

Nuclear weapons at a crossroads as Obama enters office

Modernized warheads and new production facilities are on hold pending an updated nuclear policy demanded by Congress.

As a new administration promising change takes office, the future of nuclear weapons and of the weapons design and production complex are arguably less certain than at any time since the end of World War II. Thousands of nuclear warheads have been or are being dismantled or mothballed. Such authorities as defense secretary William Perry, former secretaries of state George Shultz and Henry Kissinger, and former senator Sam Nunn have proposed the goal of global nuclear disarmament. Even Linton Brooks, the former head of the National Nuclear Security Administration (NNSA), acknowledged last month that the number of nuclear weapons required for deterring a nuclear attack on the US and its allies is "almost certainly" fewer than 1700—the low-end estimate of the range of warheads that President Bush and Russian President Vladimir Putin established under the Moscow Treaty of 2002.

President-elect Barack Obama has enumerated a 12-point action plan to prevent terrorists from obtaining nuclear weapons or materials. Those points include negotiating directly with nuclear aspirants Iran and North Korea, strengthening the International Atomic Energy Agency, reducing numbers of weapons, and securing weapons-usable materials at vulnerable sites worldwide within four years. The plan also calls for establishing an international nuclear fuel bank and "fuel cycle centers" to meet an anticipated explosion in demand for nuclear power while simultaneously containing the dual-use technology needed to manufacture the fuel. A recent State Department report identified 32 nations that have no experience with nuclear power but are expressing serious interest in acquiring it.

Apart from a pledge to seek further deep reductions in numbers of warheads through negotiations with Russia, Obama has yet to enunciate his plans for addressing a drifting US nuclear policy. But defense secretary Robert Gates, who will be staying on in that post in the new administration, has indicated where he stands. "As long as other states have or

seek nuclear weapons—and potentially can threaten us, our allies, and friends—then we must have a deterrent capacity that makes it clear that challenging the United States . . . could result in an overwhelming, catastrophic response," he said in a November 2008 speech. For its part, Congress has rejected repeated attempts by the Bush administration to begin updating the aging nuclear arsenal, which makes the US the only declared nuclear weapons nation not modernizing its forces, according to Gates.

Representative Ellen Tauscher (D-CA), who chairs the strategic forces subcommittee of the House Armed Services Committee, said that any proposals to replace aging weapons with safer, more secure, and more reliable designs won't be considered for at least another year; that delay is to give the Obama administration time to prepare the new nuclear policy that lawmakers ordered in 2007 legislation. And NNSA's ambitious plan to shrink and modernize its weapons production complex will also have to wait, she told a conference on deterrence sponsored by ExchangeMonitor Publications in early December. The new nuclear policy is to consider recommendations due next April from a bipartisan



Tauscher

commission cochaired by Perry and John Foster, a former director of Lawrence Livermore National Laboratory who favors a strong nuclear arsenal. "We can't do anything until we have been informed by a significant set of facts and we have a bipartisan agreement on how to move forward," said Tauscher, whose district includes LLNL.

In an interim report released 15 December, the commission warned that if Iran and North Korea are allowed to build nuclear arsenals, proliferation will be at a "tipping point," with a cascade of other nations likely to follow suit and a corresponding increase in the risk of a weapon or fissile materials winding up in terrorist hands. The report also af-



Chilton

firmed the importance of DOE's science-based approach to maintaining the US stockpile, saying that high confidence in the deployed weapons will allow bigger reductions to be made in the thousands of warheads that are kept as backups.

Reliability is critical

Today's nuclear weapons stockpile has been cut in half

since Bush took office, NNSA administrator Thomas D'Agostino told the conference. The actual numbers are classified, but D'Agostino said NNSA is on course to beat by two years the 2200- to 1700-weapon ceiling that the Moscow Treaty sets for 2012. Both he and his predecessor Brooks emphasized that having fewer weapons increases the need for those remaining to be reliable. The reductions do not lessen the imperative to modernize the arsenal or the complex that manufactures and maintains it, said Air Force general Kevin Chilton, commander of the US Strategic Command. Were the US to have the capacity to build 50 warheads a year—which it does not currently have—it would take 40 years to replace a stockpile of 2000 warheads, he said. Further, the weapons in the US stockpile were designed to last only 15 to 20 years, and "not a one of them is less than 20 years old." Aging is fast becoming a critical concern in the nuclear weapons workforce as well. "I'm told that the last person who designed and built a nuclear weapon and participated in a test of that weapon will be dead or retired in the next five years," Chilton warned.

A recently completed white paper from a joint task force of the American Physical Society, the American Association for the Advancement of Science, and the Center for Strategic and International Studies urged the US to reestablish its leadership in nuclear nonproliferation matters by, among other things, ratifying the Comprehensive Test Ban Treaty. John Browne, a member of the task force and a former director of Los Alamos National Laboratory, said in an interview that the US "gave up a high-ground position" in nonproliferation when it rejected the CTBT in 1999. Since then, the system for

monitoring and detecting underground explosions has been refined to the point where cheating is nearly impossible anywhere in the world, Browne said. The task force also called for serious negotiations with Russia toward a follow-on arms control agreement to replace the Strategic Arms Reduction Treaty, which expires at the end of 2009, with the goal of further reductions in their stockpiles.

Labs seek direction

With so little weapons work to do, the national laboratories and other weapons infrastructure are increasingly looking outside NNSA for work. "We have a vast amount of expertise that is not available anywhere else . . . including sensor and detection technology, high-performance computing, microsystems, chemical and biological detection technology, and explosives science," D'Agostino said.

The weapons design laboratories, LLNL and LANL, each have shed 2000 employees over the past two years, LLNL director George Miller said. Capabilities developed in the design of nuclear weapons frequently have applications elsewhere. One example is nuclear forensics, the science of pinpointing the origins of a nuclear device that terrorists might detonate. In that highly specialized field, he said, "it takes a nuclear weapons designer to find [another designer]." But lacking new weapons projects to design and build has made it increasingly difficult for the labs to recruit a new generation of scientists and engineers. As Chilton noted, "you can study rocket science for as long as you want, but if you don't build a rocket factory, you can't get to the Moon." The task force report calls for broadening the missions of the weapons laboratories to include energy security, a change that could help them recruit and retain new talent.

Miller said many policymakers mistakenly believe that the science-based stockpile stewardship program, which had brought billions of dollars in new experimental facilities and supercom-

puting capabilities to the weapons labs since the cessation of nuclear testing in 1992, has been completed. In fact, major new facilities such as the National Ignition Facility at LLNL and the Dual-Axis Hydrodynamic Radiographic Test Facility at LANL are just now coming on line, and years of experiments designed to spot potential flaws in the nuclear arsenal lie ahead.

Science on the cheap

The missions of the national laboratories have grown dramatically over the past several decades, said Frances Fragos Townsend, former homeland security adviser to President Bush; they now include increasing amounts of "work for others" performed under contracts with federal agencies such as Defense and Homeland Security. Townsend, who is cochairing a task force for the Henry L. Stimson Center that is looking into leveraging the national laboratories' S&T capabilities, said DOE has become the "landlord for a significant share of the national security S&T capabilities needed throughout the government." But she said the DOE labs "have provided science on the cheap" for those agencies, which haven't been required to share the cost of necessary long-term investments. And although customer agencies have been "comfortable" working with the labs, Townsend said, due to a shared history of R&D on sensitive security matters, she warned that the labs risk losing their customers to other research performers if they don't keep their costs down. "[The labs'] overhead is high, and if they care about their long-term viability, they're going to have to learn to compete better," she said.

LANL director Michael Anastasio said the labs could make a good case for a piece of Obama's economic stimulus plan, which the president-elect has said will include rebuilding the nation's infrastructure. "What higher-leverage investment is there than science and technology?" asked Anastasio.

David Kramer

Applying Title IX to university science departments

Some federal funding agencies are reviewing the treatment of female students and faculty members in university departments they fund. Can such spot checks lead the way to gender equity?

"Everything that needed to happen has happened," says Debra Rolison, a chemist at the US Naval Research Laboratory (NRL) in Washington, DC. By that she means that stirring the pot has paid off: Nearly a decade ago she suggested

applying Title IX to achieve gender equity in university science departments, and now it's not only the law but it's backed by mandates for enforcement.

In 2004 the Government Accountability Office said that universities and

AC Resistance Bridge



SIM921 ... \$2495 (U.S. List)

- Accurate millikelvin thermometry
- Microvolt/picoamp excitation
- 1 mΩ to 100 MΩ range
- 2 Hz to 60 Hz frequency range
- Linearized analog output

The SIM921 AC Resistance Bridge is a precision, low-noise instrument designed for cryogenic thermometry applications. With its ultra-low excitation power, the SIM921 can measure thermistors and other resistive samples at millikelvin temperatures with negligible self-heating errors.



SIM900 Mainframe loaded with a variety of SIM modules

SRS Stanford Research Systems
Phone (408) 744-9040
www.thinkSRS.com