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U.S. Nuclear Weapons Complex: Y-12 and Oak Ridge National Laboratory at High Risk

The Project on Government Oversight

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EXECUTIVE SUMMARY

Investigators from the Project On Government Oversight conducted a site visit of the Oak Ridge National Laboratory (ORNL) in the fall of 2005.[1] POGO investigators drove to the World War II-era building at ORNL – Building 3019 – which holds 1,000 cans of uranium-233, easily parked in front of the building which is "protected" by a single chain link fence, walked around for about 15 minutes, and were leaving before guards finally approached them and escorted them from the area.

If the investigators had intended to do harm, they could have quickly detonated a device to blow up the building. In fact, it would have taken very little time or effort to detonate an improvised nuclear device (IND). Unfortunately, creating an IND is extraordinarily simple and could cause a detonation yielding as much as 10 kilotons, approximately the size of the Hiroshima explosion.

ORNL is the most poorly protected site in the U.S. nuclear weapons complex. In fact, when POGO's investigators visited the site, there were no setback barriers to protect against truck bombs despite the number of trucks going in and out of the facility because of major construction projects; there appeared to be no fence behind the building along the truck ramp, although a truck with a bomb could park within ten feet of the building; and the building itself appears to have been constructed with corrugated steel over reinforced concrete, which attackers could easily breach.

ORNL is located near the Y-12 National Security Complex, which houses the majority of the nation's highly enriched uranium (HEU). Y-12 stores between 400 to 500 metric tons of HEU – enough for about 14,000 nuclear warheads. The configuration of Y-12 makes it particularly difficult to protect. The site is three miles long, approximately one-half mile wide, and lies between two ridge lines. There are currently five target buildings at Y-12, with multiple targets within each building.

Y-12 and ORNL employ 13,000 people and are both located very close to the cities of Knoxville and Oak Ridge in Tennessee. The impact on the site and surrounding areas of a nuclear detonation would be catastrophic. The fallout from a 10 kiloton IND detonation at Y-12 could result in an estimated 60,000 casualties, including 18,000 fatalities, and harmful radiation sickness for over 40 miles.

In 2003, two years after 9/11, DOE finally increased the design basis threat (DBT), the standard that determines the level of threat a facility's protective force must be able to defend against. The 2003 DBT required that facilities protect against 1.5 times the pre-9/11 level – but this increased level is still less than half the number of terrorists involved in 9/11. All nuclear weapons sites had to implement defensive strategies to comply with that increased threat level by October 2006.

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[1] On the site visit to Y-12 were POGO's Executive Director Danielle Brian, Senior Investigator Peter Stockton, and unpaid consultant Ron Timm. Ms. Brian did not attend the site visit to ORNL.

Rather than requiring Y-12 to meet these requirements, the DOE's approach can only be compared to lowering a hurdle to allow a sprinter to easily jump over it: Because Y-12 cannot meet the already-inadequate 2003 DBT, Energy Secretary Samuel Bodman has waived the requirement for the facility to do so.

In order to bolster security, Y-12 has begun a long-overdue plan to build a storage facility called the Highly Enriched Uranium Materials Facility (HEUMF) to store the majority of the weapons-quantities of highly enriched uranium currently housed in the five above-ground storage buildings. A facility called the Uranium Processing Facility (UPF) is planned to house the remainder of the HEU. The UPF, currently in the design phase, will also be an above-ground structure. The DOE Inspector General and POGO have both been critical of the above-ground design on both cost and security grounds.

There have been several cost increases and schedule slippages during the construction of the HEUMF. Initially estimated to cost $97 million and open in 2008, the current cost estimate is more than $500 million and, after the most recent construction debacle, it is not scheduled to be completed until at least 2010. Furthermore, the proposed UPF, which will be adjacent to the HEUMF, is not scheduled to be constructed until 2013. Secretary Bodman's security waiver means Y-12 will not hire the additional guards required to protect the multiple aging buildings. Therefore, there will be nearly 300 fewer guards protecting the HEU at Y-12 than is required to meet the government's standards, leaving the site at high risk for at least the next seven years.

RECOMMENDATIONS

- Accelerate the schedule for downblending the excess highly enriched uranium. This will reduce storage needs at Y-12 and allow the number of buildings that could be targeted in an attack to be reduced from five to three in less than a year. Reducing targets at Y-12 will significantly decrease the site's security costs while simultaneously increasing the effectiveness of its security.

- Declare an additional 100 metric tons of highly enriched uranium surplus, and downblend it. This would leave at least 100 metric of highly enriched uranium available for use by naval reactors.

- Immediately increase the size and composition of Y-12's protective force so that the site would no longer need a waiver from meeting the 2003 DBT.

- Upgrade armaments. The protective force needs high-caliber machine guns in order to lay down suppressive fire. They also need explosive breaching capability in the event that adversaries gain access to and barricade themselves in one or more of the target buildings.

- Revise tactics. The security officers trained in defensive tactics (SPO 2s) should be deployed on the targets (at the vaults or with the HEU that is being processed) in a defensive position, and the offensively-trained security officers (SRTs) should be freed to respond to an attack and neutralize the adversary.

- Increase training and provide more realistic training, as recommended by both the Meis report and the DOE Inspector General.

- If high-tech weapons, detection systems, and delay mechanisms are found to be effective in rigorous performance tests, they should be deployed at Y-12.

- Make arrangements to bring in the Army's Special Operations Unit known as Grizzly Hitch to run more realistic tests against the protective force, as suggested in the Meis report.

- Implement a realistic retirement system for the protective force. The Y-12 security force is aging and there is no retirement system for security officers who have worked 20 years on the force: Federal law enforcement has a retirement policy, and nuclear weapons facilities should have one as well.

- Base award fees to BWXT and Wackenhut on pre-established baselines, requirements, or standards. Award the fees only after the desired outcomes are tested to ensure that performance is equal to or exceeds the contract. For example, Wackenhut's award fees should depend on its ability to protect the facility rather than on the number of guards, man hours, or other criteria that may be specified in the contract.

- The most secure design for the HEUMF would have been an underground design. However, because the facility is currently under construction as an above-ground design, POGO recommends that this facility be bermed. The current design and construction needs to be altered so that the HEUMF will be able to withstand being bermed with the tons of dirt necessary to make the facility adequately secure.

- If DOE downblends the excess HEU, move the mission for the Uranium Processing Facility to the HEUMF. If DOE does not downblend the excess HEU, alter the design of the UPF to that of an underground or bermed facility.

- De-inventory ORNL's Building 3019 of all special nuclear materials on an accelerated basis because it cannot be adequately secured.

- Downblend the uranium-233 onsite at ORNL. If a decision is made not to do so, the uranium-233 should immediately be moved to Y-12 or Idaho National Laboratory, which already houses significant quantities of uranium-233, so that it all can be downblended.

- Immediately increase the size of the security force, including creating a Special Response Team, in order to protect the special nuclear materials until they are removed from ORNL.

INTRODUCTION

> *"The gravest danger ... and the one requiring the most urgent attention is the possibility that terrorists could obtain highly enriched uranium or plutonium for use in an improvised nuclear device."* – Senator Richard Lugar (R-IN) and former Senator Sam Nunn (D-GA), 2004. [2]

In 2004, an authoritative report on nuclear terrorism by the Monterey Institute[3] concluded that a variety of U.S. policies "need revision based on the recognition that non-state actors seeking to cause nuclear mayhem represent the paramount threat facing the United States today." Among the policies that need reexamination, according to the study, are those in the U.S. nuclear materials security programs "that do not give priority to the fissile material of greatest interest to terrorists – that is, highly enriched uranium."[4]

The report concurs with the findings of a variety of government agencies including the Government Accountability Office; intelligence reviews by the CIA and other intelligence agencies; and the Department of Energy's (DOE) own internal reviews. In fact, over the years, dozens of reviews both inside and outside the government have found that DOE's efforts to protect the nation's nuclear weapons materials leaves much to be desired.[5] For instance, in the summer of 2003, in preparation for a hearing before Congress, National Nuclear Security Administration (NNSA)[6] head Linton Brooks asked Admiral Richard Mies[7] to conduct a review

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[2] Ferguson, Charles. *The Four Faces of Nuclear Terrorism.* Monterey Institute of International Studies Center for Nonproliferation Studies, CA, 2004. Foreword.

[3] The Monterey Institute of International Policy Studies' Center for Nonproliferation Studies is an affiliate institution of Middlebury College. It contains four graduate schools, multiple research centers, and numerous special programs. The Center for Nonproliferation Studies is the largest non-governmental organization in the world devoted to curbing the spread of weapons of mass destruction, and is the only organization dedicated exclusively to graduate education and research on nonproliferation issues.

[4] *Four Faces*, pp 321-322.

[5] "Over 50 Reports, Hearings, Testimonies and Commissions in the Past Five Years Concluding that DOE has Serious Security Problems." Project On Government Oversight, January 22, 2002. http://www.pogo.org/p/environment/eo-020114-nuclear.html.

[6] Two departments in the Department of Energy have responsibility for nuclear weapons facilities: NNSA, which oversees seven nuclear weapons sites, including Y-12; and the Office of Energy, Science and the Environment (ESE), which oversees five sites containing weapons-grade nuclear material, including ORNL.

[7] Admiral Mies is a former Commander in Chief of the United States Strategic Command, the unified command responsible for command and control of all U.S. strategic nuclear forces supporting the national security objective of strategic deterrence.

of security at NNSA sites.[8] The report is highly critical of every aspect of security at NNSA sites, including vulnerability assessments, security plans, tactics, training, and testing of the protective force. Although the report was not site specific on the failures, a number of the key findings clearly concern the Y-12 National Security Complex (Y-12) and the Oak Ridge National Laboratory (ORNL).[9]

The risk of nuclear terrorism has been an issue of concern in other countries as well, such as the former Soviet Union where nuclear materials are poorly secured. The U.S. has been at the forefront of the nascent efforts to address these vulnerabilities, spending billions of dollars attempting to secure these materials. However, Harvard University's Matthew Bunn, an expert on the security of nuclear materials in the international arena, has argued that the U.S. should also lead by example: "Bush needs to lead a fast-paced global effort to remove the potential bomb material from the world's most vulnerable sites and make sure that every remaining cache has security sufficient to defeat terrorist threats. To credibly lead that effort, the United States has to get its own house in order."[10]

There are three main terrorism scenarios that are considered when assessing security against a terrorist attack at nuclear weapons sites:

1) The creation of an improvised nuclear device on site by suicidal terrorists, which only takes minutes to accomplish.[11]

2) The use of conventional explosives on site to create a radiological dispersal device, also known as a dirty bomb.

3) The theft of nuclear materials in order to create a crude nuclear weapon off-site that could be used to devastate a highly-populated U.S. city.

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[8] Meis, Admiral Richard W. *NNSA SECURITY: An Independent Review*. April 2005. http://www.nnsa.doe.gov/docs/reports/2005-05-02_Mies_Executive_Summary_and_Report.pdf. Downloaded October 16, 2006.

[9] The Meis Report was so critical that it was withheld from the public for over a year. On June 29, 2005, POGO requested the report under the Freedom of Information Act. Days prior to releasing the report to POGO, NNSA put out a press release claiming it had implemented 70 percent of Mies' recommendations. The claim was bizarre given that basic security problems cited in the Mies Report would take years to remedy. "Controversial Nuclear Security Report Released." Project On Government Oversight, September 2, 2005. http://pogo.org/p/homeland/ha-050901-doe.html/.

[10] Bunn, Matthew. "The Nuclear Campus." *Boston Globe* op-ed, October 20, 2005.

[11] An improvised nuclear device (IND) explosion is qualitatively different from a "dirty bomb." While exploding plutonium or highly enriched uranium with a bomb would cause a major dispersion of highly radioactive materials, as occurred at the Chernobyl Reactor in the Ukraine, an IND explosion could cause a chain reaction on par with the devastation of Hiroshima and Nagasaki, Japan. An IND can be created at a number of DOE sites because of the presence of nuclear weapons or special nuclear materials in bomb-grade quality and quantity. This can cause nuclear detonations of varying sizes. Little time is required to accomplish this act.

Since POGO's original report in 2001, *U.S. Nuclear Weapons Complex: Security at Risk*, the organization's continuing investigations[12] have documented how a variety of U.S. nuclear facilities have not implemented adequate protections against these threats, even when the facilities have large stashes of weapons-grade and weapons-quantity nuclear materials which particularly merit protection. As the nation learned on September 11, 2001, terrorists can be suicidal. The potential impact of a terrorist attack using nuclear weapons on U.S. soil is too significant to permit the kind of inefficient and ineffective security at nuclear weapons facilities which has persisted.

There are some proven technologies DOE could implement to improve the current security situation. For instance, the U.S. government has simple delay mechanisms which would significantly slow terrorist access to sensitive materials. At least two of these mechanisms were developed by DOE and are currently deployed at Department of Defense facilities, as well as at DOE's Idaho National Laboratory and Office of Safeguard Transportation trailers, which transport nuclear warheads and nuclear material throughout the U.S.[13]

This report more specifically documents the shortcomings of efforts to secure Y-12 and ORNL. An initial examination of these sites was reported in POGO's May 2005 study, *U.S. Nuclear Weapons Complex: Homeland Security Opportunities*. That report presented the findings of POGO's investigation into security at facilities throughout the nuclear weapons complex, and concluded that consolidating weapons-grade nuclear materials from 13 sites to seven sites would dramatically increase security, as well as save the DOE an estimated $3 billion in security costs over three years.[14]

For this investigation, POGO drew upon multiple sources including DOE analysts; current and former DOE officials; the Scowcroft Commission staff;[15] the Nuclear Command and Control Staff at the Pentagon; the Secretary of Energy's Advisory Board;[16] current and former

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[12] For more information about POGO's investigations into the security of the nuclear weapons complex, visit POGO's website at http://www.pogo.org/p/x/2004nuclearweapons.html.

[13] Ron Timm, an unpaid consultant to POGO who has contributed to this report, owns the patent on these technologies.

[14] *U.S. Nuclear Weapons Complex: Homeland Security Opportunities*. Project On Government Oversight, May 2005. http://www.pogo.org/p/homeland/ho-050301-consolidation.html.

[15] In 2001, Secretary of Defense Donald Rumsfeld established the Scowcroft Commission, headed by General Brent Scowcroft, to review security of nuclear weapons facilities. The Commission's report was completed in March 2002 and classified as a top secret document. Despite requests, an unclassified version of the report has never been released to the public. See "Testimony of Danielle Brian, POGO Executive Director." Hearing before the House Subcommittee on National Security, Veterans Affairs, and International Relations, September 24, 2002. http://www.pogo.org/p/environment/et-020903-nukepower.html.

[16] The Secretary of Energy Advisory Board (SEAB) was chartered in January 1990 to provide the Secretary with timely, balanced, external advice on issues of importance to the Secretary. Shortly after completion of its report on consolidating the nuclear weapons complex, the Secretary disbanded the Board as of May 20, 2006. http://www.seab.energy.gov/publications/NWCITFRept-7-11-05.pdf. Downloaded October 16, 2006.

Wackenhut management and security officers; the Mies Commission;[17] the Natural Resources Defense Council; congressional staff; the Defense Threat Reduction Agency; and members of Grizzly Hitch, a section of the Army Special Operations Command at Fort Bragg, N.C., that tests the security of nuclear weapons facilities.

THE IMPACTS OF A NUCLEAR ATTACK

The Y-12 National Security Complex (Y-12) and the Oak Ridge National Laboratory (ORNL) are both located in Tennessee near Knoxville (population 173,890) and Oak Ridge (population 28,000). The combined workforce for the two sites is approximately 13,000 people. If a terrorist group attacked either one of the facilities and created a detonation using an improvised nuclear device (IND), it would result in an unmitigated disaster, causing untold numbers of deaths, radiation sickness, and property damage.

The explosion from the nuclear bomb dropped on Hiroshima was created using a "gun type" method (firing a piece of highly enriched uranium at another piece to create a chain reaction). Using the same theory, terrorists could create a crude IND by taking two pieces of the highly enriched uranium (HEU) and slamming them together with conventional explosives, or by simply dropping one plate of HEU from a certain height onto another.[18] This nearly happened accidentally at Y-12 several years ago.[19] As Nobel Prize-winning physicist Luis Alvarez explained:

> With modern weapons-grade uranium, the background neutron rate is so low that terrorists, if they had such material, would have a good chance of setting off a high-yield explosion simply by dropping one half of the material onto the other half. Most people seem unaware that if separated U-235 [highly enriched uranium] is at hand, it's a trivial job to set off a nuclear explosion. ... Given a supply of U-235 ... even a high school kid could make a bomb in short order.[20]

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[17] Then-DOE Secretary Spencer Abraham appointed the Mies Commission, headed by Admiral Richard Mies, to conduct an independent assessment of security at nuclear weapons facilities. DOE's National Nuclear Security Administration kept the report secret until forced to release it in response to a Freedom of Information Act request from POGO in 2005. http://www.pogo.org/p/homeland/ha-050901-doe.html.

[18] Bunn, Matthew and John P. Holdren. " A Tutorial on Nuclear Weapons and Nuclear-Explosive Materials: Nuclear Weapons Design and Materials." *Securing the Bomb 2006*. Managing the Atom Project, Harvard University. September 6, 2006. http://www.nti.org/e_research/cnwm/overview/technical2.asp. Downloaded October 16, 2006.

[19] The HEU was not dropped from a significant height, and the scientist was able to kick away the piece that was dropped before a reaction could take place.

[20] Alvarez, Luis W. *Alvarez: Adventures of a Physicist*. Basic Books: New York, 1987. p 125.

According to Princeton University physicist Frank von Hippel, "a 100-pound mass of uranium dropped on a second 100-pound mass, from a height of about 6 feet, could produce a blast of 5 to10 kilotons."[21] By comparison, the blast from the Hiroshima bomb was 13 kilotons. It killed over 200,000 people.[22]

The effects on the population surrounding Y-12 and ORNL would be devastating. The Natural Resources Defense Council (NRDC) performed a simulation of the effects of a 10 kiloton nuclear explosion at the approximate location of the highly enriched uranium storage site at Y-12.[23] (See Figure 1.) NRDC's calculation concluded that the detonation of an IND at Y-12 could cause over 60,000 casualties, including nearly 5,000 fatalities, if the detonation occurred during the day for an unsheltered population.[24] (See Figure 2.) Casualties were calculated based on the residential population only, and did not include the worker population – 13,000 between Y-12 and ORNL – which would be killed immediately.[25] The fatalities would likely total around 18,000 people.

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[21] Wald, Matthew L. "Suicidal Nuclear Threat Is Seen at Weapon's Plants." *The New York Times,* January 23, 2002.

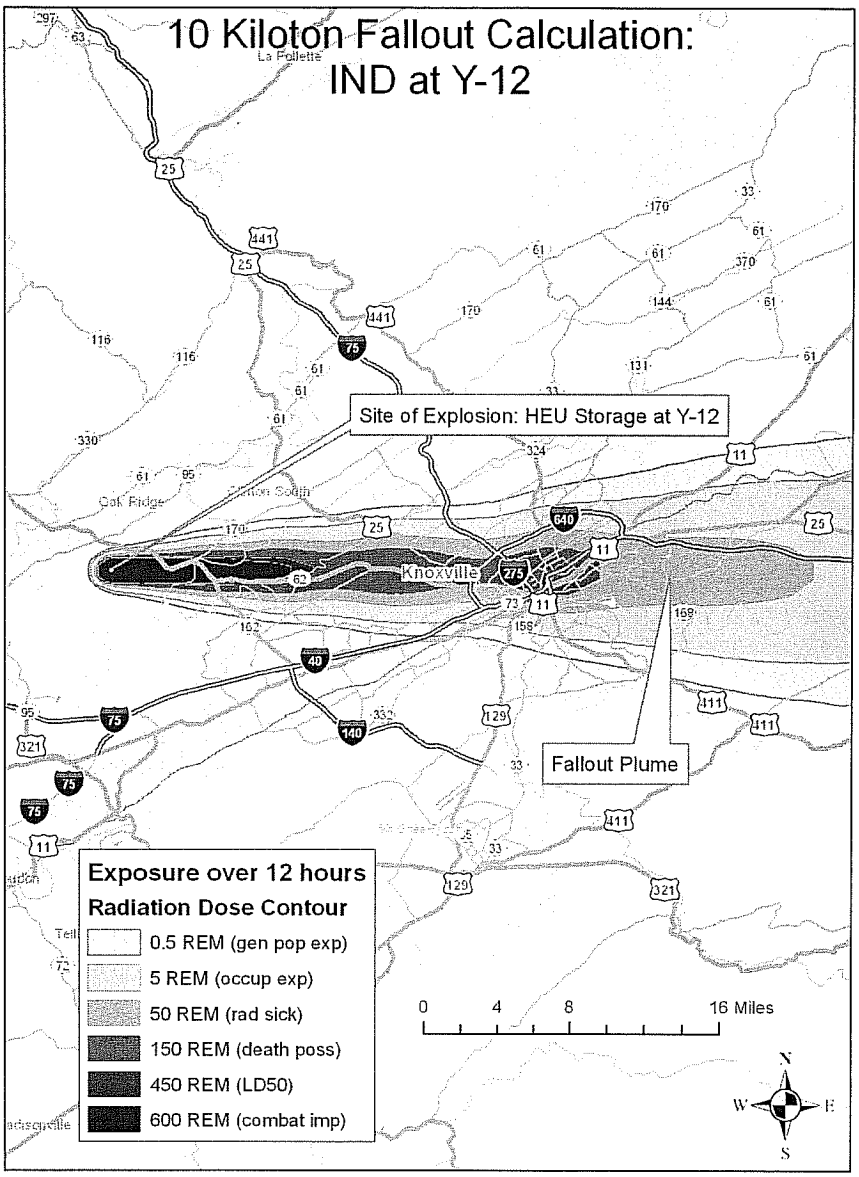
[22] *WMD 411.* Center for Nonproliferation Studies at the Monterey Institute of International Studies, 2004. http://www.nti.org/f_wmd411/f1a4_1.html. Downloaded October 16, 2006; and "The Destructive Power of Nuclear Weapons: Hiroshima and Nagasaki." Nuclear Terrorism Tutorial: Center for Nonproliferation Studies at the Monterey Institute of International Studies, 2005. Chapter 2. http://www.nti.org/h_learnmore/nuctutorial/chapter02_08.html. Downloaded October 16, 2006.

[23] Matthew McKinzie, Ph.D., Scientific Consultant, Natural Resources Defense Council (NRDC) performed the simulation using the U.S. Department of Defense computer code HPAC (Hazard Prediction and Assessment Capability, version 3.2.2).

[24] The calculation assumed that the explosion was caused by a fission reaction, and was at ground level at Y-12 on a clear November day with winds blowing eastward at four meters per second (13.12 feet per second). In this scenario, the most intensely radioactive zone in the fallout plume is calculated to extend no more than 10 miles from the explosion site.

[25] "Oak Ridge National Laboratory Fact Sheet." UT-Batelle, 2006. http://www.ornl.gov/ornlhome/fact.pdf; and "Y-12 National Security Complex: Fact Sheet." BWXT Y-12, 2006. http://www.y12.doe.gov/about/factsheet.php. Downloaded October 16, 2006.

Figure 1. 10 Kiloton Fallout Calculation: Improvised Nuclear Device Detonation at Y-12



Source: Natural Resources Defense Council

Key: **REM** – roentgen equivalent man: A measure of radiation exposure in terms of the health effects

gen pop exp – general population exposure

occup exp – occupant exposure

rad sick – radiation sickness

death poss – death possible, depending on age and health at time of incident

LD50 – 50% of people exposed experience a lethal dose, depending on age and health at the time of exposure

combat imp – combat impaired, such a high level of radiation that those exposed would have difficulty performing functions of a soldier (primarily for on-site personnel)

Figure 2. Consequence Analysis of Improvised Nuclear Device Detonation at Y-12

	Fatalities and Casualties from Nuclear Explosion Prompt Effects[26] in Residential Population (not including worker population)	**Fatalities and Casualties from Nuclear Explosion Prompt and Fallout Effects to Residential Population (not including worker population)**	**Total Fatalities and Casualties in Residential Population (not including worker population)**
Calculation assuming people are out in the open			
Fatalities	358	4,453	4,811
Injuries (mostly from radiation sickness)	178	57,396	57,574
Total Casualties	536	61,849	62,385
Fatalities and Casualties assuming people are sheltered but in nuclear effects zones			
Fatalities	254	477	731
Injuries (mostly from radiation sickness)	419	2,766	3,185
Total Casualties	673	3,243	3,916

Source: Natural Resources Defense Council

[26] The Nuclear Explosion Prompt Effects include the initial blast wave, high winds, heat radiation, thermal radiation, and initial pulse radiation.

THE DESIGN BASIS THREAT: A MOVING TARGET

The Design Basis Threat (DBT) describes the level of threat – the number of outside attackers, the number of active and passive inside conspirators, and the kinds of weapons and size of truck bombs that would be available to terrorists – a facility's protective force is required to defend against. (Appendix A) Since the 9/11 terrorist attacks, DOE has closely examined its DBT for facilities with assembled nuclear warheads, and weapons-grade and weapons-quantities of nuclear materials that can be used to quickly construct an IND or radiological dispersal device.

2003 Design Basis Threat

In 2003, almost two years after the 9/11 attacks, DOE finally announced a new DBT and that the DBT would be fully implemented by October 2006. The previous DBT had been criticized as being unrealistically low, even before 9/11: the number of predicted adversaries was about one quarter the number that was actually involved in the 9/11 attacks.

The 2003 DBT was only slightly more realistic, but did not come close to the Postulated Threat[27] developed by the intelligence community. It was still less than half the number of 9/11 adversaries. Even so, for facilities with assembled nuclear weapons,[28] the new DBT doubled the number of predicted outside attackers. But for sites containing special nuclear materials, which can be used to create an improvised nuclear device, DOE only increased the DBT by 1.5 times. This minor increase for these sites was surprising because most security experts believe that it is more likely for terrorists to attempt to gain access to special nuclear materials in order to create an IND than it is for them to try to gain access to a nuclear weapon: it is extraordinarily difficult, if not impossible, for a terrorist group to detonate a relatively-modern U.S. nuclear warhead, which has such safeguards as Permissive Action Links (PALs)[29] and locks. As noted before, an IND can be created much more easily.

In early 2004, both the Government Accountability Office (GAO) and the DOE Inspector General (IG) concluded that a number of nuclear weapons facilities will not be able to meet the October 2006 deadline for implementing the 2003 DBT. The GAO concluded that, "... DOE has not developed any official long-range cost estimates or developed any integrated, long-range implementation plans for the May 2003 DBT."[30]

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[27] The Postulated Threat is the intelligence community's best estimate of the threat faced by nuclear facilities. This includes the number of adversaries, lethality of their weapons, and the size of a truck bomb that terrorists might use.

[28] Pantex, where nuclear weapons are assembled; Nevada Test Site (which has no nuclear weapons, but was mistakenly included); and the Transportation Division, which transports nuclear weapons.

[29] Since the 1960s, nearly all U.S. nuclear warheads have been equipped with safety locks or "PALs" (Permissive Action Links). If a warhead is stolen, it would be virtually impossible to detonate without a top-secret code.

[30] *Nuclear Security: DOE Must Address Significant Issues to Meet the Requirements of the New Design Basis Threat.* Government Accountability Office (GAO-04-701T), April 27, 2004. p 12. http://www.gao.gov/new.items/d04701t.pdf#search=%22gao-04-701T%22. Downloaded October 16, 2006.

In 2003 and 2004, several hearings were held on this issue by the House Government Reform Subcommittee on National Security and the House Energy and Commerce Subcommittee on Oversight and Investigations. At one of the hearings, the GAO reported its findings to National Security Subcommittee Chairman Christopher Shays (R-CT), who had requested a wide-ranging review of security throughout the nuclear weapons complex. The Congressional investigators' testimony was unusually critical of the feeble 2003 DBT, as well as of security at the sites being managed by the National Nuclear Security Administration (NNSA). They were also critical of the 2003 DBT, reporting that some officials believed it was a "funding basis threat," or Dollar Basis Threat, suggesting that the DOE simply did not want to spend the money it would need to implement more realistic protections.[31]

In October 2005, the DOE IG also issued a highly critical report about the inability of NNSA sites to meet the 2003 DBT. According to the report:

> NNSA sites will now have to implement, in one year, approximately 87 percent of the upgrades scheduled to be completed by the end of FY2006. Since several sites reported that the FY 2006 budget request does not cover their implementation needs nor fully fund maintaining the measures already in place, it is questionable whether the remaining upgrades can be implemented by the end of FY 2006.[32]

The IG's Office has also told POGO that it currently has a draft report questioning whether DOE's Energy, Science, and Environment (ESE) office, which oversees ORNL, can meet the 2003 DBT.

2004 Design Basis Threat

On September 14, 2004, DOE Headquarters sent a directive to all sites in the nuclear weapons complex ordering a significant increase in their security posture. The intent was to require better protection for sites containing weapons quantities of plutonium and highly enriched uranium (also known as special nuclear materials). This move was codified in October 2004 when then-Energy Secretary Spencer Abraham officially announced the increase in requirements, the second increase since 9/11. Under the new requirements, security forces would have to be prepared to repel more than three to four times the number of attackers they were required to protect against prior to 9/11, doubling the DBT at assembled weapons sites and more than doubling it at special nuclear materials (SNM) sites. Furthermore, the new DBT would assume that adversaries would be using far more lethal weapons and much larger truck bombs than had previously been considered, even by the 2003 DBT.

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[31] Ibid. p 8.

[32] "The National Nuclear Security Administration's Implementation of the 2003 Design Basis Threat." Department of Energy Office of Inspector General (DOE/IG-0705), October 2005. pp 1-2. http://www.ig.energy.gov/documents/CalendarYear2005/ig-0705.pdf. Downloaded October 16, 2006.

Yet, these new standards would not be fully implemented until at least 2008 – seven years after 9/11. Representative Shays was highly critical of the time lag for implementation: "The design basis threat, if it isn't met until 2008, we are basically stating that we are vulnerable. ... In other words, we can't meet what we believe is the threat."[33] The NNSA estimated that the new security requirements for its seven sites would cost $500 million annually in manpower alone. That estimate does not include further technological upgrades such as more secure storage facilities, activated barriers,[34] high-tech sensors, cameras, or other infrastructure improvements that would be needed to meet the 2004 DBT.

2005 Design Basis Threat

In 2005, new DOE Secretary Samuel Bodman directed another review of the DBT because the Department had concluded that implementing the 2004 security rules just cost too much money. On November 30, 2005, the Secretary lowered the security requirements, reverting to a security posture closer to the 2003 DBT. An exception was that Pantex, which houses assembled nuclear warheads and SNM, and the Office of Security Transportation, which transports assembled nuclear weapons and SNM, would stay at the far more robust 2004 DBT level. For the other sites, including the sites with a high IND risk, the number of adversaries were reduced by approximately 25%. The sites are supposed to implement the new 2005 requirements by 2008 – again, almost seven years after 9/11. It is important to note that, according to government investigators interviewed by POGO, the Russian DBT standards to protect their nuclear materials are more robust than even the most robust U.S. 2004 DBT.[35]

The DOE's Office of Independent Oversight (OA) is responsible for determining whether a site can meet the requirements of the DBT by conducting performance (force-on-force) tests. However, as of fall 2005, OA had only tested three of the seven NNSA Category I sites,[36] and "two of the sites that had comprehensive inspections were not tested against the full 2003 DBT requirements, but only against progress made at the time of the inspection."[37] POGO has learned from government officials familiar with the tests that Y-12 was tested both in 2004 and again in 2005 because of Wackenhut's poor performance on the previous test.

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[33] "DOE/ESE Security: How Ready is the Protective Force?" Hearing before the House Government Reform Subcommittee on National Security, July 26, 2005. p 99. http://www.pogo.org/m/hsp/Y12/DOEHearing-072605.pdf.

[34] Activated barriers, such as cold smoke and sticky foam, are delay mechanisms that are activated upon any unauthorized entry into areas equipped with them.

[35] POGO makes no judgement as to whether Russian nuclear sites can meet their DBT.

[36] Category I sites are those that have weapons quantities of weapons-grade nuclear materials.

[37] *Special Report on 'The National Nuclear Security Administration's Implementation of the 2003 Design Basis Threat.'* Department of Energy Office of Inspector General (DOE/IG-0705), October 7, 2005. p 4. http://www.ig.energy.gov/documents/CalendarYear2005/ig-0705.pdf. Downloaded October 16, 2006.

Possible 2006 Design Basis Threat

POGO has learned from DOE officials and congressional staff that there is pressure from NNSA and ESE program offices to further reduce the 2005 DBT because of the cost to implement it.

Dollar Basis Threat or Design Basis Threat?

In June 2006, NNSA was required to report to the House Armed Services Committee on its status and cost of meeting the 2005 DBT. POGO has learned from the Committee that the report was submitted, but it is classified. POGO obtained internal DOE emails that reveal the struggles over how to resolve the growing tension that exists between budget constraints and security requirements as long as the materials remain spread across the complex. The Office of Management and Budget reduced the FY2007 DOE security budget by $200 million, mostly because they were disappointed in the lack of progress in DOE's consolidation efforts. NNSA head Linton Brooks writes that he cannot reveal the cut in security funding because he has to defend the President's budget:

> The obvious problem is that we will be providing a repot [*sic*] that indicates that we have not chosen to seek funding in the FY07 budget to implement the 2005 DBT by the end of 2008. We all know that is because OMB denied funding, but since we will be defending the Administration's position, we won't be able to say that. I assume that our argument will be competing priorities. That will work pretty well on the NNSA side where I have taken major reductions in outyear projection in the interest of deficit reduction. It may work less well for the rest of the department if we actually have significant plus ups for science and nuclear energy. We will be telling the Congress that complying with the DBT is less important than either of those. (Appendix B)

DOE's Office of Security and Safety Performance Assurance Director Glenn Podonsky pointed out that the way out of this morass is to consolidate the SNM and reduce the security costs:

> I believe that if we vigorously pursue the strategies and initiatives we have previously identified, such as material consolidation and the revised approach to protective force employment envisioned in the elite force initiative and further facilitated by the increased and more effective use of security technologies, we can meet our DBT-related commitments in a timely manner. (Appendix B)

If DOE implements a plan presented by POGO in its 2005 report, *U. S. Nuclear Weapons Complex: Homeland Security Opportunities*, to consolidate the special nuclear materials currently spread across the country at 13 sites down to seven, the Department would save $3 billion over a three-year period while increasing security, thereby reducing the financial pressure to decrease the DBT.

TWO SITES AT HIGH RISK: Y-12 AND ORNL

At Y-12, the plan is to replace the five aging buildings currently storing HEU with two: the Highly Enriched Uranium Materials Facility (HEUMF), into which the majority of Y-12's SNM will be consolidated, and a Uranium Processing Facility (UPF), which is currently only in the design phase and is not scheduled to be built until 2013. According to a Y-12 security briefing for POGO investigators, DOE has decided not to spend the money to increase the size of the protective force to the 800 officers necessary to protect the site. As a result, Y-12 will not have a guard force necessary to meet the government's security standards until the facility's HEU has been consolidated into the HEUMF and the UPF. Energy Secretary Samuel Bodman has issued a waiver for Y-12, exempting the facility from DOE's security standards because it cannot meet them. In other words, Y-12 will remain at high risk for the next seven years. (Appendix C) This raises the question: what is the point of a standard if it is simply waived when it cannot be met?

ORNL also will remain at high risk until the uranium-233 stored there has been removed from the lab entirely. It is physically impossible to protect that material at ORNL because of the location of Building 3019, where the material is stored. With labs and other buildings within 50-100 feet of Building 3019, there is not enough space for double-alarm sensors that provide detection and some delay. In addition, with no stand-off distance, there is no room for vehicle barriers to handle the design-basis blast.[38]

Y-12 NATIONAL SECURITY COMPLEX

> *My concerns about Los Alamos ... pale in comparison to the Y-12 facility at Oak Ridge, Tennessee. ... That is a very vulnerable site. [It has] too many structures and not enough buffer zone [around it]. By the time the defenders knew that a security threat existed, it would be too late to respond. I know that they're working on it, but it has to be fixed today.* – Representative Christopher Shays (R-CT), Chairman of the House Government Reform National Security Subcommittee[39]

> *I know that security at the Y-12 facilities at Oak Ridge, Tennessee, is of particular concern to this Subcommittee. These facilities do represent some of the most difficult security problems we face in some parts of the complex – aging, outdated facilities built in the early days of the Cold War – or earlier – when no threat of the current nature was envisioned.* – NNSA Administrator Linton Brooks[40]

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[38] The design-basis blast is the size of explosive the protective force has to be prepared to protect against.

[39] Hertsgaard, Mark. "Nuclear Insecurity." *Vanity Fair*, November 2003. p 190.

[40] "Testimony of Linton F. Brooks, Undersecretary for Nuclear Security and NNSA Administrator." Hearing before the House Government Reform Subcommittee on National Security, Emerging Threats, and International Relations, April 27, 2004. p 9. http://reform.house.gov/UploadedFiles/BrooksAprilTestimony.pdf. Downloaded October 16, 2006.

The Y-12 National Security Complex (Y-12) dates from the World War II Manhattan Project and is currently where DOE manufactures nuclear weapons components. The facility is overseen by DOE's National Nuclear Security Administration (NNSA) and operated by contractor BWX Technologies Y-12 (BWXT), and Wackenhut Corporation is contracted to provide security. Y-12 contains the world's largest repository of highly enriched uranium (HEU) in metal form, storing approximately 400 metric tons of the material – enough for about 14,000 nuclear warheads. It only takes about 45 kilograms (approximately 100 pounds) of HEU to construct a crude nuclear bomb.[41] HEU is the material of choice for terrorists because it is easy and quick to create a crude nuclear weapon either on location at one of the nation's nuclear facilities or, if stolen from a facility, in a highly-populated city.

Y-12 is in Oak Ridge, Tennessee, about 15 miles from Knoxville.[42] Roughly 700,000 people live within a 100 mile radius of the facility.[43] The 811-acre compound – over three miles long and half a mile wide[44] – is nestled in a valley between two ridges. (See Figure 3.) Because of its location, Y-12 is a difficult site to defend: attackers could use the surrounding high ground to help gain control of the facility.

There have been long-standing security problems at Y-12. The problems first came to light in the early 1980s when congressional investigators discovered that the facility's HEU and nuclear weapons parts were being stored in WWII-era wooden buildings, all above ground. The storage buildings – which are still above ground and one is even still wooden – are prime targets for a terrorist attack, and security at Y-12 is precarious at best. The wooden building, Building 9720-5, is the primary HEU storage location, although HEU is also stored in four other buildings at Y-12. Storing HEU in a wooden building is not only concerning for security reasons, but for safety reasons as well. According to a 1996 DOE report, "Fire dominates all Y-12 Plant HEU accident scenarios. Building 9720-5, the primary HEU storage facility, is a warehouse of timber frame construction." (Appendix D)

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[41] Allison, Graham. "The Ongoing Failure of Imagination." *Bulletin of Atomic Scientists,* September/October 2006. http://www.thebulletin.org/article.php?art_ofn=so06allison. Downloaded October 16, 2006.

[42] "Y-12 Fact Sheet." Y-12 National Security Complex, Department of Energy, 2006. http://www.y12.doe.gov/about/factsheet.php. Downloaded October 16, 2006.

[43] "Census 2000 PHC-T-3 Ranking Tables for Metropolitan Areas: 1990 and 2000." U.S. Census Bureau, April 2, 2001. p 3. http://www.census.gov/population/cen2000/phc-t3/tab03.pdf. Downloaded October 16, 2006.

[44] "Y-12 Fact Sheet." Y-12 National Security Complex, Department of Energy, 2006. http://www.y12.doe.gov/about/factsheet.php. Downloaded October 16, 2006.

Figure 3. Aerial Photo of Y-12 National Security Complex

Inventories of nuclear materials are supposed to be conducted by DOE's weapons facilities every few years, or even more frequently, to ensure that none of the materials have been stolen. However, it is unclear how a credible inventory could or would be conducted at Y-12 because huge numbers of containers of highly enriched uranium have not been opened for 20 to 40 years. Counting containers alone would not work because, in a theft situation, the containers could be emptied and another material substituted. (Appendix E)

In 2000, a DOE team was dispatched to Y-12 when it was discovered that the facility had not taken an inventory of its highly enriched uranium in five or six years. Y-12 was ultimately given an unsatisfactory rating. In 2004, another team was dispatched to Y-12 because of questions about its inventory, and sources tell POGO Y-12 was given a rating of only "marginal."

Much of the material being stored at Y-12 remains there needlessly. Over 174 metric tons were declared excess and not necessary for the nuclear weapons program in 1996. As of 2005, only 34 metric tons had been downblended.[45] DOE claims that by the end of 2006, 91 metric tons will have been downblended. The rest of the downblending is not scheduled to be completed as late as 2030. (Appendix F)

INEFFECTIVE SECURITY

DOE periodically conducts tests of its nuclear facilities' security by staging mock "terrorist" attacks. These force-on-force exercises make it possible for the Department to simulate what might happen during a real terrorist attack, and to assess whether security forces can adequately defend against the attacks. As Y-12's infrastructure is currently configured, the site's ability to protect its nuclear stockpile against even the inadequate 2003 DBT is highly questionable.

Recent force-on-force tests at Y-12 have exposed the ineffectiveness of security at the facility. Timeline tests have shown that, during an attack, intruders can get from outside Y-12's double-fence line to inside one of the five storage buildings in about 45 seconds. In fact, the "adversaries" were able to gain access to the nuclear materials so quickly that, in order to create some sort of delay, trailers were lined end-to-end around the wooden storage building where the majority of our nation's HEU is stored. Security experts advise POGO that this defensive strategy is of questionable effectiveness.

In addition, there have been a series of security debacles at Y-12 over the past two years that are also indicative of the systemic security problems. These security failures should not be construed as being the fault of individual protective force guards who, in POGO's experience, are dedicated to protecting the site and to improving security. Instead, the fault lies squarely with the security contractor: The problem stems from poor training, excessive work hours, lack of critical weapons, and an infrastructure that is almost impossible to defend. POGO received a fax

[45] Downblending is the process of converting highly enriched uranium into low enriched uranium, which does not pose an IND or theft threat.

in summer 2005 from a member of the Y-12 guard force that outlines their primary concerns. It reads:

Issues with Department of Energy's Security

- Limited manpower and resources to deal with a terrorist attack
- No sniper teams – No breaching teams
- The dog and doghandlers are subcontracted and qualifications are limited and questionable.
  We have no night vision devices, no scope-mounted weapons, no armored vehicles,[46] no equipment or suits for biological warfare[47] – and very little training in dealing with biological warfare.
  Outer perimeter of facility has virtually non-existent patrols.[48]
- [Name redacted] is head of the tactical response over Oak Ridge, Tennessee. Although he has worked at his [*sic*] facility for a number of years, he has no background in military or law enforcement training.
- We take no oath of allegiance in nuclear security, while law enforcement and military have an oath of allegiance.
  The men and women who protect our nations [*sic*] nuclear stockpile could be a vital resource by making us federalized officers. [Emphasis in original] (Appendix G)

Overtime For Profit

Throughout POGO's investigation, we have been informed by numerous sources that Wackenhut security guards are forced to work excessive overtime at Y-12. In some cases, guards worked more than 70 or 80 hours per week, resulting in extreme fatigue. POGO also learned that Wackenhut had refused to hire additional guards. In February 2006, the DOE IG issued a report concluding that the Wackenhut contract included an incentive to increase overtime. In 2005 alone, the overtime worked by the guards resulted in an additional profit of $1.8 million for Wackenhut.[49]

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[46] At the time that this report went to print, POGO understood that there were at least five armored vehicles (although how well-armored is in question).

[47] POGO understands that, in the last year, the SWAT-capable guards have been outfitted with some of this equipment.

[48] Y-12 claims that it now has outer-perimeter patrols.

[49] *Protective Force Contracts at the Oak Ridge Reservation.* Department of Energy Office of Inspector General (DOE/IG-0719), February 2006. p 2. http://www.ig.energy.gov/documents/CalendarYear2006/IG-0719.pdf. Downloaded October 16, 2006.

Two Decades of Cheating

In June 2003, Y-12 conducted a force-on-force exercise, but the results were too good to be true. Computer simulations conducted prior to the exercises indicated that the guard force would lose two of the attacks decisively. However, Wackenhut had received advanced information on the scenarios enabling its guard force to cheat on the test. In January 2004, the DOE IG investigated the incident, and found that the test was "tainted and unreliable." The IG also found that Wackenhut and its predecessors had been cheating in force-on-force drills at Y-12 for over two decades. According to the IG report, the force-on-force tests at Y-12 were estimated to cost $50,000 to $85,000 each – taxpayer dollars that were wasted because the tests reflected what Wackenhut wanted DOE to see rather than the actual state of security.[50]

Failed Security Tests

In late 2003, Y-12 failed a force-on-force test in a performance that was described by sources as "ugly."[51] In the test, Y-12 could not protect the site or its HEU. The failure was so embarrassing, DOE needed a scapegoat and replaced the federal assistant manager in charge of security at Y-12. However, no action was taken against Wackenhut, the security contractor responsible for security.

In March 2005, DOE Director of Security and Safety Performance Assurance Glenn Podonsky testified before Congress that,

> Our three most recent Independent Oversight inspections at NNSA sites (Sandia National Laboratories-New Mexico, Y-12, and Nevada Test Site) identified some common implementation problems, including insufficient frequency of large scale force-on-force performance testing/exercises and inadequate weapons and equipment to fully deal with today's threat (e.g., armored vehicles, anti-armor weapons, weapons with high rates of fire) ... . Y-12 exhibited significant deficiencies in most major protection program elements.[52]

Also in 2005, DOE Headquarters tested security at Y-12 again. Both the government and the security contractor claimed that the force-on-force was a great success. However, POGO later

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[50] *Protective Force Performance Test Improprieties.*" Department of Energy Office of Inspector General (DOE IG/IG-0636), January 2004. p 1. http://www.ig.energy.gov/documents/CalendarYear2004/ig-0636.pdf. Downloaded October 16, 2006.

[51] "Y-12 bombs security exercise: nuclear weapons plant vulnerable to terrorists, oversight group says." *Knoxville News Sentinel*, January 16, 2004.

[52] "Testimony of Glenn S. Podonsky, Director, Officeof Security and Safety Performance Assurance, U.S. Department of Energy." Hearing before the House Energy and Commerce Subcommittee on Oversight and Investigations, March 18, 2005. http://energycommerce.house.gov/108/Hearings/03182005hearing1457/Podonsky.pdf. Downloaded October 16, 2006.

found that the protective force lost at least one attack decisively – a theft scenario during which the "adversaries" successfully entered a building and stole the mock HEU. One DOE official told POGO that they were "disappointed" in the results.

A Near-Miss

In September 2004, during a force-on-force exercise, an alarm went off during the drill, causing Wackenhut to believe a real attack was taking place. In response, Wackenhut released armed guards with loaded machine guns who came within seconds of firing upon the unarmed guards involved in the security test.[53] The potential "friendly-fire" incident was averted just seconds before it occurred.[54] As described in an anonymous letter slipped under the door of the guard force union, "In closin[g] this was as close to a near fatal situation as Y-12 has ever seen. [In] Wackenhut's rush to prepare for upcoming audits, it placed its own police officers in harms way, and narrowly escaped what could have been a deadly mistake." POGO wrote an op-ed in *The Oak Ridger* describing the efforts by Wackenhut to cover up the incident and to retaliate against the security officers who had disclosed it. (Appendix H)

Refrigerator Shooting

Also in September 2004, a Wackenhut guard fired a weapon accidentally loaded with some live ammunition (instead of the dummy rounds that were supposed to be used) during a training exercise in Y-12's cafeteria. The bullet went through a refrigerator and a wall, and ended up hitting a filing cabinet in the next room. Luckily, nobody was hit by the bullet.[55]

These security debacles have called into question the capacity of security contractor Wackenhut to protect the site. Despite an unusually bad track record, it appears that little or nothing has been done to hold Wackenhut accountable for these failures. In fact, Wackenhut got an "outstanding" performance rating from the NNSA and a $3.26 million award fee.[56] Currently, the DOE is considering whether to grant this contract to another contractor.

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[53] "Wackenhut Guards Almost Shot During Nuclear Security Test." POGO Alert, October 23, 2004. http://www.pogo.org/p/homeland/ha-041003-Y12.html; and "Security Drill at Weapons Plant Raises Safety Questions." *The New York Times*, December 21, 2004. p 14. http://www.pogo.org/m/hsp/hsp-nytimes-12212004.pdf. Downloaded October 16, 2006.

[54] Stockton, Peter and Danielle Brian. "Wackenhut's Witch Hunt Tale." *The Oak Ridger* op-ed, November 12, 2004. http://www.pogo.org/m/hsp/hsp-OakRidger-11122004.pdf. Downloaded October 16, 2006.

[55] "Live Ammo Round Sparks Investigation." *Knoxville News Sentinel,* September 22, 2004.

[56] Brumley, William J., Manager of the Y-12 Site Office. "Contract number DE-AC0500OR22928, Wackenhut Services, Inc. Performance Evaluation Report for the Period January 1, 2005, through June 30, 2005." August 30, 2005. pp 1. http://seiu23.advocateoffice.com/vertical/Sites/{2FDAD06E-E7D3-4DE0-AEF2-0C787424C292}/uploads/{FBA113EB-4DB9-402E-A787-08E0DC12005A}.PDF. Downloaded October 16, 2006.

COMBAT EFFECTIVENESS

The security debacles and the force-on-force failures raise concerns because, if guards fail to keep terrorists from entering the facility during a real attack, it would be difficult if not impossible to regain control of the facility. Military doctrine states that when casualties exceed 20%, forces become combat ineffective due to loss of command and communications, and because of basic squad-sized tactical deficiencies. An Army Special Forces Commander wrote:

> As a unit sustains casualties (dead or wounded) elements of the fire and maneuver schemes or "close quarter battle" drills begin to come apart. ... [I]f casualties are high (in excess of 10%) qualified replacements become increasingly problematic and command and control begins to be lost. Units are normally considered "combat ineffective" and are rotated off the line when they have sustained 15-20% casualties. At this point maneuver, fire rates, communications and command and control can no longer be relied on to support the mission. Continuation would be expected to result in unnecessary and increasingly high casualties with little expectation of success. (Appendix I)

Under the current security posture, an unacceptable percentage of guards would be killed in the initial surprise attack and fire fight. In fact, Y-12's security plan estimates that at least 50% of the facility's guard force would be killed during a terrorist attack.[57] At that point, according to combat veterans, it is unlikely that any further offensive action to recapture the facility by the protective force would be possible.

It is important to understand that performance (force-on-force) tests do not reflect the three major advantages held by terrorists: surprise, speed, and violence of action. Furthermore, in force-on-force tests using Multiple Integrated Laser Engagement System (MILES) weapons laser-simulation equipment, protective force guards exhibit unrealistic bravery. In one test, 14 protective force members were "killed" at the entrance of a building, yet the others continued to enter despite the danger. This phenomenon is known as "MILES bravery." With live ammunition flying, combat veterans have told POGO, this is totally unrealistic. POGO is not questioning the bravery of the protective force guards, but believes that the false sense of security should be taken into account when evaluating security test performances.

Y-12's STRATEGY AND ARMAMENTS

Strategy

During POGO's visit to Y-12, its investigators were briefed about the facility's strategy to deny terrorists access to the targets containing HEU. The investigators were told that this strategy was to deploy Special Response Teams (SRTs) on the targets containing HEU, such as vaults and cages, in order to delay the terrorists from gaining access to those targets, and to utilize Security Police Officers-II (SPO 2s) to move quickly in a hunt-and-destroy mission. Because SPO 2s are

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[57] DOE officials confirmed this fact during POGO's site visit to Y-12. In a number of force-on-force scenarios tested by DOE, even when the protective force is successful in repelling an attack, they lose up to 80-95% of the force. In fact, in early spring 2006, a facility with large amounts of HEU lost 80% of its protective force in a force-on-force test.

not trained or armed to the degree as the SRTs, who are equipped and trained with SWAT capabilities, Y-12's delay strategy is clearly backwards. The SPO 2s should be deployed on the stationery targets to delay the attackers, and the better-armed and better-trained SRTs should be able to move from target to target in the mission to kill the terrorists. (Appendix J)

POGO hopes that the current strategy has been changed.

Armaments

The intelligence community has concluded that, if terrorists attack nuclear facilities, they would do so using the most advanced and lethal weapons available. Yet, Y-12 guards are not equipped with the essential weapons they need to counter the tactics and weapons of the postulated adversaries. Y-12 displayed the weapons deployed at the plant during a visit by POGO in September 2005. These weapons were mostly semiautomatic – rather than automatic – rifles, and did not include sniper rifles or 50-caliber machine guns. In addition, the protective force had no explosive breaching capability. In a suicidal attack, it is expected that terrorists might attempt to barricade themselves inside a critical facility with nuclear materials. In order to root them out, the protective force would need to be able to blow off the doors of the facility or breach the side of the building, something they are currently not equipped to do.

Another defensive system is the remotely operated weapons system (ROWS). Officials at Y-12 claim to have deployed two ROWS inside a target building at Y-12, which we believe to be the wooden building storing the majority of the site's highly enriched uranium. However, Army Special Operations personnel advised POGO that ROWS are of limited value. If they are deployed outside, they can be destroyed with a 50-caliber sniper rifle. If they are deployed inside, "they are just another target." Y-12 admits that, when deployed inside, the ROWS can be neutralized with grenades or even flash-bangs[58] – which can blind the weapons' sensors – meaning that when the visuals come back up, operators would not be able to distinguish between the protective force and the attackers. Special Response Teams (SRT) at Y-12 are particularly concerned about this potential friendly-fire problem. Furthermore, the reliability of ROWS is also of concern. When Y-12 demonstrated the ROWS for POGO at their training center, it malfunctioned twice: once it would not fire, the second time the monitors went dead.

THE PROBLEMATIC HIGHLY ENRICHED URANIUM MATERIALS FACILITY

In order to bolster its security, Y-12 has begun a long-overdue plan to build a storage facility, known as the Highly Enriched Uranium Materials Facility (HEUMF). The facility will be used to consolidate the majority of nuclear materials from the Material Access Areas (MAAs), the five[59] buildings storing weapons-quantities of highly enriched uranium. Below is a list of the six original target buildings, the HEUMF, a proposed new Uranium Processing Facility (UPF), and DOE's schedule to consolidate the Y-12 material into the HEUMF and UPF. (See Figure 4.)

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[58] Flash-bangs are low-grade explosives meant to disorient without causing serious harm.

[59] There were originally six storage and processing buildings, but DOE states that it de-inventoried one of these buildings in 2006. "Major Relocation of Highly Enriched Uranium Completed at Y-12 National Security Complex." Y-12 Office News Release, October 2, 2006. http://www.nnsa.doe.gov/docs/newsreleases/2006/PR_2006-10-02_NR-07-06.pdf. Downloaded October 16, 2006.

Figure 4. Y-12's Schedule for Consolidating the Material Access Areas

Current MAAs	Purpose	2006 MAAs	2008 MAAs	2013 MAAs
9720-5 (West)	Storage of 80% of Y-12's HEU, Shipping & Receiving	CAT I nuclear materials	Deinventoried (behind schedule)	Deinventoried
9212 (East)	Processing & Storage	CAT I nuclear materials	CAT I nuclear materials	Deinventoried
9215 (East)	Processing & Storage	CAT I nuclear materials	CAT I nuclear materials	Deinventoried
9204-2 (East)	Processing & Storage	CAT I nuclear materials	CAT I nuclear materials	Deinventoried
9204-2E (East)	Processing & Storage	CAT I nuclear materials	CAT I nuclear materials	Deinventoried
HEUMF	Storage, Shipping & Receiving	Under construction	CAT I nuclear materials (behind schedule)	CAT I nuclear materials
Uranium Processing Facility	Processing	Planning	Under construction	CAT I nuclear materials
9204-4 (East End)	Processing & Storage	Deinventoried	Deinventoried	Deinventoried

Until five years ago, when Lockheed Martin still managed Y-12, the plan had called for a partially underground or "bermed" storage facility. Virtually all modern nuclear weapons and nuclear material storage facilities are underground, including the Device Assembly Facility at the Nevada Test Site and the KUMSC nuclear storage facility at Kirtland Air Force Base. U.S. Special Operations Command personnel have told POGO that an underground design is the only credible one because an above-ground facility is substantially more vulnerable to many more and simpler attack scenarios. An underground facility would be much harder to penetrate and would serve as a greater deterrent to terrorists. Yet in 2001, BWXT – the current contractor – changed the plan for an underground or bermed facility to that of an above-ground facility. In the spring of 2005, BWXT's then-president, Dennis Ruddy, told POGO that the above-ground design is far more secure than any proposed underground or bermed facility. He claimed that the specifics were classified, so could not defend his position.[60]

The DOE IG criticized the design and cost of the new plan for the building, concluding that it would be more expensive and less secure than the original plan. Originally, the bermed

[60] On October 15, 2005, and October 28, 2005, POGO sent a Freedom of Information Act request for internal DOE analyses to determine how the decision was made to abandon the underground or berm design in exchange for the above-ground design. POGO has yet to receive any documents responsive to this request. In May 2006, the DOE Oak Ridge Office informed POGO that "the documents you have requested are now under the jurisdiction of the National Nuclear Security Administration (NNSA). By copy of this letter, we will forward your request to the NNSA [in Albuquerque, NM] for processing."

facility was estimated to cost $97 million.[61] The cost of the new, less secure design increased to $144 million, then to $313 million,[62] with the contractor now estimating that the cost of the HEUMF is up to $500 million.[63] In his report, DOE Inspector General Gregory H. Friedman wrote that the new design will have:

> Higher life-cycle costs than the original design. Personnel security requirements that would be greater than the berm design. More complex construction requirements that may add cost and time to the project schedule. (Appendix K)

In 2004, Sandia National Laboratory was asked by the NNSA to evaluate the new design. It was ultimately Sandia's approval of the above-ground design that persuaded DOE Headquarters to give it the green light. POGO has learned, however, that the Sandia study did not compare the new design to the underground or bermed design, explaining in the small print they did not want to have to consider an entire redesign for the building. Ironically, it was an earlier Sandia study that had recommended using existing designs from two other government-owned underground facilities to solve the Y-12 storage problem – the Device Assembly Facility and KUMSC. DOE leaders, including former Deputy Secretary Kyle McSlarrow, were assured by NNSA that the Sandia review addressed the concerns raised by both the DOE IG and the Director of Safeguards and Security Performance Assurance. However, neither the Inspector General nor the Director of Safeguards and Security were contacted about the review.

The new design for the storage facility leaves much to be desired for the purposes of security. Because the HEUMF will be above-ground, there will be five surfaces – four walls and a roof – vulnerable to attack. A bermed facility only has one. The walls are being made of steel-reinforced concrete, but are only about 18 inches thick – the walls at the Device Assembly Facility, on the other hand, are three feet thick and covered with 14 to 15 feet of dirt.[64] It is likely that a large platter charge[65] could blow through all of the HEUMF's walls and out the other side (40 pounds traveling at 6,000 ft/sec). A platter charge would have been far less effective against the previously-planned bermed facility because it only has one exposed surface. Furthermore, the above-ground design requires fighting positions in four towers, rather than the two towers required by a bermed facility. These two additional towers will require twice the manpower as that needed to defend a bermed facility. Finally, the current design uses standard fixed barriers as delay mechanisms rather than activated barriers or other proven technologies that can provide

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[61] This number was determined through a POGO interview with a White House official.

[62] "Y-12 Awards New HEU Storage Facility Contract." *NNSA News*: Department of Energy, October 2004. p 4. http://www.nnsa.doe.gov/docs/newsletters/2004/nl_2004Oct_NNSA_News.pdf#search=%22HEUMF%20%24500%22. Downloaded October 16, 2006.

[63] Munger, Frank. "Lots of Changes Occurring at Y-12: Cost of Biggest Project has increased about $150 Million." *Knoxville News Sentinel*, September 18, 2006. p A11.

[64] Facts determined during POGO site visits to Y-12 and the Nevada Test Site.

[65] A platter charge is created by placing explosives on the concave side of a metal plate. The detonation sends the plate through the target.

three to ten times the delay of standard fixed barriers. Attached is an in-depth analysis of the security weaknesses involved in the design of the HEUMF prepared by Ron Timm, of RETA Security, Inc., a former DOE security contractor.[66] (Appendix L)

Despite the security weaknesses, Y-12's contractor, BWXT, moved ahead with the construction of HEUMF in spring 2005.[67] Then, on February 3, 2006, work was halted because of a significant flaw in the construction of the building. Apparently, the contractor was not using enough rebar in the concrete used to build the facility. An article by Frank Munger in *Knoxville News Sentinel* revealed that BWXT knew about the problems two weeks before work was stopped:

> Construction problems at a high-security storage complex for bomb-grade uranium were under discussion at least two weeks before a stop-work order was issued February 3rd. According to memos released Monday by the Defense Nuclear Facilities Safety Board, concerns about the building's reinforcing steel were raised in early to mid-January.[68] (Appendix M)

Two months later, construction was allowed to restart with an estimated cost increase of over $150 million, and another significant schedule slippage. Prior to these problems, the schedule for moving the majority of Y-12's highly enriched uranium into HEUMF had already been extended to 2010. After the construction debacle, it is uncertain when the move will be completed. Until a redesign is completed, it is also unclear how and when Y-12 will be able to successfully protect its highly enriched uranium. It appears that the only effective compensatory measure available would be a much larger protective force with more advanced weapons, but no plans are being made to implement these measures.

The House Appropriations Committee expressed its dissatisfaction with the current situation. "The Committee is disappointed that the Department of Energy's only nuclear material consolidation effort has run into management problems resulting in cost overruns that may result in schedule delays for completing the HEU Materials Facility."[69] The House Armed Services and

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[66] As mentioned before, Ron Timm holds the patent for the delay mechanisms, cold smoke and sticky foam, mentioned in this analysis.

[67] When POGO visited the HEUMF site in September 2005, the project manager claimed that construction was 30% complete. That seemed questionable since only one wall had been started.

[68] Munger, Frank. "Building Concerns Raised Before Work Was Stopped." *Knoxville News Sentinel*, February 2005.

[69] *FY2007 Committee Report: Energy and Water Development Appropriations Bill, 2007.* House Committee on Appropriations, May 19, 2006. p 114. http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=109_cong_reports&docid=f:hr474.pdf. Downloaded October 16, 2006.

Senate Appropriations Committees also registered equal levels of frustration with the HEUMF construction problems.[70]

Adding to the dire situation is that Y-12's defensive strategy is predicated on the timely completion of the HEUMF and the subsequent de-inventorying of the wooden storage building 9720-5. The HEU from Building 9720-5 is not scheduled to be moved into the HEUMF until 2010, and the HEU from the other four buildings is not scheduled to move into the UPF until 2013. Energy Secretary Bodman granted a waiver to Y-12 that releases it from complying with the IND denial requirement for multiple processing facilities until the end of 2008. However, Y-12 will still be unable to adequately protect its HEU when the waiver expires, and will require additional waivers.

This extended inability of Y-12 to meet required security standards for the next seven years is causing some concern at DOE Headquarters. In fact, NNSA Security Director William Desmond wrote to the Y-12 Site Office Manager in a June 14, 2005, memo stating, "I consider this [the original] extension to be in the best interests of the Department and the Public, but will not consider any request for further extension." This standoff appears unresolvable. As a result, Y-12 will continue to be unable to defend itself against suicidal terrorists intent on creating an IND. There is no possible way that Y-12 can meet either the 2003 or the 2005 DBT until both the HEUMF and the UPF are built and the materials are moved into them – in 2013. As a result, there is at least a seven year gap where the highly enriched uranium at Y-12 will continue to be vulnerable to terrorist attack.

THE PROPOSED URANIUM PROCESSING FACILITY

BWXT is also in the design phase for a new Uranium Processing Facility (UPF) which will fabricate secondaries – the highly enriched uranium parts of all nuclear weapons. The current design is for an above-ground facility to be built next to the HEUMF, with an estimated cost of $1 billion. Based on past DOE performance on major construction projects, that cost is likely to rise to $2 billion. In operation, this facility would contain huge amounts of HEU in process.

As with HEUMF, UPF is an above-ground design and therefore far more vulnerable and expensive than an underground or bermed facility would be. If DOE will be downblending a major portion of the excess HEU, as POGO and several DOE officials have previously recommended, it may be possible to move the mission currently proposed for UPF to HEUMF, eliminating the need for a second multi-billion – yet unsecure – building. If, however, DOE does not downblend the excess HEU, the above-ground design for the UPF must be changed to that of an underground or bermed facility. Not only is an underground or bermed facility far more secure, but it will save potentially billions of dollars.

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[70] *FY07 National Defense Authorization Act Committee Report*. House Armed Services Committee, May 5, 2006. p 463. http://www.house.gov/hasc/NDAA2007CommiteeReport.pdf. Downloaded October 16, 2006. http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=109_cong_reports&docid=f:sr274.109.pdf. Downloaded October 16, 2006; and *FY07 Energy and Water Appropriations Bill Committee Report* (109-274). Senate Energy and Water Appropriations Committee, June 29, 2006. pp 155-156. http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=109_cong_reports&docid=f:sr274.109.pdf. Downloaded October 16, 2006.

RECOMMENDATIONS

- Accelerate the schedule for downblending the excess highly enriched uranium. This will reduce storage needs at Y-12 and allow the number of buildings that could be targeted in an attack to be reduced from five to three in less than a year. Reducing targets at Y-12 will significantly decrease the site's security costs while simultaneously increasing the effectiveness of its security.

- Declare an additional 100 metric tons of highly enriched uranium surplus, and downblend it. This would leave at least 100 metric of highly enriched uranium available for use by naval reactors.

- Immediately increase the size and composition of Y-12's protective force so that the site would no longer need a waiver from meeting the 2003 DBT.

- Upgrade armaments. The protective force needs high-caliber machine guns in order to lay down suppressive fire. They also need explosive breaching capability in the event that adversaries gain access to and barricade themselves in one or more of the target buildings.

- Revise tactics. The security officers trained in defensive tactics (SPO 2s) should be deployed on the targets (at the vaults or with the HEU that is being processed) in a defensive position, and the offensively-trained security officers (SRTs) should be freed to respond to an attack and neutralize the adversary.

- Increase training and provide more realistic training, as recommended by both the Meis report and the DOE Inspector General.

- If high-tech weapons, detection systems, and delay mechanisms are found to be effective in rigorous performance tests, they should be deployed at Y-12.

- Make arrangements to bring in the Army's Special Operations Unit known as Grizzly Hitch to run more realistic tests against the protective force, as suggested in the Meis report.

- Implement a realistic retirement system for the protective force. The Y-12 security force is aging and there is no retirement system for security officers who have worked 20 years on the force: Federal law enforcement has a retirement policy, and nuclear weapons facilities should have one as well.

- Base award fees to BWXT and Wackenhut on pre-established baselines, requirements, or standards. Award the fees only after the desired outcomes are tested to ensure that performance is equal to or exceeds the contract. For example, Wackenhut's award fees should depend on its ability to protect the facility rather than on the number of guards, man hours, or other criteria that may be specified in the contract.

- The most secure design for the HEUMF would have been an underground design. However, because the facility is currently under construction as an above-ground design, POGO recommends that this facility be bermed. The current design and construction needs to be altered so that the HEUMF will be able to withstand being bermed with the tons of dirt necessary to make the facility adequately secure.

- If DOE downblends the excess HEU, move the mission for the Uranium Processing Facility to the HEUMF. If DOE does not downblend the excess HEU, alter the design of the UPF to that of an underground or bermed facility.

OAK RIDGE NATIONAL LABORATORY

Before the first nuclear bomb had even been built, senior government leaders knew that the nuclear weapons infrastructure, while meant to provide the ultimate weapon, posed a risk to Americans. For example, General Leslie Groves, the military commander of the Manhattan Project, decided against locating plutonium production – which was perceived to be more dangerous than the enrichment of uranium – at Oak Ridge in favor of the more remotely-located Hanford site in Washington state. Richard Rhodes, author of *The Making of the Atomic Bomb*, wrote:

> Twelve days after Enrico Fermi proved the chain reaction in Chicago on December 2, 1942, Groves had assembled a list of criteria for a plutonium production area and definitely and finally ruled out Tennessee. "The Clinton site [where the current Oak Ridge National Laboratory and Y-12 National Security Complex, which in the beginning was part of Oak Ridge, are located]...was not far from Knoxville. ... If because of some unknown and unanticipated factor a reactor were to explode and throw great quantities of highly radioactive materials into the atmosphere when the wind was blowing toward Knoxville, the loss of life and the damage to health in the area might be catastrophic."[71]

Oak Ridge National Laboratory (ORNL) is about eight miles from Y-12 and is overseen by the Energy, Science, and Environment Division (ESE) of the DOE. The site is operated by contractor University of Tennessee/Battelle, and security is provided by Wackenhut. ORNL dates back to the Manhattan Project and performs basic scientific research for a variety of disciplines. ORNL stores 1,000 cans of uranium-233 in a storage building called Building 3019.[72] Although the facility does not yet acknowledge the risk, senior nuclear engineers advise POGO that this material is as potent and dangerous as highly enriched uranium in terms of making an improvised nuclear bomb or a radiological dispersal device.

Given the danger of uranium-233, it is extraordinary that the ORNL does not have the security systems required for housing weapons-grade materials. In fact, ORNL is the least secure site in the DOE's nuclear weapons complex. Lab managers have not had an approved security plan (known as a Site Specific Security Plan) since 1997. Furthermore, ORNL is missing fundamental aspects of a basic security system: a double fence line with sensors and cameras between them; an adequate number of guards; and a Special Response Team (SRT), an on-site security team with SWAT capabilities. In fact, ORNL's defensive strategy depends on the protective force (particularly the Special Response Team) from Y-12 to respond to a security emergency. This strategy is seriously flawed: it makes the already-vulnerable Y-12 even more so, especially if an attack on ORNL is actually a diversion and the real target is Y-12. Even more troubling is that the response time would be too long in the event of a real terrorist attack. There is one road that runs between the two sites that could be easily mined or rendered impassable by a sniper.

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[71] Rhodes, Richard. *The Making of the Atomic Bomb*. New York: Simon & Schuster, 1986. p 496.

[72] In addition, ORNL stores some stockpiles of neptunium-237, which is a byproduct from plutonium production and is a potential IND material.

In March 2005, The DOE Director of the Office of Security and Safety Performance Assurance testified before Congress that he was concerned that ORNL security was inadequate, "...at Oak Ridge National Laboratory (an ESE site) portions of the protection system lacked the defense-in-depth that we require, and the site relies on an agreement with a neighboring site for special response team (i.e., offensive combative) capabilities."[73] Later, in June 2005, the DOE's Inspector General Gregory Friedman reported that Oak Ridge's security officers, on average, trained 40 percent less for combat readiness than dictated by the federal government requirements.[74]

In addition to security problems at ORNL are long-standing safety issues. The safety problems posed by the facility's Building 3019, which is where ORNL's uranium-233 is stored, have been recognized for years. In 1996, the DOE Highly Enriched Uranium Working Group concluded that Building 3019 was one of the four facilities in the entire nuclear weapons complex "that warrant special management action plans to assure safe interim nuclear materials management." (Appendix D)

POGO's VISIT TO OAK RIDGE NATIONAL LAB

> "*But in many ways ESE* [Energy, Science, and Environment Division of DOE] *seems stuck in denial about organizational and fiscal demands of DBT-compliant strategy. Tactical training on assault scenarios lack vigor or realism.*" – Representative Michael Turner (R-OH) before the House Government Reform Subcommittee on National Security, July 26, 2005.

On September 27, 2005, POGO Senior Investigator Peter Stockton and unpaid consultant Ron Timm visited ORNL for a previously-scheduled meeting with security officials to discuss the security of the facility. However, the itinerary was limited to a tour of science sites. ORNL officials claimed that no security officials from the DOE site office, contractor Battelle, or Wackenhut were available.

After leaving the DOE public affairs office, POGO investigators drove to Building 3019, which contains ORNL's uranium-233. POGO's investigators were able to find the building within 15 minutes, after an ORNL employee gave them directions. The investigators parked their car in front of the building within sight of two armed security officers who were standing next to their vehicle talking to each other. The guards said nothing to POGO's investigators, got into their vehicle, and drove off. POGO's two investigators then wandered around the building for about 15 minutes observing the security (or lack thereof). The two POGO investigators have significant security backgrounds and were shocked by what they observed.

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[73] "Testimony of Glenn S. Podonsky, Director, Officeof Security and Safety Performance Assurance, U.S. Department of Energy," Hearing before the House Energy and Commerce Subcommittee on Oversight and Investigations, March 18, 2005.

[74] *Protective Force Training at the Department of Energy's Oak Ridge Reservation.* Department of Energy Office of the Inspector General (DOE/IG-0694), June 2005, Letter to the Secretary. p 1. http://ig.energy.gov/documents/CalendarYear2005/ig-0694.pdf. Downloaded October 16, 2006.

Eventually, a security officer drove up and asked the investigators if the blue truck in the parking lot down the hill was theirs. It was not. When the two investigators were walking back to their own car, they were told to stop as two more Wackenhut vehicles arrived. A Battelle security official soon arrived and stood nearby talking on his cell phone for about 10 to 15 minutes as more armed guards arrived and stood around. Another vehicle then pulled up with top Wackenhut and Battelle security officials. They attempted to claim that the POGO investigators had been told to leave the site immediately. In fact, POGO's investigators had not been told to leave the site at all. At this point, the POGO investigators were escorted off the site by two security patrol vehicles.[75]

DOE has claimed that the two POGO investigators broke away from their escort. This accusations is false: there was no escort. In fact, the public affairs officers had the investigators' cell phone numbers and could have called them to determine where they were. Despite this, it took the officers at least 25 minutes to locate the POGO investigators and inform them that they must leave the site.[76]

This incident demonstrates that once an individual gains access to ORNL, he or she has unimpeded access to the exterior of Building 3019. For example, there were no setback barriers to protect against truck bombs, yet a number of trucks were observed going in and out of the facility because of major construction projects. There was only a single chain link fence around part of Building 3019, within less than 10 feet of the building. That fence, of course, would provide no warning or delay in case of an attack. There appeared to be no fence in the back of the building along the truck ramp, even though a truck with a bomb could park within ten feet of the building and level it. The building itself appears to have been constructed with corrugated steel over reinforced concrete, which attackers could easily breach without warning.

POGO has learned that ORNL security officers failed a self-assessment force-on-force test in 2004. Special Response Team members from Y-12 acted as attackers, successfully breaching security at ORNL and "killing" the entire protective force in 90 seconds. It is important to recognize that this self assessment was not as rigorous as an independent test administered by DOE. Although DOE security inspectors visited ORNL in 2000 to assess security, they did not run a performance test. Nor have they conducted a performance test since 2000. However, since POGO's September 2005 visit, DOE has sent four teams of security experts to determine how to resolve the security problems at ORNL. These attempts have only resulted in bureaucratic wrangling over which DOE office will pay for disposing of the material.

In POGO's May 2005 report, we recommended that DOE end its attempt to extract medical isotopes from the uranium-233 in order to allow the immediate downblending of those volatile materials.[77] In January 2006, DOE ordered the end of the isotope effort and there is no

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[75] Munger, Frank. "Watchdog group, DOE at odds on ORNL security." *Knoxville News-Sentinel.* September 30, 2005. p A1.

[76] Letter to Department of Energy Secretary Samuel Bodman. Project on Government Oversight, September 29, 2005. http://www.pogo.org/m/hsp/hsp-Bodman-09292005.pdf.

[77] *U.S. Nuclear Weapons Complex: Homeland Security Opportunities.* Project on Government Oversight, May 2005. p 26. http://www.pogo.org/p/homeland/ho-050301-consolidation.html.

other use for uranium-233. However, the downblending of this dangerous and unprotected material is still stalled, leaving the site at high risk.

In 2005, ORNL attempted to get a waiver from the Secretary of Energy from meeting the already-inadequate 2003 DBT. Fortunately, this request did not gain DOE support. However, it is unclear how ORNL could ever meet that DBT. It is impossible to defend the uranium-233 at ORNL because of the location of the storage building. As a result, ORNL will remain at high risk until the uranium-233 has been removed from the facility entirely. The DOE IG is scheduled to release a report about ORNL's ability to meet the 2003 DBT. The House Appropriations Committee increased the budget request for ORNL by $25 million "for the disposition of material [the uranium-233] in building 3019."[78]

RECOMMENDATIONS

- De-inventory ORNL's Building 3019 of all special nuclear materials on an accelerated basis because it cannot be adequately secured.

- Downblend the uranium-233 onsite at ORNL. If a decision is made not to do so, the uranium-233 should immediately be moved to Y-12 or Idaho National Laboratory, which already houses significant quantities of uranium-233,[79] so that it all can be downblended.

- Immediately increase the size of the security force, including creating a Special Response Team, in order to protect the special nuclear materials until they are removed from ORNL.

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[78] *FY2007 Committee Report: Energy and Water Development Appropriations Bill, 2007*. House Committee on Appropriations, May 19, 2006. p 125. Available at http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=109_cong_reports&docid=f:hr474.pdf. Downloaded October 16, 2006.

[79] "Defense Nuclear Facilities Safety Board Recommendation 97-1 to the Secretary of Energy." Defense Nuclear Facilities Safety Board, March 7, 1997. p 2. http://www.dnfsb.gov/pub_docs/dnfsb/rec_1997_01.html. Downloaded October 16, 2006.

GLOSSARY

DBT – Design basis threat

DOE – Department of Energy

ESE – Energy, Science and Environment office of the Department of Energy

HEU – Highly enriched uranium

HEUMF – Highly Enriched Uranium Materials Facility

IND – Improvised nuclear device

KUMSC – Kirtland Underground Munitions Storage Complex

MAAs – Material Access Areas

MILES – Multiple Integrated Laser Engagement System

NNSA – National Nuclear Security Administration

NRDC – Natural Resources Defense Council

OA – Office of Independent Oversight of the Department of Energy

ORNL – Oak Ridge National Laboratory

ROWS – Remotely operated weapons systems

SNM – Special nuclear materials

SPO 2 – Security Police Officer-II

SRT – Special Response Team

UPF – Uranium Processing Facility