The Future of Y12

An analysis of capacity and facility needs at the Y12 Nuclear Weapons Complex in Oak Ridge, TN in light of declining production needs and increasing demand for dismantlement.

In a satellite-video appearance at the 2001 Nuclear Decision-Makers Forum in Albuquerque, New Mexico, then-Senator Pete Domenici declared from the giant screen that facilities at the Y12 Nuclear Weapons Complex in Oak Ridge, Tennessee were in bad shape. Workers, Domenici said, had to wear hard hats in one building because chunks of concrete were falling from the ceiling. Later in the meeting, the President of BWXT-Y12, operating contractor for the Oak Ridge weapons plant, said Y12 was operating in "run-to-failure" mode.

Upgrading the Y12 facilities has been on the wish-list for the Department of Energy and the National Nuclear Security Administration for nearly two decades. Many of the uranium operations buildings at Y12 were constructed of hollow-clay tiles during the Manhattan Project days of the early 1940s. DOE's own Safety Survey in 1993 said critical facilities would not be expected to survive a design-basis earthquake or a tornado. The current modernization scenario at Y12 envisions consolidation of operations currently conducted in at least six separate buildings into one facility, reducing the security footprint.

Throughout the last two decades, a series of arguments have been put forward in support of a new Uranium facility at Y12. Some of these are:

- worker safety
- enhanced material accountability
- improved capability to withstand natural phenomena
- reduced security footprint/increased security
- efficiency of operations
- increased capacity for handling and storage of uranium
- reduced infrastructure and maintenance costs

- local economic benefit of $3.5 billion dollar construction project
- increased confidence in weapons production capacity
- increased capacity for dismantlement operations
- the prohibitive cost of upgrades to existing facilities

Many of these arguments are now being made in favor of the most recent modernization proposal, the Uranium Processing Facility (UPF). It is clear that a new facility would provide many of the benefits proponents advertise, but this does not automatically mean the UPF should be built. Other factors should be considered as well, such as:

- the impact of new bomb plant construction on nonproliferation efforts
- the actual need for secondary life extension upgrades into the distant future
- scheduled reductions in the US nuclear arsenal
- promises of further reductions in the US arsenal
- the risk of continuation of nuclear weapons production
- the outlay of $3.5 billion in a time of deep deficit spending
- cost comparison between consolidation in place with upgrades to old, down-sized facilities and new construction in light of financial realities and reduced capacity demands.
- job reductions due to innovations in robotics and automated manufacturing processes

FINDING: The arguments for the UPF have, almost without exception, been used for more than twenty years to justify weapons facilities in Oak Ridge. Changes in US policy, concern over nuclear proliferation, and global realities have created an environment in which the power of arguments for a new weapons production facility has eroded significantly.

The Work at Y12

The Y12 Nuclear Weapons Complex in Oak Ridge was built during the Manhattan Project to enrich uranium in the quest to build an atomic bomb. It was successful; the calutrons at Y12 produced the highly enriched uranium that fueled *Little Boy*, the bomb that destroyed Hiroshima, Japan. After the war, the United States turned to gaseous diffusion as its preferred enrichment technology, and Y12 carved out a new niche—it became the sole manufacturer of "secondaries," also known as "canned subassemblies (CSAs). The secondary is aptly named. The "physics package" in a nuclear warhead or bomb has two parts. The primary, a plutonium sphere with a tritium vial inserted, is a small atomic bomb that acts to trigger the secondary which produces a thermonuclear fusion explosion. The thermonuclear secondary consists of highly enriched uranium, lithium deuteride, depleted uranium, and other classified materials. Y12 has produced the thermonuclear secondary for every nuclear weapon in the US arsenal, more than 70,000 since 1949.

The dominant mission of Y12 today is the production of new and/or refurbished thermonuclear secondaries for existing US nuclear warheads as part of the Stockpile Life Extension Program. In 2009, Y12 is producing secondaries for the W76 warhead; NNSA says the life extension upgrades to the W76 will result in the W-76 Modification 1, a warhead with new military capabilities. Critics note this is essentially new weapons production "backdoored" through the life extension program. According to the 2008 Ten Year Site Plan, the demise of the Reliable Replacement Warhead program renders the W78 Life Extension Program more likely, but Congressional action does not support that assertion. Congress has dedicated money to studying modification of the B61 (producing Modification 12), but

an active Superfund site

One byproduct of weapons production activities in Oak Ridge has been pollution. Y12 put environmental concerns on the map in 1983 when it was disclosed that more than 2,000,000 pounds of toxic mercury had been "lost to the environment." The actual amount of mercury dispersed in the air and spilled into surface and groundwater has not been definitively determined, but it is known to be well in excess of the initial two million pound estimate. In addition, other contaminants (uranium, chromium, PCBs, nitrates) have been poured or spilled into ground and surface waters. East Fork Poplar Creek, which drains the east end of Bear Creek Valley, where Y12 is located, is posted to prevent contact with water. In November 1989, Y12, along with the rest of DOE's nuclear reservation in Oak Ridge, was added to the EPA's National Priorities List, making it the first DOE Superfund site among the major weapons production facilities. Unlike most Superfund sites, though, which are closed in order to enable rapid and thorough remediation, Y12 continues to operate. The continued operation of Y12 constrains cleanup operations and sets up a competition for funding between production and cleanup. Today, twenty years after Y12s listing on the NPL, the water draining the weapons plant is supplemented by the addition of millions of gallons of water from the Clinch River every day in order to dilute contamination released from legacy operations. Even with the addition of river water, in periods of heavy rainfall, Y12 releases mercury into East Fork Poplar Creek in excess of EPA and state standards for chronic exposure to biota.

has limited the study to non-nuclear upgrades to the B61.

Y12 has other missions: production of joint test assemblies for Lawrence Livermore and Los Alamos National Labs (JTAs are blanks—non nuclear warhead packages for testing and analysis), dismantlement of retired warhead secondaries, storage of enriched uranium in safeguarded facilities, preparing excess highly enriched uranium for downblending, supplying special nuclear materials for the nuclear navy, promoting nonproliferation internationally, and a catch-all "work for others" category that refers mostly to work for other federal agencies, including non-nuclear projects for the Department of Defense. The work is carried out by B&W Y12, operating contractor for the weapons plant. Wackenhut provides security for Y12. In addition, Bechtel Jacobs manages the contract for cleanup of a myriad of contaminated sites at Y12.

Money is the main driver for missions at Y12. "There is no driver for dismantlement work at this time," said William Brumley when he was site manager at Y12. When asked what that meant, Brumley extended his hand and rubbed his thumb in a circular motion across the tips of his index and middle fingers. In recent years, the money that drove the mission at Y12 has been dedicated to the Life Extension Program and the construction of a new uranium storage facility, due to come on-line in 2011.

FINDING: The mission of Y12 has always been to serve the national interest as determined by nuclear policy and decision-makers from outside the community. Work at Y12 has been prioritized by the availability of funds appropriated by Congress. As a result, production activities compete for resources with dismantlement, disassembly, disposition, technology development, environmental restoration and other programs.

Defense Programs Facilities at Y12

The Y12 Nuclear Weapons complex occupies 811 acres in Bear Creek Valley; 630 aces are fenced. In 2001, DOE/NNSA reported more than 7 million square feet in 390 buildings were in use at Y12, with Defense Programs—weapons production/dismantlement/storage—claiming 5.3 million square feet. (TYP07, p.3) The work takes place in several clusters of buildings identified by the number of the main building. Just under half of the floor space currently used by Y12 NNSA predates 1950. (TYP07, p.8).

The Building 9212 Complex includes buildings 9212, 9818, 9815, 9980, and 9981. Building 9212 (100,000 sq ft) was built in the 1940s. DOE says "Over 100 operations or processes have been or are capable of being performed within the Building 9212 Complex." (2001 Y12 SWEIS, Vol 1, p.4-65) These processes include casting of HEU metal for weapons, quality evaluations of metal, recovery and processing of HEU for storage, reuse or future disposition (downblending), packaging of HEU for off-site shipment, support for International Atomic Energy Agency sampling of surplus HEU, preparation of special uranium compounds for research reactor fuel. The two major processing areas are the Chemical Recovery Operations and Metallurgical Operations.

The 9215 Complex includes Building 9215 (127,000 sq ft) and Building 9998 (24,000 sq ft); the two are physically attached at one corner; both were built in the 1940s and have been modified and expanded since. The 9215 Complex aids in dismantlement work, provides for storage and handling of HEU inventories, fabricates metal shapes as needed for stockpile maintenance, and supports other nuclear programs at US and foreign facilities. Both 9215 and 9998 appear on maps to be contiguous with 9212.

Next door to 9215, building 9204-2E (three stories, 68 ft high, 151,200 sq ft; reinforced concrete, clay tile, concrete block with brick veneer) was built in 1971 to house weapons assemblies. Current operations include: assembly of new or replacement weapons, quality certification of components and assemblies, disassembly of retired weapons assemblies, and storage of retired assemblies, subassemblies and components. The building has five vault-type rooms and one vault in addition to production operations. Building 9204-2 (270,000 sq ft) houses lithium operations. These buildings have dry room facilities [9402-2 has three dry rooms; 9204-2E has one large, 2,500 sq ft dry room with several workstations; the dry rooms have hoists for moving materials (SAR, p.65)] that operate in super-dry conditions; weapons components are fabricated and installed in canned subassemblies in these buildings (SAR 1984, p.11). The 1984 Final Safety Analysis Report lists Building 9204-4 as a disassembly facility; the 2009-2018 Ten Year Site Plan lists building 9204-4 as "not required to support Y12 mission requirements." Buildings 9204-2 and 9204-2E are equipped with lift equipment, including hoists that run on monorails over equipment and, in Bldg 9204-2E bridge cranes (5-ton and 9-ton) in assembly bays. The 1984 Final Safety Analysis Report for Y12 finds Bldg 9204-2E is at risk of collapse in seismic event or 75 mph winds.

To the west of the production and dismantlement operations buildings are two other mission critical buildings: Building 9720-12 is a warehouse that stores materials that have been removed from higher security buildings in the Material Access Area. Building 9720-5 is used for storage of weapons materials and assemblies. Built in the 1940s it has since been renovated.

Building 9995 is the Analytical Chemistry Lab, constructed in 1952 and located in the high security area. It provides services for weapons production and work-for-others programs. Built in 1952 it has been expanded twice and has had some modifications. Of 150 chemical fuming hoods, approximately 20 were replaced in the mid-1980s;

other units have been replaced at times, but most are original equipment.

Building 9201-5W is a depleted uranium machine shop and also houses offices. Building 9201-5N houses electroplating processes and depleted uranium machining. It houses a vertical turret lathe and is serviced by a 15-ton bridge crane. It is included in a list (SAR, 1984) as a weapons assembly facility. A cyanide treatment facility has operated in Building 9201-5N; in 2001 it was inactive.

FINDINGS: The buildings in which Y12 does its work were built as needed over a span of decades; maintenance has been constrained by funding. As a result many of the mission critical facilities are in various stages of disrepair. Currently, an aggressive program to reduce the footprint of Y12 through decommissioning and demolition of facilities no longer required is realizing cost savings.

Seismic and other structural integrity concerns about several buildings, especially 9204-2E should be addressed in any future scenario.

Adequacy of Current Facilities

The March 2007, Y12 Ten Year site plan says "significant investment is required to consolidate Y12's enriched uranium operations, maintain or upgrade site infrastructure, and meet the current design basis threat." (TYP07, p.1). The 10-Year Plan lists the following critical capabilities for Y12:

- modification, replacement or repair of secondaries (Ur and Lithium components)
- production of hardware for labs to support testing for certification (JTAs, expected to reduce in 2010 and level off; the NNSA decides the schedule for production of JTAs, TYP07, p. 31)
- surveillance of weapons through disassembly and inspection
- dismantlement, storage and disposition of weapons and materials returned from stockpile (disassembly, dismantlement of various bomb and warhead secondaries; 21 types according to TYP07, p. 31)
- packaging of materials/components for shipment
- management and secure storage of materials and strategic assets
- supply special nuclear materials for naval reactors
- processing of weapons materials—including chemical recovery, purification and conversion to a storage/disposition/reuse-suitable form
- support other Homeland Security programs (TYP07, p.2)

One year later, the 2008 Ten Year Plan said the following gaps exist for mission critical operations pending an estimated 2018 or later completion of the UPF:

> ensuring that mission critical facilities, infrastructure and equipment can bridge the gap to new, modernized facilities

> upgrade and modernization of utilities infrastructure system

The NNSA does not argue that a new Uranium Processing Facility is necessary to meet mission requirements—the work Y12 is expected to perform is currently being done and will continue to be done for ten years in current facilities. If, in fact, the 2007 TYP is correct in identifying that Y12 falls short of meeting the "design basis threat," this serious deficiency should be addressed immediately. If the security of weapons components and special nuclear materials is not currently compromised at Y12, the language of the 2007 TYP is deceptive and should not be used to justify new construction. Given the absolute necessity of protecting nuclear weapons components and special nuclear materials from design basis threats, it is likely the language of the 2007 TYP at the very least exaggerates any possible security shortfall.

FINDING: Critical mission requirements are not the driver behind UPF.

The 2007 Ten Year Plan (p.61) says other factors drive modernization considerations, including the need for seismic upgrades, enhanced security, and projected environmental, safety and health requirements which are not detailed.

Cost of Modernization: New Facility v. Consolidate/Upgrade-In-Place

The Y12 Ten Year Site Plan, March 2009-18, says seismic, ventilation and other upgrades estimated at $80 million to Building 9212 will be required to keep the building operating safely until the UPF is built. ($100 million in FIRP funding minus $20 million in deferred maintenance saved; TYP09, p.19) This number corresponds roughly to a 2007 table indexing current facilities (TYP07, p.61) which says total NNSA mission critical building

deferred maintenance cost is $121,528,000.

The Ten Year Plan provides no comprehensive overview of what the upgrades will cover, or how long the renovated 9212 complex could function safely, but at $80 million, it seems likely the renovations would be substantial and provide ES&H assurances beyond 2018.

Reduction of the footprint of operations enhances security and reduces security costs, relieves some deferred maintenance costs, and could increase regulatory pressure on Y12 to address legacy contamination issues. Under the best-case scenarios outlined in the Y12 Ten Year Plan, the Y12 mission requirements can be accomplished with 2.5-3 million sq ft. (TYP07, p.3)

The Y12 Building and Location map shows most weapons assembly and dismantlement operations occupy a small footprint within the PIDA high security area. With the retirement of 9204-4, the relocation of warehoused weapons materials and assemblies from Building 9720-12 could conceivably reduce the high security footprint by 1/3; relocating the outlying 9201-5N (assembly and DU machining), 9201-5W (DU machine shop) and 9720-5 (weapons storage) would result in a further reduction; the high security footprint could occupy one half its current space. Security cost savings under a consolidate-in-place scenario could approach NNSA's estimated security savings for a new UPF.

According to Y12's Ten Year Plan, accelerating dismantlement operations will further reduce the need for high security storage facilities for special nuclear materials (highly enriched uranium).

FINDING: A combined program to consolidate operations and upgrade current facilities sufficient to maintain manufacturing and production capacity for the foreseeable future could be accomplished at dramatic savings compared to construction of a new facility.

Infrastructure and ES&H driven upgrades to current facilities to "bridge the gap" to a new UPF will not "expire" in 2018 but could be expected to render facilities functional for at least another decade, during which the future of US nuclear force needs would become much clearer. With a pricetag of $3.5 billion, building a new UPF would cost 43 times as much as a consolidate/upgrade in place scenario.

The Need for Production Capability in the Long Term

The future need for production operations at Y12 is uncertain. In April, 2009 President Barack Obama announced a firm commitment to a world free of nuclear weapons; three months later President Obama announced an agreement to reduce the US strategic arsenal to a maximum of 1,695 warheads, pledging efforts to pursue further deep cuts in the renewal of the START Treaty which expires in December 2009.

In keeping with this commitment, the Obama Administration submitted a budget to Congress which include bare bones funding for design of the new UPF; Congress nearly doubled the funding in passing the 2010 budget.

There are many brushes trying to put paint on the picture of the future of nuclear weapons policy in the US. The Nuclear Posture Review, which will recommend force structure requirements to the President, is being prepared by the Pentagon, and early reports indicate it envisions a future with an enduring nuclear arsenal, possibly including new weapon design and production. But powerful voices, led by Henry Kissinger, George Shultz, Sam Nunn and William Perry, have called for the US to move in a new direction. They have been joined, says Shultz, by 3/4ths of all living Secretaries of State, Secretaries of Defense, and National Security Advisers. In an article in Yale Divinity School publication, *Reflections*, Shultz wrote: "We are at a tipping point. The simple continuation of present practice with regard to nuclear weapons is leading in the wrong direction. We need to change direction."

As a result, it is not completely clear what the mission of Y12 will be in ten or twenty years. But we do know some things:

- We know that dismantlement and disassembly operations will be required to meet arms control agreements
- We know that safe and secure storage of weapons assemblies and special nuclear material will be a priority
- We know that some surveillance of current warheads will be required to meet safety and security requirements
- We know that NNSA has determined that Highly Enriched Uranium operations will be carried out at Y12 and not at another site
- We know there are no current plans or funding for new weapon designs
- We know Life Extension regimes beyond the W76 are uncertain
- We know that the US nuclear stockpile will be further reduced from its present status

In the uncertain but expected category:

- We can expect that the stockpile ceiling of 1,695 warheads announced by President Obama in June, 2009, will continue to be lowered as arms negotiations move forward—Obama himself called the June announcement a "first step" toward deeper cuts and

pushed for multilateral arms control efforts in the UN Security Council resolution presented by the US and passed by the Council in September 2009.

• We can expect pressures for further deep reductions will be growing, not only from the international community, but also from influential US advisers whose analysis persuades them an enduring nuclear arsenal undermines US security and nonproliferation goals.

The picture of US nuclear policy that begins to emerge is not clear, but it offers guidance as one considers what is reasonable to project for the future at Y12. It also raises significant questions for Y12. We know that dismantlement, disassembly, storage and disposition facilities will be increasingly important. And we expect production operations will be of declining importance.

FINDING: Any statement of "need" for new production facilities should be predicated on the expectation that demand for production capacity will decline to near zero over the next forty years, while demand for dismantlement/disposition capacity will increase.

Production v. Dismantlement

In the context of US nonproliferation goals, considering protocols for safeguarding of weapons components and materials and verification of agreements, an important question arises: should production and dismantlement operations coexist in a dual use facility?

The description of current operations at Y12 indicates no requirement for co-habitation between the programs. "Machining operations for dismantlement operations differ considerably from product fabrication requirements. Technology such as lasers or chipless cutter techniques may be applied to the relatively low accuracy and high throughput needs of dismantlement." (TYP07, p.42.) Recent news reports indicate that other processes—the use of infrared to melt adhesives—are unique to dismantlement/disassembly and have no application in production activities. The 1984 SAR indicates production and disassembly operations take place in separate facilities and use dedicated equipment: "Specially designed equipment and carefully controlled procedures are used." (SAR, p.230)

Production operations include metal processing, fabrication, and assembly operations. Some of these are unique to nuclear weapons manufacturing, but others are not. Many current (c. 2007) processes mimic those used in commercial applications for common metals and alloys. Enriched uranium is more specialized and low-volume. (TYP07, p.42)

Y12's wish list for the new UPF includes new technologies for higher processing yields and better control of chemistry: microwave processing, radiant heating, flexible pressing, and purification that minimizes chemical processing. (TYP07, p.42) Another wish is for the Agile Machine Tool to combine lathes and mills on one platform. (TYP07, p.21) There is no indication that new technologies are necessary as Y12 pursues its current Life Extension mission, nor is it clear that new technologies are a reasonable investment if the future portends further deep cuts in the US arsenal.

Modernization—the UPF— would streamline production operations, shifting from small-lot, batch mode operations (TYP07, p.42) to enclosed, automated operations. NNSA says the shift would provide environmental, safety and health benefits—the benefits are not enumerated, nor is it clear how necessary they are; no cost-benefit analysis is provided to document the claim. According to NNSA, the shift to automated operations would nearly halve the Y12 workforce.

Production/assembly operations take place in several buildings which are designed to accommodate the distinctive requirements of the mission. Dry rooms in Bldgs 9204-2 and 9204-2E have large viewing windows that allow for monitoring of the work taking place inside. Descriptions of the workflow indicate that a worker in a sealed suit (to control moisture) assembles weapons assembly parts, welding large aluminum, steel, magnesium and depleted uranium parts (and one deleted material, SAR p.123) with remote-operated electron-beam welders, and bonding others with adhesive materials (SAR, p.111); a second worker, outside the dry room, tracks and records the activities inside. In Bldg 9204-2E, a metallic inert gas welder (used to weld Beryllium parts? SAR p.66) operated through glove ports is also available; this building also apparently houses a CO_2 laser welder to weld thin stainless steel parts under an argon/helium cover gas. Activities in the dry rooms include assembly of CSAs and "disassembly for rework." (SAR, p. 89) Rework apparently refers to subassemblies which fail the leak test performed after assembly is completed. (SAR, p.94)

Bldg 9204-2E houses a heated pneumatic press, the hazardous materials weld finishing booth, and other process that are classified.

Certification (nondestructive testing) includes measuring contours, optical comparison, ultrasonic tests, dimensional inspection, etc (SAR, p. 111). It takes place in a 3,400 sq ft area on the second floor of Bldg 9204-2E.

The 2007 Ten Year Site Plan expects many of the current production processes will be improved or eliminated by new technology developments. If this is the case, prudence would suggest upgrading current operations in place where required to fill the gap and

investing in new technology development (currently 2% of Y12's budget) rather than building a new facility and stocking it with equipment that may well be obsolete before it is put into service. (TYP07, p.12)

As surely as production requirements are declining, the demand for dismantlement, disassembly, storage and staging for disposition will increase.

Dismantlement primarily takes place in dedicated facilities. Subassemblies are moved from Building 9720-5 and slated for reclamation or disposal. Subassemblies slated for reclamation are disassembled, their parts assayed, and then dispatched for recycling or salvage. Subassemblies slated for disposal travel through the quality evaluation lab. The outer casing is removed in a dry room and the unit is leak-tested. A valve is installed to take a gas sample for measurement, and the unit is disassembled in an inert glove box.

The Quality Evaluation Lab is a dual use facility used to service retired weapons and production line weapons (SAR p. 155). It is a 15,000 sq ft, large, open room and contains two 10-ton overhead crane bridges, each with two 2-ton hoists which can be used over entire area. Facilities and equipment include: Moisture Outgas Monitoring facility measures hydrogen balance of weapons units (SAR, p.156); Inert Atmosphere Glove Box: used for disassembly under controlled conditions (SAR, p. 156); Vertical Turret Lathe – vertical boring and milling of DU and nonU metal, also used for the first disassembly cut on outside case of weapons assemblies, cooled with 50% freon, 50% oil; Enriched Uranium Lathe for disassembly cuts on EU parts (freon coolant in enclosed hood); No enriched lathe, 60 inch center lathe, to make disassembly cuts on DU and other materials. (nonrecirculating freon, as of 1984) used as coolant. (SAR, p. 162) ; Disassembly booth: 8 sq ft. floor covered with paper to collect corrosion particles that fall to the floor during disassembly, booth uses a 500 lb hoist. (SAR, p. 164). Disassembly also takes place on "Surface Plates" with hand tools. A hydraulic press is used to deform classified weapons shapes (SAR p. 184).

While current information is limited, with the exception of some quality evaluation lab processes which are used retired and production line weapons (SAR, p.155), production operations and the facilities which accommodate them do not appear to overlap significantly with requirements for dismantlement operations.

Finally, the operating contractor of Y12, B&W Y12, sets out a vision of "multipurpose facilities" which will support an ever-changing future with respect to nuclear weapons and the need to seek growth in complementary work and support any new missions." (TYP07, p.15) At the same time, the NNSA proposes a $3 billion investment in the UPF as a dedicated, single-purpose, high security/limited access facility.

FINDING: Except for Building 9204-2E (a relatively small assembly and disassembly facility), production and dismantlement operations operate independent of each other, in separate facilities. Quality evaluation equipment and lab facilities used for surveillance activities are an area where production and disassembly operations overlap. (SAR, p.155)

The Future of the Life Extension Program

The United States is not manufacturing new, from-the-ground-up nuclear weapons. The mission of Y12 today is to support the current stockpile by performing Life Extension Upgrades on existing warheads. The Stockpile Life Extension Program refurbishes old warheads to extend their reliable shelf-life for decades. Estimates of the reliable life of a refurbished warhead range from 40 years (the official DOE number) to 120 years (the number cited by Y12 Site Manager Robert Dempsey in 1998).

What manufacturing capabilities does the US needs to maintain a safe and reliable stockpile pending further deep cuts in the nuclear arsenal?

The current active US strategic nuclear stockpile is not terribly old by nuclear weapons standards where weapons were designed with an expected shelf-life* of 40 years. The oldest active weapons in the US stockpile (excluding those scheduled for deactivation by the Moscow SORT Treaty) are 100 W80 cruise missile warheads produced in 1981, followed by 320 B83 bombs built in 1983—26 years old as of 2009.

Four hundred W88/Mark 5 Trident missiles were manufactured beginning in 1988; they are reaching the halfway point of their reliable shelf-life. Two hundred six B61/Modification 10 strategic bombs were produced starting in 1990, but they are not in the active stockpile. More recently, 20 B61/Modification 11 bombs were produced in 1997.

Since then, the Stockpile Life Extension program has been refurbishing aging warheads to give them a new lease on death. More than 300 W87 warheads were refurbished (completed in 20--), and more than 2000 W76 warheads are scheduled for LEPs; the first was completed in 2008. A study of LEP/Modification of the B61 has been funded by Congress (the result would be the B61-Mod 12).

The bottom line is this: the United States has more than 1,000 warheads/bombs that are of relatively recent origin and, over the next ten years, could triple that number if currently scheduled LEPs are completed. The weapons include cruise missiles, Trident missiles, and bombs, providing the US with a triad of defensive options.

What does this mean for manufacturing capabilities at Y12?

Given the current US arsenal, according to NNSA estimates, $100-120 million of upgrades will keep Y12 operational until 2018, at which time the US will have "Life Extended" warheads in excess of the numbers President Obama declared in June as the "first step" in arms reductions.

[*There is no specific reliability boundary; there is no physical reason weapons would be reliable one day and suddenly unreliable the next—reliable shelf-life is an estimate; the warheads would likely remain fully operational for a much longer time. To date, the NNSA has made no documentation of warhead degradation over time publicly available; previous NNSA claims of plutonium pit deterioration due to aging were shown to be false in an independent study by the JASON.]

FINDING: As LEP work at Y12 increases the number of refurbished, Life Extended warheads in the US arsenal, arms control agreements are decreasing the size of the US nuclear stockpile. At some point in the near future, those two numbers will meet. The "need" for Y12's production operations will vanish, at least for several decades.

At the same time, arms reduction agreements will increase the need for dismantlement, disassembly, storage and disposition capacity at Y12.

Proposals for new facilities for Y12 should reflect this shift in mission emphasis and priorities in the future.

The Nature and Purpose of New Facilities at Y12

Future weapons activities in the United States are likely to be subject to international verification and safeguard protocols as a consequence of arms control agreements and Nonproliferation Treaty compliance. The United States is pushing for such protocols to be enforced against other nations, and it is clear such a policy is only tenable if the US submits its operations to the same inspection regimes.

The Ten Year Plan suggests Y12 foresees a transparent future: The Transparency Technology Demonstration Complex in Bldg 9203 is a user facility to demonstrate technologies for inspection/verification in support of arms control agreements.

Forward-looking planning for the Y12 of the future must ask: What are the requirements, physical or otherwise, for IAEA certification of treaty compliance? What challenges does a production/dual use facility present that would be avoided if separate facilities were designed for dismantlement and production activities? What are the cost comparisons of the possible permutations—upgrading aging production facilities (assuming a limited-life requirement for the facilities) and constructing a new dedicated facility for dismantlement operations? What design features of any new facilities or upgrades to old facilities will accommodate inspection and verification requirements?

And a question which will grow more important over the next several years must also be asked: What level of dual-use facilities would the US find acceptable in North Korea or other nations?

FINDING: As long as Y12 is responsible for weapons components and special nuclear material, safeguards are of paramount importance. In the nuclear weapons complex of the future, international inspections and verification will be of growing importance; incorporating such needs into the design of any new facilities is prudent and, in the long run, will prove to be cost-effective.

Future Economic Impact of Y12 in Oak Ridge/East Tennessee

The economic impact of operations at Y12 is primarily measured in the number of workers employed. Job projections over the next 15 years look different to different sectors of the workforce, but in the end they are similarly bleak.

Building a new UPF or a new dismantlement facility would not result in a surge of construction jobs but would maintain the construction workforce (about 1,000 jobs) currently building the HEU storage facility at Y12. NNSA has not provided an estimate of how many jobs would be created during an upgrade-in-place scenario if the UPF were not built, so there is insufficient information to compare workforce requirements.

Under modernized/UPF scenario, the Defense Programs workforce would be reduced to 2,000-2,500 from 4,500(TYP07, p.3) If the UPF were not built, it could be expected that an upgrade-in-place scenario would include some modernization of equipment technology resulting in the loss of some jobs. In either scenario, a significantly reduced footprint would reduce security requirements—the UPF scenario would more dramatically reduce the guard force at Y12.

FINDING: The future of Y12 shows a sharp decline in jobs for weapons production activities. Depending on the amount of automation incorporated into new or upgraded facilities, an increase in dismantlement operations should result in a steady or slightly diminished workforce requirement.

Security at Y12

Pending construction of new facilities, or major renovation of current facilities, "much of the workload during the next 5-10 years will be accomplished in many of Y12's existing Mission Critical facilities. Accordingly investments will be based on the risk in meeting mission commitments and on ES&H and security requirements, balanced with the need to implement Complex 2030 facility and infrastructure improvements." (TYP07, p. 3)

Increasing security assurances is a benefit of modernization, according to NNSA. The UPF would be a "designed denial facility" (TYP07, xii.) The NNSA does not discuss security operations, so it is not clear in what ways (if at all) a "designed denial facility" would offer qualitative improvements in material, facility or worker security. It is also not clear whether similar "design denial" objectives could be achieved (and at what cost) in a reduced-footprint, consolidated, upgrade-in-place scenario. For obvious reasons, Y12 admits no security vulnerabilities as it is currently configured and operating.

FINDING: While it is difficult to assess security needs and requirements because of information classification, the reduction of an overall security footprint should result in higher security whether achieved through a new facility or a consolidation/ upgrade-in-place scenario.

Sources

TYP07 refers to the Y12 Ten Year Plan issued in March 2007
TYP09 refers to the Y12 Ten Year Plan issued in March 2008
SAR refers to the 1984 Safety Analysis Report
DOE 1993 Safety Survey
Y12 Site Wide Environmental Impact Statement, prepared in 2001.
Draft Y12 Site Wide Environmental Impact Statement, 2009

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