



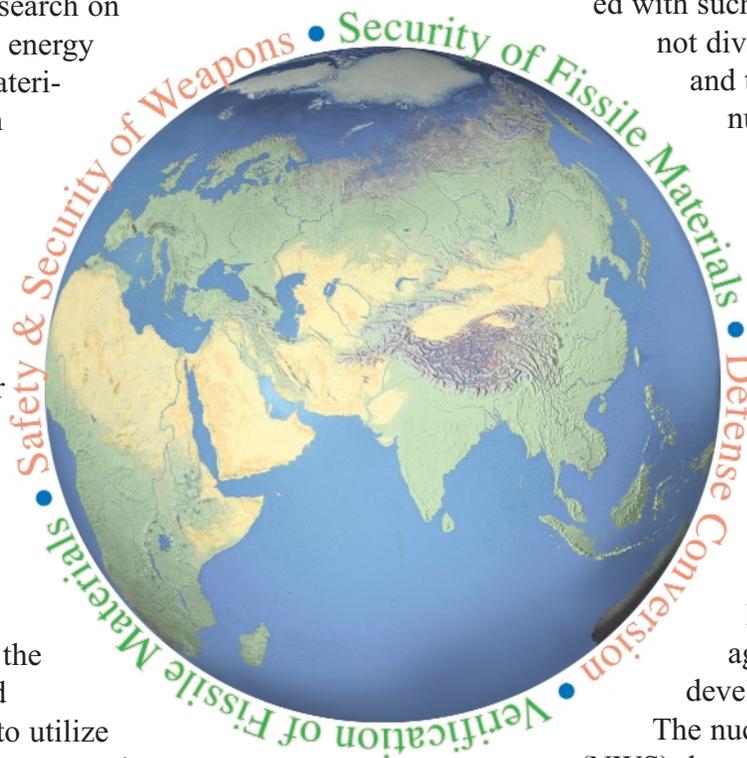
## International Security News

International Security Programs  
Dori Ellis, Director

### Focus: International Safeguards and Nuclear Material Protection



The world has long recognized that nuclear science and technology offer the potential for both great benefit and great harm to mankind. In 1946, President Truman appointed Bernard Baruch as chief negotiator for a plan to create a United Nations Atomic Development Authority to conduct research on peaceful uses of atomic energy and to control fissile material worldwide. The plan died, but the idea did not. President Dwight D. Eisenhower's "Atoms for Peace" speech to the United Nations General Assembly on December 8, 1953, again framed the challenge of internationally managing nuclear science and technology to the benefit of mankind. Eisenhower challenged the world to join the United States in seeking ways to utilize "fissionable material ... to serve the peaceful pursuits of mankind" – including electricity generation, agriculture, medicine, and other peaceful activities – and to do so in a way that would reduce the threat of nuclear war.



These efforts eventually led to the creation of the International Atomic Energy Agency (IAEA) in 1957. The purpose of the IAEA is to promote research and practical application of nuclear science and technology for peaceful purposes, to implement safeguards to ensure that nuclear materials associated with such peaceful purposes are not diverted for military use, and to adopt and promote nuclear safety standards.

This regime was expanded and enhanced when the *Treaty on the Nonproliferation of Nuclear Weapons* (NPT) entered into force in 1970. The NPT requires that all nonnuclear weapon states (NNWS) that are party to the treaty accept IAEA safeguards and agree not to acquire or develop nuclear weapons.

The nuclear weapon states (NWS) that are party to the NPT agree not to assist NNWS in the development or acquisition of nuclear weapons. All parties agree to cooperate on the peaceful use of nuclear science and technology and to pursue negotiations in good faith

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on measures relating to "cessation of the nuclear arms race."

Concerns about global warming and energy supplies, nuclear accidents such as Chernobyl, and revelations about the nuclear weapons efforts in Iraq, North Korea, India, Pakistan, and elsewhere have highlighted both the importance and the difficulty of promoting peaceful, safe, proliferation-resistant nuclear use.

In response to some of these challenges, the IAEA is pursuing implementation of a strengthened safeguards regime with new measures, including complementary access, short notice inspections, environmental monitoring, and remote monitoring. The events of September 11 further reinforce not only the importance of nuclear material safeguards, which focus on preventing diversion by governments, but also the need for improved physical security to protect against theft or sabotage by sub-national terrorist groups.

Sandia's programs to improve the safety and security of nuclear weapons and materials in Russia have been covered in previous issues of *International*

*Security News* and will be addressed again in future issues. This issue will focus on safeguards and physical protection of nuclear materials in other parts of the world. As described in the following articles, the current emphasis of Sandia's programs in international safeguards and nuclear material protection is on effective and efficient unattended remote monitoring to support traditional and strengthened safeguards and on physical protection of nuclear facilities and materials from theft and sabotage. These efforts are not new to Sandia, but recent world events have given us a renewed sense of urgency. Sandia is eager to continue working with our sponsors and partners to help meet the challenges laid down half a century ago by Presidents Truman and Eisenhower. Source: Larry Walker 5320, MS 1363, 505-845-9145, fax 505-284-5974, lswalke@sandia.gov



**The International Programs Building** at Sandia National Laboratories will bring together the various International Security Programs at one location in August 2002. (rendering by architect Dekker/Perich/Sabatini)

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# Reducing the Nuclear Threat in the 21<sup>st</sup> Century

Charles B. Curtis

*President and Chief Operating Officer of the Nuclear Threat Initiative*

*The comments below are excerpts of Mr. Charles B. Curtis' presentation on October 29, 2001, at the Symposium on International Safeguards: Verification and Nuclear Material Security, sponsored by the International Atomic Energy Agency in Vienna, Austria.*



Today I speak as the President of the Nuclear Threat Initiative (NTI) – a newly formed charitable organization dedicated to reducing as urgently and comprehensively as possible the global threat from nuclear, biological, and chemical weapons. This urgent task has united CNN founder Ted Turner and former US Senator Sam Nunn, who cochair the NTI.

Since September 11, the public in many countries has become intensely aware of the clear and present danger of terrorist sabotage of nuclear power plants. Much has also been said in the press about the possible threat of radiological “dirty bombs.” But I want to focus my remarks today on another issue of rising public concern – the threat of terrorism and the threat from poorly protected nuclear weapons materials.

As people are suddenly ready to support far stronger action to keep nuclear weapons out of terrorist hands, we have to make sure people understand that IAEA is the only international institution of global scope devoted to controlling access to weapons-usable material. We all need to be able to make the case for the work of the IAEA. As we do so, we must call attention to its funding gap.

During 15 years of zero real growth in the IAEA safeguards budget, the number of states that are part of the nonproliferation regime, the number of safeguarded facilities in those states, and the amount of plutonium and HEU requiring safeguards have all increased dramatically. The IAEA safeguards system is facing a “quiet crisis.” A gap between the nuclear threat and our global response already exists. Zero growth budgets at IAEA widen the gap. The time has come, instead, for member states

to agree to a substantial real increase in the IAEA regular safeguards budget.

The discovery in Iraq in 1991 of a substantial covert nuclear weapons program led to the establishment of an *Additional Protocol*, with wide-ranging new inspection authorities and information access that will give the IAEA what it needs to conclude that there are no covert nuclear activities in states subject to the protocol. However, the *Additional Protocol* serves only to detect covert nuclear activities. It does not – even when fully in force – offer assurance against theft, seizure, or unauthorized acquisition of nuclear material inside the state.

In fact, there is no international standard or requirement for the physical protection of nuclear material within a state. The worldwide system of security for nuclear materials is no stronger than the system of security at the weakest, worst defended site, which in many cases amounts to no more than a poorly paid, unarmed guard sitting inside a chain-link fence.

The *Convention on the Physical Protection of Nuclear Materials* – which currently covers only transport of materials across international borders – must be toughened, deepened, and broadened. An amended *Convention* should include a binding commitment to meet high security standards along with a requirement for each nation to report regularly on its procedures, regulations, and standards for securing and accounting for its nuclear material.

The IAEA has fewer than three full-time staff working on physical protection of nuclear materials and

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## IAEA Safeguards and US Support Program



The International Atomic Energy Agency (IAEA), established as an autonomous organization under the United Nations (UN) in 1957, serves as the world's foremost inter-governmental forum for scientific and technical cooperation in the peaceful use of nuclear technology. The IAEA is the culmination of US President Dwight D. Eisenhower's proposal in his Atoms for Peace speech before the UN General Assembly in 1953, in which Eisenhower envisioned an international body to control and develop the use of atomic energy. The IAEA is an independent, intergovernmental, science and technology-based organization in the United Nations family and serves as the global focal point for nuclear cooperation.

Today, the IAEA is divided into six Technical Departments that are responsible for such areas as Nuclear Energy, Nuclear Safety, and Nuclear Science and Applications. One area that Sandia National Laboratories provides extensive support to is the Department of Safeguards. This department is responsible for ensuring the safe, secure, and peaceful use of nonweapons nuclear materials for all its signature member states. The Department of Safeguards employs an inspection system to verify that countries comply with their commitments under the *Nuclear Nonproliferation Treaty* (NPT) and other nonproliferation agreements to use nuclear material and facilities only for peaceful purposes.

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preventing illicit trafficking. The regular budget expenditure for this program in the last year was under one million dollars – total. This staff and resource investment is grossly inadequate to address the dangers we face.

That's why I am pleased to announce a three-year grant from NTI to the IAEA in the amount of 1.2 million dollars to expand the agency's ability to review security for nuclear facilities worldwide, to identify needed security upgrades, and to organize contributions from member states to carry out the upgrades.

There is also a great deal that leading nuclear weapons states must now do – to reduce and control weapons of mass destruction and their essential ingredients and technologies. President Bush and President Putin should commit their countries to a course of action that would ensure that any nuclear,

chemical, and biological weapons and materials are safe, secure, and accounted for – with reciprocal monitoring sufficient to assure each other, and the rest of the world, that this is the case. The United States should develop, with Russia, a plan to secure or neutralize all of Russia's potential bomb material as rapidly as possible; appoint a senior official to take charge of getting the job done; and dedicate substantial additional US resources to accelerate and strengthen these efforts.

In the end, we need to ask: Is keeping nuclear weapons out of terrorist hands a priority or an afterthought? If it's an afterthought, after what? If it's a priority, do our effort and investment reflect that?

In short, we need to make the most of this moment and the attention it brings to widen, deepen, and strengthen IAEA efforts – and send the world a proper and reasonable bill for the priceless work the IAEA does to harness the power of the atom for peaceful purposes and to provide for our nuclear security.

*Charles B. Curtis served as Under Secretary and then Deputy Secretary of Energy from February 1994 to May 1997. Mr. Curtis was the chief operating officer of the Department of Energy and, among other duties, had direct programmatic responsibility for all DOE science, technology, and national security programs. Mr. Curtis chaired the Federal Energy Regulatory Commission from 1977 to 1981 and also has held positions on the staff of the US House of Representatives and with the US Treasury and the Securities and Exchange Commission.*

**Opinions expressed by the Guest Editor are not necessarily the opinions of Sandia National Laboratories.**

## Chernobyl Mobile Monitoring System for Container Transport



The International Atomic Energy Agency (IAEA) is planning to implement the use of unattended verification and monitoring technologies for safeguarding the movement and storage of about 25,000 spent fuel assemblies and 3,000 absorbers from three RBMK (Reactor Bolshoi Moschnosti Kanalnyi) reactors at the Chernobyl Nuclear Power Plant (NPP) and a separate fuel storage facility with a capacity of 25,000 items. RBMK reactors are on-load fueled, and movements of fuel assemblies, absorbers, or nonfuel items can take place at any time between the three reactors and the spent fuel storage facility. Railroad wagons will transport containers with spent fuel assemblies and absorbers from the Chernobyl NPP (Reactors 1, 2, and 3 and wet storage) to the Chernobyl Conditioning Facility, a distance of about four kilometers.

The verification of spent fuel is performed at the shipping port of the reactor hatch or the loading-unloading hall in the wet storage by gamma-neutron unattended monitors. Continuity of knowledge has to be maintained from the time the assemblies are loaded into the container in the Chernobyl NPP to the time when they are unloaded from the container in the Conditioning Facility. An integrated containment and surveillance–nondestructive assay system with remote data transmission capabilities is

installed on the wagon and is being envisioned at this point to perform this task.

Because of the low temperatures at Chernobyl during the winter season and the vibrations of the wagon, the system should be ruggedized to assure high reliability. Remote data transmission would greatly reduce inspection effort. As with all systems developed for the IAEA, this system will have to be tamper resistant to maintain continuity of knowledge of the nuclear materials.



**Chernobyl's reactor #4**, where at least 31 people died after the worst accident in the history of the nuclear power industry

Sandia National Laboratories has been assigned the lead role in developing, testing, and installing this mobile system. Richard Lucero, project lead, and Jack Bartberger, mechanical designer, both of International Safeguards and Technical Applications Department 5323, are evaluating all environmental and functional conditions at Chernobyl and finalizing the conceptual approach to this project. The delivery of this system to the IAEA is scheduled for September 2002. Source: Don Glidewell 5323, MS 1361, 505-844-9261, fax 505-284-5437, ddglide@sandia.gov

## Data Review Station



Sandia National Laboratories has developed a two-way, radio-frequency seal under the auspices of the Defense Nuclear Material Stewardship (DNMS) program funded by the Department of Energy Defense Programs. This seal, designated the T-1, meets the needs of many customers by providing a reliable, robust seal inside a tamper-indicating enclosure. The T-1 can provide a tailored sensor platform based on user need, including features such as motion detection, radiation detection, temperature measurement, and fiber-optic seals. All data can be authenticated for assured data integrity. The T-1

was delivered to the International Atomic Energy Agency (IAEA) last year through the Program of Technical Assistance to IAEA Safeguards (POTAS). The seal can communicate in a two-way mode and can be used to support the IAEA's remote monitoring systems worldwide.

The T-1 has passed the IAEA's exhaustive certification testing process, which includes vulnerability analyses, environmental testing, and functionality testing. However, before the IAEA can gain the full

*Data Review Station continued on page 6*

benefit of the T-1, it needs an automated data review system that will manage a system of T-1 units, provide system integration with all other components, communicate with the IAEA, and ensure the level of system integrity required by the IAEA. Sandia currently has been assigned the task of developing this Data Review Station (DRS). Larry Desonier, International Safeguards and Technical Applications Department 5323, is the project lead.

The DRS is composed of several software components and associated hardware components upon which the software will run. The system requires the following software:

- Data Review Component (DRC)
- Communication Component (CC)
- T-1 Test Program (TTP)
- Key Management Component (KMC)

The software will run on the following hardware platforms:

- Data Review and T-1 Test Computer (data review computer)

- Removable Key Management Computer (RKMC)
- T-1 ESP (Electronic Sensor Platform) Interrogator/Transceiver (IT)



Workstation displaying monitoring data

The DRS will provide for the review and validation of authenticated T-1 data. The DRS will receive all authenticated T-1 ESP events and all state-of-health messages. Any missed T-1 events will be recovered automatically by the monitoring system and transferred to the DRS with the original authentication signature. As a result, the DRS will maintain a complete historical record of all authenticated T-1 event messages and all received state-of-health (SOH) messages. Monitoring system time, T-1 unit storage locations, and individual container identification will also be transferred.

The Removable Key Management Computer (RKMC) performs two functions: It programs the T-1 units and it validates authenticated T-1 messages. The authentication keys are destroyed if the

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## Improved Information Collection to Support the IAEA's State Evaluation Process



For seven years the International Atomic Energy Agency (IAEA) has been developing a method for detecting undeclared nuclear material and nuclear-related activities in countries with comprehensive safeguards agreements in force. The method that has evolved is called the State Evaluation Process. The process involves comparing all available information with the information declared by a country, including the information declared under the *Protocol Additional to Safeguards Agreements* approved by the Board of Governors in May 1997.

All available information includes information obtained through inspections and complementary access, other internal IAEA information, and externally originated information accessible by the IAEA. One type of externally originated information is open source information, defined as publicly available information such as technical reports, internet web pages, news articles, promotional materials, vendors catalogs, books, scientific articles, and commercial satellite imagery. The Safeguards Information Technology (SGIT) Division of IAEA has established an open source

Improved Information Collection continued on page 7

collection and processing capability in support of the State Evaluation Process.

The Strengthened Safeguards program incorporates several new safeguards measures and broadens safeguards conclusions from *no evidence of diversion of nuclear material* to include *no evidence of undeclared nuclear material or activities*. Under Strengthened Safeguards, the Secretariat must declare that, having evaluated all information obtained, it has found no indication of the presence of undeclared nuclear material or activities. Clearly, if insufficient information is obtained, the conclusion that *no indication of the presence of undeclared nuclear material* was found is not reassuring.

The credibility of the conclusion rests on the assurance that a thorough, competent effort to obtain information took place, that this effort would most likely have obtained such information if it exists, and that the Secretariat would have recognized the significance of that information once obtained.

Regarding the open source component of this

information, SGIT has consulted with experts to determine the most relevant sources of English-language information, has acquired and adapted sophisticated text management and retrieval software to process it, has recruited experienced information analysts, and is identifying the issues that still must be addressed.

Joyce van Berkel, Proliferation Sciences 5913, has just returned from a three-year assignment at the IAEA, where she worked as an SGIT country officer participating in the State Evaluation Process. Van Berkel has been asked by SGIT-IIS (Information Support Services Section) to help develop an approach for the quality assurance of open source collection and processing and to address other priority open source issues, such as streamlining open source collection processes and developing a quick translation service for languages that are not official Agency languages. The first of van Berkel's three planned consultations took place in Vienna on April 15 through 26, 2002. The goal of this first consultation was to define the priorities and requirements for the consulting task and to begin working on the top priority issue. Source: Joyce van Berkel 5913, MS 1217, 505-845-9565, fax 505-284-6844, javanbe@sandia.gov

The IAEA maintains its headquarters at the Vienna International Centre in Vienna, Austria, located alongside the famous Danube River. Additionally, the agency maintains field and liaison offices in Canada, Geneva, New York, and Tokyo; operates laboratories in Austria and Monaco; and supports a research center in Trieste, Italy, that is administered by the United Nations Educational and Scientific Organization (UNESCO).

At the end of the year 2000, the number of staff members in the IAEA Secretariat was 2,173: 912 in the professional and higher categories. These figures represent regular, temporary assistance, and extrabudgetary staff, as well as Cost Free Experts and consultants. Cost Free Experts are technical experts in a field where the IAEA needs support on

a limited term basis – typically two to three years. When a particular need is identified, the IAEA will solicit support from its Member State Support Programs. Within the United States Support Program (USSP), these requests are typically forwarded to the national laboratories and private industry to find the best-qualified candidates. Sandia is currently supporting the IAEA with subject matter experts assigned to Vienna.

Similarly, the IAEA often has identified technology issues or equipment needs that cannot be supported within its regular budget. The IAEA has been funded on a zero-growth budget scenario for several years. Unfortunately, the workload continues to increase, with new facilities coming on-line throughout the world and the mission of the IAEA

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# NEWS

from an International Safeguards  
and  
Nuclear Material Protection Perspective

★  
*Current headlines emphasize the importance of the work outlined throughout International Security News.*  
★

## Baghdad Faces Up to Letting Back UN Inspectors

**Russia and the Arab world** are urging Saddam Hussein to readmit United Nations weapons inspectors to Iraq to avoid a large-scale American attack. After three years of refusing to deal with UN arms inspectors, a high-level Iraqi delegation will meet with the leader of the inspection commission, Hans Blix. Diplomats and UN officials said that the agreement to meet indicates the concern Iraq has that the threat of an American attack is real, if not imminent. About 230 inspectors from dozens of countries have been trained or are now in training to work in Iraq, Dr. Blix said.

Many of Iraq's critics believe Hussein blocked the return of inspectors after they came too close to discovering the true extent of Iraq's arsenal of chemical and biological weapons and long-range missiles. In their eight years in Iraq, weapons inspectors found evidence of anthrax and the deadly VX nerve gas.



In a March 7 meeting, UN Secretary General Kofi Annan made it clear that Baghdad has no choice but to comply with UN resolutions requiring the elimination of its nuclear, chemical, and biological weapons programs. Annan pressed Iraq to account for Kuwaitis who disappeared during the

*Baghdad Faces Up - Continued on page 9*

### Australia Donates to IAEA Fund against Nuclear Terrorism

**Australia** will make a contribution of 100,000 Australian dollars to a fund being established by the IAEA in Vienna to support international efforts to address the threat of nuclear/radiological terrorism.

[excerpted from a 6 March media release from the office of Foreign Affairs Minister, [www.FT.com](http://www.FT.com) Financial Times (BBC), March 7, 2002]

### North Korea Accuses US of Jeopardizing Nuclear Accord

**North Korea threatened to end a 1994 agreement** to freeze its suspected nuclear weapons program, slamming what it called an "antagonistic" US attitude. Under the 1994 Agreed Framework, North Korea froze nuclear development suspected of supporting an atomic weapons program in exchange for receiving two nuclear energy reactors that produce less weapons-grade plutonium. The two reactors are currently under construction by a US-led international consortium. US officials say North Korea's exports of missile and other weapons technology endangers US security, a concern that has multiplied since the September 11 terror attacks. [Excerpted from SpaceDaily (Agence France-Presse), March 6, 2002]

## Russia Edges Closer to Importing Nuclear Waste

Russia's parliament took a step closer to importing nuclear waste from abroad by giving near-final approval for creating a special committee to oversee the controversial project. Putin last July signed a controversial law authorizing the import of nuclear waste, which could see Russia take in an estimated 20,000 metric tons of spent fuel from abroad once all the logistics are in place. Government studies say the project could earn Russia 21 billion dollars (24.1 billion euros) over the next 10 years. However the legislation has been vigorously opposed by environmental groups and some scientists who argue that Russia lacks the necessary equipment and finances to safely store nuclear waste. A recent report said that Russia had already accumulated 14,000 metric tons of high-grade nuclear waste from its own reactors and weaponry.

[excerpted from SpaceDaily (Agence France-Presse), March 6, 2002; Pavel Shevtsov (RIA), www.FT.com Financial Times, March 6, 2002]



## Data Show World Awash in Stolen Nuclear Material

Stanford researchers have compiled what they intend to be the world's most complete database of lost, stolen, and misplaced nuclear material. Nuclear physicist and arms control researcher Friedrich Steinhausler, who leads the Stanford group, initiated the database when he became alarmed over the unreliability of most of the available information.

The database is intended to help governments and international agencies track missing nuclear material worldwide, supplementing existing national programs that often fail to share information. [excerpted from Andrew Quinn, Yahoo! News (Reuters), March 6, 2002]



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## Baghdad Faces Up - Continued from page 8

Persian Gulf War in 1991 and made a commitment to assist in the search for Iraqi prisoners of war lost during the Gulf War. Iraq agreed to return some of the property it stole from Kuwait during its 1990 occupation of that country.

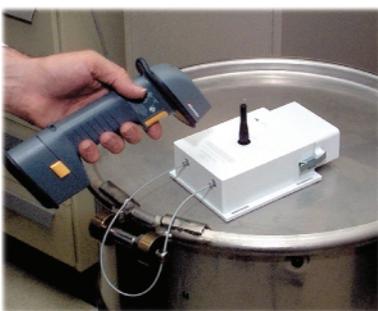
Annan told the UN Security Council that the Iraqis had asked for more information on the timetable for lifting sanctions if they agreed to allow arms inspectors to return. Iraq also wanted to talk about the patrolling of no-flight zones by the US and Britain over northern and southern Iraq and the establishment of a zone free of weapons of mass destruction across the Middle East. The last point is usually understood to mean disarming Israel, especially of nuclear weapons. (excerpted from Carola Hoyos, www.FT.com Financial Times, March 6, 2002; Barbara Crossette, www.nytimes.com, March 6, 2002; Barbara Crossette, www.nytimes.com, March 8, 2002; Colum Lynch, www.washingtonpost.com, March 8, 2002; Barbara Crossette www.nytimes.com, March 9, 2002; www.nytimes.com, March 10, 2002)

## Trilateral Initiative Is Response to NPT Article VI



*The Treaty on the Nonproliferation of Nuclear Weapons (NPT)* provides the legal basis for applying safeguards to peaceful nuclear activities. The institution responsible for applying safeguards is the International Atomic Energy Agency (IAEA). In addition to safeguards, the treaty calls for negotiations on nuclear disarmament. Specifically, Article VI of the treaty reads: “Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament and on a treaty on general and complete disarmament under strict and effective international control.”

In 1993, as part of his nonproliferation policy, US President William Clinton announced that, in order to demonstrate the irreversibility of the disarmament process, nuclear material that had been deemed excess to US requirements for its nuclear deterrence would be made available for international inspections, presumably by the IAEA. In 1996, Russian Federation (RF) President Yeltsin pledged to make available for IAEA verification 50 metric tons of weapons-origin plutonium. The specified plutonium had been declared excess for military purposes and was designated to be stored in the new Mayak Fissile Material Storage Facility.



An electronic seal on a fissile material container may be part of a verification regime under the Trilateral Initiative.

In September 1996, the Secretary of Energy of the United States, the Minister of Atomic Energy of the RF, and the Director General of the IAEA established the Trilateral

Initiative in response to these offers to consider the practical implications of placing excess defense materials under IAEA verification. The participants noted the importance of these commitments from

the US and Russia as a significant contribution to the fulfillment of the “Principles and Objectives” agreed upon at the 1995 *Nuclear Nonproliferation Treaty (NPT)* Review and Extension Conference. The importance of these commitments was reinforced at the 2000 *NPT Review Conference*.

A working group was formed to consider technical, legal, and financial issues. Implementing the Trilateral Initiative may appear to be just a small step toward addressing Article VI but conveys to parties of the NPT that the two major weapon states take seriously their commitment to disarmament.

The Trilateral Initiative is working toward a verification regime with two objectives:

1. Verification of declarations made when fissile material is submitted for IAEA verification
2. Monitoring to assure that declared material remains removed from weapons programs

Much of the fissile material to be placed under IAEA verification is still in classified form and therefore is not accessible for traditional IAEA inspections that would be carried out under the *Voluntary Offer Agreements* in each country.

The legal basis for IAEA verification of weapon-origin and other fissile material released from defense programs will be a bilateral agreement between each participating country and the IAEA. The pattern for these agreements will be a *Model Verification Agreement* that is under negotiation. Although the negotiations have progressed rather smoothly, several important issues must be agreed to by the parties before further progress can be made:

- Establishment of termination criteria under which Trilateral Verification ends and the material transfers to another regime or no further verification is required

*Trilateral Initiative continued on page 11*

- Establishment of the relationship between the Trilateral Initiative and the *Plutonium Management and Disposition Agreement*, because both will apply to the same material
- Agreement by both the US and the RF on the level of symmetry that will be acceptable with respect to the timing, types, and amount of fissile material that each places under IAEA verification

At the present time, neither the US nor the RF has announced the scope or timing for placing material under IAEA verification.

A plan for funding this new IAEA verification regime has been deferred until a number of important legal and technical issues are resolved. This funding plan is the responsibility of the IAEA, in consultation with the other two parties. The plan is anticipated to be brought before the IAEA Board of Governors this year.

Efforts are under way to complete the technical criteria for the IAEA to follow in the implementation of the verification regime. Technical working groups have made substantial progress in the design and development of measuring instruments to verify attributes of the material without revealing classified characteristics to an inspector. The verification techniques for classified forms have been agreed upon at the conceptual level, and work has begun on prototype equipment. The attributes to be measured include plutonium, a weapons-grade plutonium threshold, and a mass threshold. Of interest is the fact that the RF is concerned about not revealing the isotopic content of its weapons-grade plutonium, whereas the United States is concerned about not revealing mass. To provide unclassified results of attribute measurements to an inspector, information barriers are being developed. The information barriers allow for only “green light/red light” observations.

The general technical requirements for a highly reliable inventory monitoring system to address the

second objective have been developed and provisionally agreed to by the parties. Since the stored inventory could be in tens of thousands of containers, one challenge has been determining a method to provide continuity of knowledge for such an inventory in a highly reliable manner. A key requirement in the case of equipment failure is that a loss of continuity of knowledge occur only for a small portion of the inventory. A layered and segmented approach to monitoring was developed to answer this need.

Sandia provides support for the Trilateral Initiative in several ways. Dennis Mangan of Cooperative International Programs Department 5320 is a Senior Technical Advisor to the US delegation and participates in the Technical Working Groups and the plenary sessions of the Joint Working Group. Sandia led the formulation of the design of the highly reliable Inventory Monitoring System (IMS). The high reliability is achieved through the Layered and Segmented System Organization (LASSO). LASSO provides redundant monitoring equipment to prevent or minimize loss of continuity of knowledge of monitored items in the event of equipment failures.

The concepts for the IMS are embodied in the *Technical Criteria for an IMS* that has been provisionally agreed to by the Parties. In November 2000, Sandia hosted a *Trilateral Technical Workshop on Inventory Monitoring Systems* where concepts, technologies, and development strategies were discussed. Nine RF delegates, seven IAEA representatives, and twenty-three US representatives attended the workshop. Technical exchanges like this workshop are building understanding and confidence among the parties.

The Trilateral Initiative is overcoming difficult issues related to international control of excess fissile material from dismantled nuclear weapons. The initiative is but one necessary step along the road to achieving international confidence that nuclear-weapon states are pursuing nuclear arms reductions and ultimately nuclear disarmament, as promised in Article VI. Source: Douglas Smathers 6512, MS 0455, 505-845-9334, fax 505- 844-9641, dcsmath@sandia.gov

being continually reviewed and expanded to meet current world threats. To meet the needs of these extrabudgetary requirements, the IAEA turns to its member states. The Member State Support Program that provides the greatest percentage of this support is the USSP.

The USSP provides extrabudgetary assistance for research and development projects to resolve technical safeguards questions and thereby assists the IAEA in its mission to verify that nuclear material placed under IAEA safeguards is not diverted for nonpeaceful purposes. The USSP is primarily funded through the US Program of Technical Assistance to IAEA Safeguards (POTAS), but additional funding is provided by the Nonproliferation and Disarmament Fund of the Department of State (DOS), the Office of International Safeguards of the National Nuclear Security Administration (NNSA), the Nuclear Regulatory Commission (NRC), and the Department of Defense (DOD).

POTAS originated in 1977 with a bill passed by Congress authorizing \$5 million over a five-year period to fund research and development on behalf of IAEA Safeguards. Funding, which is provided through the Foreign Assistance Act, thereafter rose steadily to \$10.2 million, where it has remained since 1993.

The USSP is managed by the International Safeguards Project Office (ISPO) at Brookhaven



**This environmental monitoring station** is part of IAEA monitoring systems implementation.



**Team members** inspect a spent fuel cooling pond during an IAEA site visit.

National Laboratory. Policy oversight is provided in Washington, DC, by the Subgroup on Safeguards Technical Support (SSTS), an interagency committee that decides which tasks requested by the IAEA will be approved. The SSTS is composed of representatives of NNSA, DOD, DOS, and NRC.

USSP provides equipment, training, software, and human resources support to IAEA staff for USSP-sponsored tasks. Research and development tasks are carried out by the national laboratories and the private sector. Two current tasks supported by Sandia include the Mobile Monitoring System for Container Transportation at the Chernobyl Nuclear Power Plant and the development of a Data Review Station for managing Sandia-developed electronic seals in remote monitoring applications. These projects are discussed in separate articles in this issue.

In recent years, the USSP sponsored many tasks designed to assist the IAEA in developing programs in environmental monitoring, remote monitoring, and information technology. As a result, the IAEA has been able to quickly implement its environmental monitoring program and is proceeding with evaluations and field tests of remote monitoring and information systems. Sandia has traditionally provided significant support in enhancing the containment and surveillance capabilities of the IAEA. Source: Don Glidewell 5323, MS 1361, 505-844-9261, fax 505-284-5437, ddglide@sandia.gov

## IAEA Physical Protection



The IAEA physical protection program focuses on providing assistance to member states through training courses, through expert visits to provide technical and regulatory advice, and through technical assistance to improve facility physical protection systems. Sandia's International Safeguards and Technical Applications Department 5323 provides critical support to the IAEA in each of these areas.

**Training:** The IAEA training program is designed to improve protection of nuclear material by ensuring that member states have access to the appropriate physical protection methodologies and technologies. The cornerstone of this training program is the biennial International Training Course (ITC) on Physical Protection taught by Sandia National Laboratories in Albuquerque. The course defines the performance-based methodology for design and evaluation of physical protection that has been adopted by the IAEA.

In addition to the ITC, several courses focusing on different aspects of physical protection have been developed and taught by Sandia National Laboratories. These include a Design-Basis Threat (DBT) Workshop and the Vital Area Identification Workshop. Other courses have been planned and are under development.



**The new external access control portal** constructed at the VVR-SM reactor facility at the Institute of Nuclear Physics in Ulegbeg, Uzbekistan

**Technical and Regulatory Advice:** Effective physical protection systems are considered essential to the prevention of the theft of nuclear material. In 1996, the International Physical Protection Advisory

Service (IPPAS) was established by the IAEA to help combat illicit trafficking in nuclear material. The IPPAS program is a fundamental part of the Agency's effort to assist its member states to establish and to maintain effective physical protection systems.

Upon request, the IPPAS program assists IAEA member states with an appraisal of their national systems for physical protection of facilities that contain nuclear

materials. This appraisal includes a national-level review of the legal and regulatory framework for physical protection and a facility-level review of the physical protection measures and procedures in place to implement that framework.

Sandia National Laboratories has been a primary participant in the establishment and conduct of the IPPAS mission. Of the 13 IPPAS missions performed to date, Sandia has participated in 11. Currently, Sandia is developing performance-based procedures for the IPPAS missions in support of an IAEA request.

*IAEA Physical Protection continued on page 16*

## Physical Protection Bilateral Visits Program



Since 1974, a US interagency team supported by experts from Sandia National Laboratories has conducted over 120 physical protection evaluation visits to some forty countries. In total, the visited countries possess over 3000 kilograms of US-origin highly enriched nuclear material, and the purpose of each visit was to ensure that the US nuclear material is adequately protected. A determination of adequacy of protection for US-origin material is required by the *Nuclear Nonproliferation Act* of 1978 (section 128). Source: David R. Ek 5323, MS 0759, 505-845-9891, fax 505-844-0011, drek@sandia.gov

## Physical Protection Upgrades for the Uzbekistan VVR-SM Reactor



A highly enriched uranium (HEU)-fueled VVR-SM nuclear reactor is located at the Institute of Nuclear Physics (INP) in

Ulegbeg, Uzbekistan, near Tashkent. Between 1996 and 1998, Sandia National Laboratories provided physical protection upgrades at the INP. In September 2000, citing the 1999 terrorist acts in Tashkent attributed to the Islamic Movement of Uzbekistan (IMU) and potential takeover threats against this nuclear facility, the president of the Uzbekistan Academy of Sciences, Dr. Bekhzod S. Yuldashev, urgently requested assistance from the United States Government for additional security enhancements for the INP reactor facility. In early 2001, the US agreed to provide additional assistance for physical protection upgrades at the INP, and the National Nuclear Security Administration (NNSA) selected Sandia to conduct this program. The

program plan projected a completion date in late Spring 2002.

Following the events of September 11, 2001, the US National Security Council (NSC) directed that the program be accelerated. In turn, Sandia hastened the shipment of materials and their installation at the INP, ensuring that the new physical protection capabilities would be available by the end of February 2002. The upgrades were installed by Advantor Corporation and Uzbekistan INP employees, who worked continuously from November 22, 2001, the date the equipment arrived in Tashkent.

Under this program, the VVR-SM reactor facility has received both internal and external upgrades to

*Physical Protection Upgrades continued on page 15*

## Linton Brooks, NA-20, Visits SNL



Linton Brooks, the recently confirmed Deputy Administrator for Defense Nuclear Nonproliferation (NA-20) in the National Nuclear Security Administration (NNSA), visited Sandia on January 30 and 31, 2002. At a well-

attended all-hands colloquium, Ambassador Brooks presented an overview of his vision for the Defense Nuclear Nonproliferation programs. Brooks indicated the programs were receiving strong support from Congress and the Administration and that funding for FY02 and FY03 looks very good. He discussed the profound impact of the September 11 events and the results and implications of recent Administration reviews of the Russian Programs. Brooks then outlined the National Security Council's recently released recommendations regarding the Plutonium Disposition program and the transfer of responsibility for the Plutonium Production Reactor Agreement from DOD to NA-20.

The remainder of the visit consisted of briefings, tours, and discussions of Sandia's participation in NA-20 programs. The first afternoon focused on Sandia's activities supporting NNSA's Office of Nonproliferation and International Security (NA-24). Brooks toured the Cooperative Monitoring Center where Sandians discussed ongoing efforts in Regional Security, International Safeguards, Warhead and Fissile Material Monitoring, and Russian Transition Assistance through the Nuclear Cities Initiative (NCI) and the Initiatives for Proliferation Prevention (IPP). The next morning was devoted to discussions of Sandia's activities in support of NNSA's Office of Nonproliferation Research and Engineering (NA-22), including tours of satellite payloads and data processing centers. The remainder of the visit concentrated on Sandia's efforts in support of NNSA's Office of International Material Protection and Cooperation (NA-25), with an emphasis on Sandia's role as lead lab for physical protection. Source: Larry Walker 5320, MS 1363, 505-845-9145, fax 505-284-5974, lswalke@sandia.gov; Holly Dockery 5350, MS 0788, 505-284-3913, fax 505-844-6067, hadocke@sandia.gov

## Sandia Hosts Lab Directors Meeting

Paul Robinson, Director of Sandia National Laboratories (SNL), hosted a meeting for weapon laboratory directors from the US and Russia on April 14 through 16, 2002. The highly successful meeting was held at Bishop's Lodge in Santa Fe, New Mexico. The purpose of the meeting was to recognize the ten-year milestone of scientific exchange between the laboratories and to discuss the future of collaboration in the areas of science and combating terrorism under the new strategic relationship between the US and Russia.

Meeting participants included National Nuclear Security Administration (NNSA) Administrator John Gordon and Deputy Administrators Everet Beckner and Linton Brooks and Russian Ministry of Atomic Energy

(MINATOM) First Deputy Minister Lev Ryabev and Division Head Natalia Klishina. Directors and deputy directors of the NNSA weapon laboratories, SNL, Los Alamos National Laboratory (LANL), and Lawrence Livermore National Laboratory (LLNL), exchanged ideas with their counterparts from MINATOM weapon institutes, the All-Russian Scientific Research Institutes of Automatics

(VNIIA), of Experimental Physics (VNIIEF), and of Technical Physics (VNIITF).

As a result of discussions on basic science collaboration, Administrator Gordon tasked the three US laboratory directors to identify two or three areas of interest fitting under the NNSA Defense Programs campaign for collaboration. Gordon also pledged to propose specific areas of potential collaboration to First Deputy Minister Ryabev and committed to identifying fiscal year-2003 funding for those activities.



**Attendees at the lab directors meeting** pause for a photo in front of Bishop's Lodge in Santa Fe.

In the area of combating terrorism, the participants decided to organize a workshop in June in Moscow under existing US-Russian agreements. The workshop will establish a baseline of

nuclear material detection requirements that would drive the development of detection capabilities under collaborative efforts. Dori Ellis will act as the US point of contact for the workshop, with each laboratory identifying a representative to participate in the workshop organizing committee. Source: Dori Ellis 5300, MS 1211, 505-845-3077, fax 505-844-8814, deellis@sandia.gov



**The Institute of Nuclear Physics** building in Ulegbeg, Uzbekistan

*Physical Protection Upgrades continued from page 14*

its physical protection capabilities. These upgrades include the replacement of outdated computer systems and a failed uninterruptible power supply in the Central Alarm Station. Further, ten wooden doors leading to internal target areas within the VVR-SM building have been replaced with security doors, a new sensed external detection fence has been installed, and a new external access control portal has been constructed. Source: Roger S. Case, Jr. 5352, MS 0788, 505-844-5139, fax 505-844-6067, rscase@sandia.gov

## Calendar: Visits, Workshops, and Conferences

**April 13-21** Albuquerque, NM: SNL hosts VNIIA for Hydrided Film meetings at the CMC. (NA-24) Carla Busick 2564, 505-844-9281

**April 18-20** Albuquerque, NM: Sandia National Laboratories' Twelfth International Arms Control Conference: *Implications of 9/11 on National Security and the Path Forward to Peace* held at the Sheraton Uptown Hotel. (SNL; NA-241; DOS) James Brown 5302, 505-284-5047 or 972-661-3261

**April 20-27** Albuquerque, NM: SNL hosts VNIITF, NNSA, LANL, ORNL, and LLNL for HEU Purchase review meetings at the CMC. (NA-23/HEU TIP) Randy Salyer 5326, 505-844-9056

**May 28-30** Kirchberg, Luxembourg: ESARDA (European Safeguards Research and Development Association) 24th Annual Meeting: *Safeguards and Nuclear Material Management: R&D Responses to the New Safeguards Environment* workshop will be held at the European Commission Conference Centre.

**June 1-8** Washington, DC: SNL and DTRA host VNIIA, MINATOM, and MOD/12th GUMO delegates for TOBOS program review at the DTRA Cooperative Monitoring Research (CMR) facility in Rosslyn, VA. (DTRA/TDA) Greg Mann 5327, 505-844-6795

**June 23-27** Orlando, FL: Institute of Nuclear Materials Management 43rd Annual Meeting. John Matter 5323, 505-845-8103 (INMM Vice President)

**September 8-13** Salzburg, Austria: Institute for Physics and Biophysics, University of Salzburg, Austria, in cooperation with and supported by the European Commission, Brussels, Belgium; LLNL, USA; European Forum, Institute for International Studies, Stanford University, USA; Austrian Institute for European Security Policy, hosts the EU-High Level Scientific International Conference on Physical Protection: *Strengthening Global Practices for Protecting Nuclear Material*.

**September 29 – October 2** London, England: *International Response to Nuclear/Radiological Terrorism* conference/workshop. (NA-25, Jack Caravelli) Holly Dockery 5350, 505-284-3913

*Data Review Station continued from page 6*

case is tampered with and cannot be accessed or altered.

The Data Review Station is scheduled for delivery to the IAEA in July 2002, and its first real-world application is expected to be at the K-Area Materials Storage facility at the Savannah River Site. Source: Don Glidewell 5323, MS 1361, 505-844-9261, fax 505-284-5437, ddglide@sandia.gov

*IAEA Physical Protection continued from page 13*

*Facility Upgrades:* As a result of issues identified in IPPAS missions, the Department of Energy has offered assistance in upgrading physical protection of facilities through Sandia National Laboratories. To date, six facilities have been upgraded based on IPPAS mission recommendations. Source: David R. Ek 5323, MS 0759, 505-845-9891, fax 505-844-0011, drek@sandia.gov

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