others are arguably necessary to retain an operating plutonium facility at all – including basic pit production capability.

One project listed, the "more than" $240 million Nuclear Materials Safeguard and Security Upgrade Project (NMSSUP), is so closely associated with the CMRR in time, space, and logic as to suggest that the former project is simply an aspect of the latter that has been broken away from it to hold down apparent cost inflation somewhat.

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[18] Letter from Danielle Brian to Secretary Bodman, January 18, 2008, at http://www.pogo.org/p/homeland/hl-080118-pits.html; Josef Hebert, "Quality of Nuclear Devices Questioned," Associated Press, January 20, 2008, at http://ap.google.com/article/ALeqM5gf16OkIt8_XfOR-kMzMGjmND8-9gD8U9MU900.

[19] Pit production, including this option, is the subject of another Study Group paper expected later this month.

[20] Neither the CMRR nor TA-55 as a whole is needed to make nuclear explosives made with uranium.

[21] See for example the interpretation of Bush Administration stockpile objectives by Robert Norris and Hans Kristensen, "The U.S. nuclear stockpile, today and tomorrow," *Bull. Atom. Sci.* Sept./Oct. 2007, at http://thebulletin.metapress.com/content/3605g0m20h18877w/fulltext.pdf. The temporary exception to this generalization is the W88 warhead, of which less than 30 additional units are to be produced between 2008 and 2010, inclusive, a campaign that will conclude long before the facilities in question come on line. The national security justification for these W88 warheads is in our view very weak; see Greg Mello, "Restarting Plutonium Pit Production: No Need, High Costs," at http://www.lasg.org/PU_talking_points1.htm.

Table 1: Pit Production and Related Construction Projects at LANL Projects underlined are desired solely or primarily for production capacity expansion. In millions of dollars. Sources: DOE congressional budget requests for FY2008 and FY2009; Consolidated Appropriations Act and Explanatory Statement, 2008[22]					
Project	**Total Project Cost**	**FY09 Request**	**FY08 Appropriation**	**Total Prior Appropriation**	**Estimated Completion Year**
Chemistry and Metallurgy Research Replacement (CMRR) Project	More than $2,164 + gloveboxes, equipment	$100	$75	$217	2019
Nuclear Materials Safeguards and Security Upgrades Project (NMSSUP)	More than 240	46	50	0	[After CMRR]
Pit Radiography Facility	47	?	1	2	"TBD"
TA-55 Reinvestment Project	175 (omits "other project costs")	17	6?	0	Unclear
Radioactive Liquid Waste Treatment (RLWTF) upgrade	80	20	26	0	2011
TA-54 nuclear waste disposal expansion	60 (omits "other project costs")	7	2	3	2011
Total	**More than $2,800; will rise**	**$190**	**$162**	**$222**	**2019**
Decomm. & Demol. (D&D) of CMR [23]	400 (2008 dollars)	0	0	0	(after CMRR is completed)
Total w/ CMR D&D	**At least $3.2 billion**				

[22] At http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110_cong_house_committee_prints&docid=f:39564c.pdf.

[23] Chemistry and Metallurgy Research Building, existing. D&D required per FY2002 Energy and Water Development Appropriations Act report, H. Rept. 107-258.

Table 1.1: Pit Production and Related Construction Projects at LANL, February 2008 Projects underlined are desired solely or primarily for production capacity expansion. Dollars in millions (M). Sources: see Table 1.					
Project	**Total Project Cost**	**FY09 Request**	**FY08 Appropriation**	**Total Prior Appropriation**	**Estimated Completion Year**
Chemistry and Metallurgy Research Replacement (CMRR) Project (Projects 03-D-103 & 04-D-125)	More than $2,164 plus "Phase B" (gloveboxes, equipment); likely to increase	$100	$75	$217	2017, or 2019 with "Other Project Costs" (OPCs)
Nuclear Materials Safeguards and Security Upgrades Project (NMSSUP)* (Projects 05-D-170-01 & 08-D-701)	More than 240	46	50	0	"2012" (logically, after CMRR & Pit Radiography Facility are complete)
Pit Radiography Facility (Projects 06-D-140-01, unnamed later one	47	0 (not fully clear)	1	2	"2011" (as of 2007) and "TBD" (as of 2008)
TA-55 Reinvestment Project (Projects 06-D-140-02, 08-D-804, 10-D-XXX, & a later one)	175 (TEC) (author interpretation: 200 w/ OPCs)	8 (Phase I) 9 (Phase II)	6 (requested; final appropriation unclear)	0	"2011" (logically, after CMRR)
Radioactive Liquid Waste Treatment (RLWTF) upgrade (Project 06-D-140-03 & 07-D-220)	97 (2007) 80 (2008)	20	26	0	2011
TA-54 nuclear waste disposal expansion (Proj. 07-D-140-02)	65 (2007 w/o OPCs; ~100 w/ OPCs) 60 (2008)	7	2	3	"2011"
Total	**At least $2.8 billion and rising**	**$190 M**	**$162 M**	**$222 M**	**2019**
Decommissioning & Demolition (D&D) of CMR	400 (2008 dollars)	0	0	0	(after CMRR is completed)
Total w/ CMR D&D	**At least $3.2 billion**				

Notes to tables: Total Estimated Cost (TEC) + Other Project Costs (OPCs) = Total Project Cost (TPC). Does not include capitalized operating expenses, 1994 - 2008 or future years. Does not include possible doubling of the CMRR project or equivalent as part of the "Los Alamos Upgrade Option" (see footnote above) which would likely double CMRR costs. (Any design savings would likely be more than outweighed by expected high inflation of construction costs). Includes no operating costs for these facilities. Includes no short-term or ultimate D&D costs except for existing CMR building.

3. Policy decisions to date have not fully incorporated the results of NNSA's pit aging studies.

The purpose of all this is to make plutonium "pits," the fissile cores around which the first explosive stages in all currently-deployed U.S. nuclear weapons are built. The U.S. has circa 24,000 pits now – about 9,800 in stockpile weapons and another 14,000 in storage.[24]

Pits last a long time.

> ...[M]ost plutonium pit types have credible lifetimes of at least 100 years. Other pit types have mitigation strategies either proposed or being implemented. Overall, the studies showed that the majority of plutonium pits for most nuclear weapons types have minimum lifetimes of at least 85 years....We can therefore conclude that pit lifetimes do not at present determine warhead lifetimes.[25]

Tens of billions of dollars have been invested in stockpile stewardship programs since 1995; the above consensus pit aging finding is one result. If this scientific result were actually applied to congressional decisions it would allow the indefinite deferral of many billions of dollars in constructing, operating, and eventually dismantling new pit production facilities. It is difficult to put a dollar cost on the program costs that were needed to come up with this finding; it is surely over one billion dollars. It would be a shame to waste that investment.[26]

4. How many pits could LANL make, with and without CMRR?

LANL has had the capability to make pits since 1945. With likely exceptions[27] however, LANL has not made pits for the stockpile from 1949 until last year, when 11 new pits were made, some or all of which were shipped to the Pantex nuclear weapons plant near Amarillo, Texas for assembly into W88 Trident warheads.

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[24] Stockpile total extrapolated from that of Robert Norris and Hans Kristensen, "U.S. Nuclear Forces, 2007," Bull. Atom. Sci. Jan/Feb. 2007, http://thebulletin.metapress.com/content/91n36687821608un/fulltext.pdf. Pantex "now stores more than 14,000" pits; see Jim McBride, "Nuclear reuse: Pantex facility to recertify plutonium weapon cores," *Amarillo Globe-News*, July 8,2007, www.amarillo.com/stories/070807/bus_7866118.shtml.

[25] Letter from Linton Brooks to Senator John Warner, summarizing and transmitting JASON review of LANL and LLNL pit aging studies, November 28, 2006, at http://lasg.org/JASONs_report_pit_aging.pdf.

[26] Comparably large savings are possible in the stockpile stewardship program if it were no longer deemed necessary to attempt to develop the capacity to certify the novel pits that would, if the CMRR was not built, not be made. Acquiring the capability to a) certify and b) manufacture novel nuclear explosives are the two largest mission drivers in the stockpile stewardship budget.

[27] There are indications LANL's TA-21 site may have briefly resumed quantity pit production in the immediate aftermath of the disastrous 1969 Rocky Flats fire (Ken Silver, East Tennessee State University, personal communication).

LANL's current (i.e. pre-CMRR) pit manufacturing capacity is uncertain and open to interpretation. In many ways it is a matter of management choice because there is more potential pit production space available, albeit space currently used for other programs.

In February of 1996 the Department of Energy (DOE) said LANL's then-current pit production capacity, prior to any investment, was "10 to 20 pits per year."[28] Later that same year DOE stated that a pit-making capacity of "up to 50 per year" is "inherent with the facilities and equipment required to manufacture one component [pit] for any stockpile system."[29]

In 2005 the Secretary of Energy's Advisory Board (SEAB) Nuclear Weapons Complex Infrastructure Task Force said LANL's existing pit production capacity could be (and should) increased by a ratio of "1:20."[30] This 20-fold increase was not just a rhetorical flourish; it rather was predicated on production of an RRW or RRW-like pit designed especially for mass production involving simpler design, broader tolerances, robotic production technologies in some steps, and fewer toxic materials.[31] Their report makes it very clear these production experts believe PF-4 could produce pits at a much higher rate than the current 10 or so pits/year, with or without RRW.

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[28] DOE, Draft Stockpile Stewardship and Management (SSM) Programmatic Environmental Impact Statement (PEIS), original reference temporarily lost.

[29] DOE, Final SSM PEIS, Volume 1, p. 3-4, Table 3.1.1.2-1, note "a," September 1996.

[30] DOE Secretary of Energy Advisory Board Weapons Complex Infrastructure Task Force, "Recommendations for the Nuclear Weapons Complex of The Future," July 13, 2005, p. H-6. At http://www.seab.energy.gov/publications/NWCITFRept-7-11-05.pdf. It is worth quoting at length:

> ...the manufacturing operation at TA-55 is extremely inefficient when compared with any conventional manufacturing operation. There is little evidence of modern manufacturing techniques being employed....Modern manufacturing techniques...if applied rigorously could yield unprecedented reductions in TA-55 pit manufacturing costs and cycle time.
>
> The enormous investment made in the TA-55 facility has not yielded anywhere near the productivity levels this facility should be capable of attaining. The process is operated with little sense of urgency. It appears that each manufacturing step is "an event" attracting numerous witnesses and visitors. The process of actually building a pit seems to be a secondary mission of the facility, not the primary focus.
>
> At every phase of operation, there appears to be numerous opportunities to "lean-out" the operation....the vast majority of the time the plutonium material, raw or in the process of becoming a pit, is waiting to be inspected, to be tested, waiting for test results, etc. This is an incredible waste of time...Fundamentally, the pit facility produces one product, yet it appears that every pit produced is a "hand crafted individual object". This method of production yields process inefficiencies in every operation. Additionally, process automation at several steps of this process would be quite valuable. Currently available CNC machining centers, modified for the unique safety hazards, would yield a wealth of productivity gains.
>
> From a modern industry standpoint, world class productivity, quality, and safety can all be attained at the TA-55 facility by thorough and rigorous analysis and hard work on the production floor. The cursory analysis of the TA-55 facility yields a ratio of value-added to non-value added work of perhaps 1:20 or much worse. This indicates a tremendous opportunity for improvement. The available productive capacity of this plant is being wasted by inefficient utilization of plant equipment and personnel.
>
> In conclusion, the TA-55 facility is an expensive national asset, which has the opportunity to be a dramatically more effective and efficient facility if operated as a modern production facility, utilizing available automation and world class operations management techniques.

[31] Congressional source, anonymous.

Existing LANL pit production capacity is to a slight degree predicated on continuing use of the nine-wing Chemistry and Metallurgy Research (CMR) building in LANL's TA-3. Much of the CMR is nearing the end of its useful life, despite extensive upgrades in the 1990s and early years of this century. Pit production could continue at LANL without the CMR (or, in another option, without the full use of the CMR), as Mr. D'Agostino, NNSA Administrator, wrote in response to congressional questions in 2007.[32]

The author believes there are no pit production activities occurring in the CMR that could not readily occur in PF-4 or the CMRR RLUOB, *provided* – and this is the catch – there were no successfully-competing missions, including certification of new pits.[33] With new-weapon certification, however, there would be no reason to produce new pits in the first place.[34]

What LANL's pit production capacity would be if CMRR *were* built is even less clear, as the many uncertainties involved – including uncertainties in the size of the CMRR and the number of facilities ultimately available at TA-55 – are compounded. In addition, as the senior cognizant DOE official explained to the author in 2002, the production rate achievable in a given number of square feet of plutonium space is a sensitive function of the production technology used – as well as the complexity of the pits, as seen in the SEAB report above. Thus any capacity cited today is not necessarily the same as the capacity that might be available ten years now, provided plutonium pit production technology development continues.[35]

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[32] Chairman Visclosky: "NNSA currently relies on the existing, 50-year-old...(CMR) facility at LANL to perform analytical chemistry and material characterization activities for the Pit Manufacturing Campaign. The CMRR would replace this facility. However, the "basis for interim operations" for the CMR facility expires in 2010...If NNSA decides to produce 30-50 RRW pits at the TA-55 facility at LANL starting in the 2012-2014 timeframe [i.e. long before the CMRR is completed], how will the CMR facility accommodate those activities?"

Mr. D'Agostino: "...The options include moving all nuclear Chemistry and Metallurgy Research Facility (CMR) operations into the Plutonium Facility at LANL with attendant displacement of other efforts in the Plutonium Facility; extending the Basis for Interim Operations with the existing operations; and shrinking the operating footprint of CMR and continuing to decrease the inventory of materials in CMR to decrease its risks to support extending the Basis for Interim Operations of CMR beyond 2010." House Energy and Water Development Appropriations Subcommittee, Hearing of March 29, 2007, supplemental questions for the record, p. 584 in Part 8, "Energy and Water Development Appropriations for 2008," printed version.

The use of the CMR solely as a radiological laboratory, rather than a nuclear facility, has to the author's knowledge not been investigated. Neither has there been to my knowledge any comprehensive study of current and planned mission requirements for LANL's nuclear facilities or for LANL's radiological facilities.

[33] In 1997 LANL wrote:

"Pit Rebuild (1996-2004): ...Los Alamos will produce a few War Reserve (WR) pits per year during this period. Present [1997] floorspace allocations for the pit rebuild program, which includes general pit fabrication, disassembly, assembly, and radiography are 11,400 sq. ft.

"Pit Fabrication (2005 and Beyond): Los Alamos will produce approximately fifty War Reserve (WR) pits per year during this period, while establishing the capacity to produce eighty pits per year with multiple shifts. Future floorspace allocations for pit fabrication programs are 18,500 sq. ft., of which 3,200 sq. ft. will be located at the CMR Building [a floor allocation which, if added to current PF-4 usage, would more or less remain within one of four wings in PF-4]. The space at the CMR building will be used primarily to test new technologies outside of the production lines [note plural] and to prepare components for testing." Drew Kornreich and Nelson DeMuth, LANL, "Alternatives for Increasing the Nuclear Materials Processing Space at Los Alamos for Future Missions," LA-UR-97-1000, April 25, 1997, p. 10. Note that under current plans, radiography would be moved to a separate facility at TA-55, liberating PF-4 floor space.

[34] The author has a paper in draft which includes further discussion of this issue.

[35] For more discussion along these lines see DOE FY2009 CBR, p. 110, under "Pit Manufacturing Capability."

Production capacity is also a function of the *flexibility* required, e.g. whether it is required to produce two or more kinds of pits simultaneously or to be preparing to do so.

The *lowest* capacity in all these scenarios is governed by what might be called the "fiasco factor." Accidents and malicious acts, previously-undiscovered infrastructure or management inadequacies, enforcement actions, preventive stand-downs – all these are real possibilities and some produce a production capacity of zero, possibly for a long, or even indefinite, period.

The highest production capacity at LANL achievable under the most aggressive – and lucky – scenario could be significantly greater than 200 pits/year.

5. <u>The House of Representatives has zeroed funding for the CMRR three times and cut its funding twice; the Senate has funded it each year. The project continues, though progress on the Nuclear Facility has been slowed to an unknown degree.</u>

The CMRR project burst into view in 2003 as a "project engineering and development" (PED) construction line item. It became a stand-alone construction project for budget and appropriations purposes the following year. Since then the Senate, led by Mr. Domenici in this case, has reliably concurred in NNSA's proposed CMRR funding. The CMRR has been consistently and strongly questioned by the House, however, with increasingly harsh words.

In its markup of NNSA's FY2004 budget request, the House Appropriations Committee had this to say about the proposed CMRR project, then new as a stand-alone project:

> The Committee recommends no funding for [the CMRR project] in fiscal year 2004. Due to the complexity of this project, the Committee directs the completion of the project management decision process for the CMR-R in fiscal year 2004...The Committee notes the Department has not completed the project engineering steps concerning the CMR-R, including reaching critical decision one (CD-1) to commence the acquisition strategy or any baseline cost validation. The current cost estimate is based on pre-conceptual planning...the Committee must question the actual commitment of the Department to its own process by allowing this project to go forward in the fiscal year 2004 budget request.

House appropriators were critical again regarding FY2005 appropriations, but they opened the door just a little:

> The Committee recommends $10,000,000 for the CMRR project, a decrease of $14,000,000 from the budget request....The NNSA concludes in its budget justification that additional analysis is required to validate cost estimates that are coming in at the high end of the pre-conceptual baseline range. Due to the complexity of the project and the uncertainty of the current estimates, the Committee directs the NNSA to complete its pre-conceptual baseline cost estimating and include in the fiscal year 2006 budget request the revised schedule and cost estimates.

By the following year (2005, in deliberations for FY2006 appropriations) the CMRR began to be overtaken by NNSA's competing ambitious priorities. House appropriators:

> The Committee recommends no funding for the CMRR project, a decrease of $55 million from the budget request. Construction at the CMRR facility should be delayed until the Department determines the long-tem plan for developing the responsive infrastructure required to maintain the nation's existing nuclear stockpile and support replacement production anticipated for the RRW initiative...the production capabilities proposed in the CMRR will be best located at whatever future production complex configuration the Department determines necessary to support the long-term stockpile program.

By the time discussion of FY2007 appropriations came around, the House was clearly losing patience.

> The Committee provides $12,400,000 for the CMRR project, a decrease of $100,000,000 million [89%] from the budget request. Construction at the CMRR facility should be terminated and the Department should revise its long-term plan for developing the responsive infrastructure required to maintain the nation's existing nuclear stockpile and support replacement production for the reliable replacement warheads (RRW). Production capabilities proposed in the CMRR should be located at the future production site that supports the RRW and long-term stockpile requirements.

But still the project continued. Congress never completed an appropriations bill for Energy and Water Development for FY2007. The CMRR was continued that year by extending the FY2006 funding level.

In its markup of the proposed FY2008 appropriation, the House said this:

> Proceeding with the CMRR project as currently designed will strongly prejudice any nuclear complex transformation plan. The CMRR facility has no coherent mission to justify it unless the decision is made to begin an aggressive new nuclear warhead design and pit production mission at Los Alamos National Laboratory. The NNSA is directed to develop a long-term plan to maintain the nation's nuclear stockpile requirements that does not assume an a priori case for the current program. Production capabilities proposed in the CMRR should be located at the future production sites identified in a detailed complex transformation plan that supports the long-term stockpile requirements. The Committee is concerned the NNSA is proceeding with large expenditures for this project while there are significant unresolved issues, and recommends the fiscal year 2007 funding be held in reserve. Although the NNSA claims the Nuclear Facility Phase 3 of the project is under review, the Committee notes the Laboratory excavated 90,000 cubic yards of soil at the construction site where the CMRR Phase 3 Nuclear Facility is proposed to be built. The Committee also notes the Department's CMRR acquisition strategy combines Critical Decision 2

(approval of performance baseline) and Critical Decision 3 (approval to start construction) under DOE Order 413.3A on project management. The Committee does not support construction projects that fail to strictly adhere to DOE Order 413.3 requirements by abbreviating the process.

Again Senate appropriators fully funded the project, though the full Senate failed to act. When the dust finally settled on the omnibus appropriations bill passed in mid-December 2007, the CMRR was funded at $75 million for FY2008, about 86% of the president's request. Neither the bill nor the report as passed contain specific guidance as to which parts of the CMRR project are to receive the abridged funding; NNSA project management is privileging RLUOB construction.[36]

6. What if any "dire" consequences would occur if the CMRR Nuclear Facility were not built?

The short answer, as well as the complete answer, is none, even if the objective were to maintain considerable innovative freedom in a future stockpile – which if exercised would be highly counterproductive.

Halting the CMRR would not threaten in any way the reliability of the 9,800-weapon U.S. nuclear stockpile, either now or ever.[37] Halting the CMRR would not threaten, even remotely, any existing U.S. nuclear capability, and so halting the CMRR would not be in any way an actual disarmament step.

It *could*, however, reflect an *aspiration* toward disarmament, depending on other policies adopted. In that case it would express the spirit of the Shultz, Perry, Kissinger and Nunn editorials with which this article began.

Halting the CMRR would not entirely remove the possibility of stockpile innovation by "small builds" of special nuclear weapons, whether pursued openly or clandestinely, whether involving plutonium or not.[38]

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[36] Steve Fong, NNSA, personal communication, 1/18/07.

[37] The author does not see any value in retaining such a stockpile. We must never lose sight of the fact that "reliability" in this case means "reliable" for the purpose of mass killing and the intimidation which flows from that potentiality. The very heinousness of such an act and the posture which promises it undercut its supposed "deterrence" value, leading to an unending quest for nuclear relevance. These considerations are far beyond the narrow scope of this paper but they cannot be totally forgotten either. They usually return in a crude, quantitative version, as in "How many nuclear weapons are necessary?" It is highly germane here to notice that all parties agree that the right answer to this question is: much fewer. The process of dismantlement produces pits, as observed in the text, increases pit redundancy, and decreases the *apparent* need for the CMRR and for pit production. The *actual* need for pit production, as noted above and in reference to the existing stockpile, is already zero.

[38] See for example, Anon., "Stockpile Stewardship Conference Planning Meeting Minutes," January 10, 2003, at http://www.lasg.org/technical/stewardship-conference.htm, and LANL, "The US Nuclear Stockpile: Looking Ahead: Drivers of, and Limits to, Change in a Test-Constrained Nuclear Stockpile," March 1999 congressional briefing (SRD, redacted), slides 56-60, at http://www.lasg.org/NuclearStockpileMar99.pdf (17.3MB).

Halting the CMRR would not diminish prospects for uranium-based weapons, for example gun-assembled, highly shock-resistant weapons of the type demonstrated in the 1962 "Aardvark" nuclear test.[39]

Halting the CMRR would not harm prospects for pit re-use, which provide an avenue for manufacture not only for thousands of warheads of some if not all existing types but of certain novel kinds as well. There is, for example, a certifiable pit re-use option for replacing Trident warheads, should that be desired, which was developed at LLNL in the late 1990s.[40] Other pit reuse options have also been developed and in some cases tested.[41]

Halting the CMRR would not prevent upgrading non-nuclear warhead components to achieve new military capabilities, as is unfortunately beginning, or is poised to begin, in the W76-1 Life Extension Project.

Halting the CMRR would not prevent existing nuclear explosives from being adapted to new delivery vehicles and systems within some constraints of size, weight, and balance.

Halting the CMRR would not threaten the scientific viability of the nuclear weapons program in any way.

Halting the CMRR *would*, however, prevent the relatively rapid production of significant quantities of new plutonium-based nuclear explosives. It would halt an RRW-type program, and it would halt the evolution of the stockpile *in this particular dimension only*.

7. For all these reasons, the CMRR is a project without a supportable mission.

This narrow paper has not attempted to describe in detail the many advantages of pursuing a strategy of "warm standby" for pit production. Neither has it placed the CMRR project within the larger context of weapons complex transformation, or attempted to quantify the significant economies in other NNSA programs that could be realized if the option of designing, certifying, and producing new-design nuclear primaries were abandoned, or the still more significant economies available if new-design nuclear explosives were abjured altogether. Also unexamined are the significant opportunity costs of these expenses within the ambit of the congressional Energy and Water Development budget. These discussions must wait for another day.

If the U.S. is not prepared to take this kind of "baby step" toward fulfilling its NPT treaty obligations, it is difficult for this author to see how the U.S. could ever play a constructive role in the international cooperation required to prevent nuclear proliferation.

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[39] David Ruppe, "U.S. Nuclear Weapons Programs Could Require Testing, Official Says," Global Security Newswire, http://thenti.com/d_newswire/issues/2003/9/3/3p.html.

[40] Greg Mello, "That Old Designing Fever," The Bulletin of Atomic Scientists, January/February 2000, http://www.lasg.org/DesigningFever.pdf?art_ofn=jf00mello.

[41] See for example James Tyler, Lawrence Livermore National Laboratory, "Innovative Warhead Design: Pit Reuse," presentation to the Galvin Panel, ND. Los Alamos Study Group files.