



International Security News

International Security Programs
Dori Ellis, Director

Nonproliferation and the Civilian Nuclear Fuel Cycle

From the Director

In the past year many world leaders, including US President George W. Bush and International Atomic Energy Agency Director General Mohammed ElBaradei, have highlighted the proliferation risks associated with the civilian nuclear fuel cycle. At the same time, recognition is growing of the important role nuclear energy can play in meeting global energy needs and in reducing tensions over competition for scarce energy resources.

This issue of the International Security News focuses on nonproliferation and the civilian nuclear fuel cycle. The articles highlight many of the ways Sandia National Laboratories is addressing the reduction of proliferation risks while ensuring that nuclear energy remains a viable element in the global energy mix. International collaborations and partnerships focus on both technological and diplomatic approaches to promoting nonproliferation of the civilian nuclear fuel cycle.

Sandia's Fourteenth International Security Conference *Strengthening the Nuclear Nonproliferation Regime: Focus on the Civilian Nuclear Fuel Cycle* held in April 2005 distinguished itself by engaging many who hold a stake in the future of global nuclear energy. The thrust of the conference was to solicit a diverse range of international perspectives, to examine whether technological approaches offer opportunities for reducing proliferation risk, and to define an agenda for future action and analysis. This issue's guest editorial is taken

directly from a keynote address to the conference presented by Dr. José Goldemberg of Brazil. Dr. Goldemberg expresses his perspective on the production and possession of nuclear weapons.

Sandia is a founding participant in the Global Nuclear Futures Initiative (GNFI), an effort led by the directors of seven Department of Energy (DOE) national laboratories. GNFI is designed to promote a comprehensive plan to ensure the development and deployment of nuclear energy in the US and other countries around the world, while reducing the risks of nuclear weapons proliferation and nuclear terrorism, as well as reducing hazardous impacts to the environment and the population’s health.

With Sandia’s nuclear energy experts in the Nuclear and Risk Technologies Center, the International Security Center collaborates around the world to address nonproliferation of the civilian nuclear fuel cycle. (See descriptions on page 3.) Nonproliferation collaborations with the Russian Federation and in East Asia are highlighted in this newsletter to provide a picture of what Sandia is doing to focus on this issue.

Successful implementation of the nonproliferation mission at Sandia requires a diverse set of capabilities above and beyond technical excellence. This issue of the newsletter highlights an example of how the International Security Center’s business infrastructure supports Sandia’s nonproliferation work.

Dori

Nonproliferation and the Civilian Nuclear Fuel Cycle

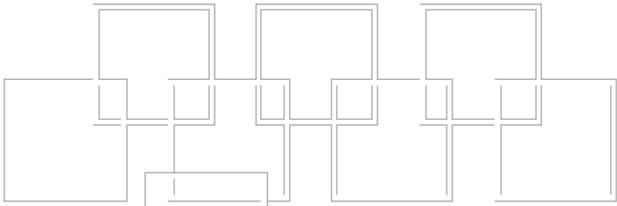
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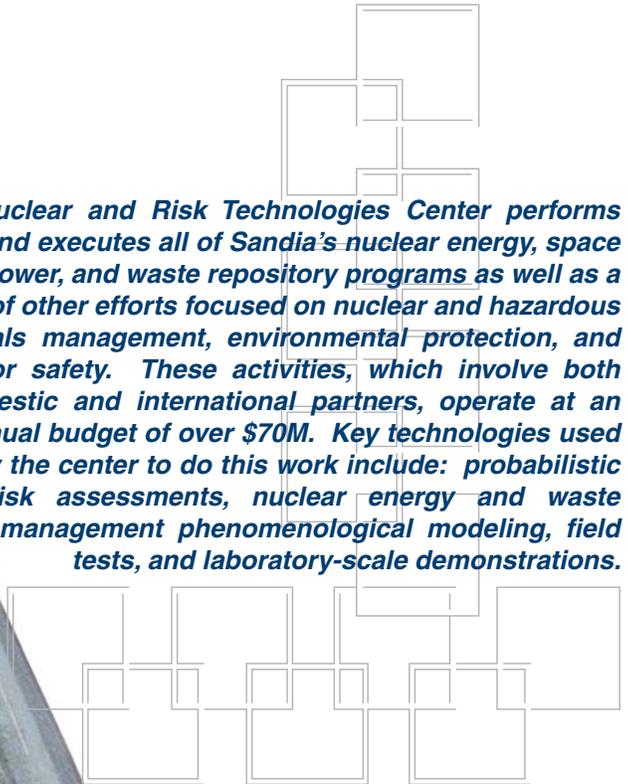
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The International Security Center at Sandia focuses on international cooperation as the means to reduce the threat of weapons of mass destruction proliferation and terrorism. The center's activities range from enhancing the security of nuclear and radiological materials through physical security and regulatory regimes, to creating awareness and standards in biosecurity, to addressing border monitoring issues, to reducing regional tensions through confidence-building measures. The center is examining the nonproliferation issues associated with increased global interest in nuclear energy and the emergence of new safeguards technologies. With a budget of \$97M, the International Security Center supports the NNSA Office of Nuclear Defense, the Defense Threat Reduction Agency, the Department of Homeland Security, the World Health Organization, and other customers.



Sandia's Nuclear and Risk Technologies Center performs research and executes all of Sandia's nuclear energy, space nuclear power, and waste repository programs as well as a variety of other efforts focused on nuclear and hazardous materials management, environmental protection, and reactor safety. These activities, which involve both domestic and international partners, operate at an annual budget of over \$70M. Key technologies used by the center to do this work include: probabilistic risk assessments, nuclear energy and waste management phenomenological modeling, field tests, and laboratory-scale demonstrations.



Giving Up Nuclear Weapons - Lessons Learned from the Past

José Goldemberg
Professor, University of São Paulo
and
Secretary for the Environment
State of São Paulo, Brazil

José Goldemberg delivered the keynote address from which this editorial is derived to the Sandia National Laboratories Fourteenth International Security Conference Strengthening the Nuclear Nonproliferation Regime: Focus on the Civilian Nuclear Fuel Cycle. The conference was held April 4 through 6, 2005, in Chantilly, Virginia. Dr. Goldemberg's full address is available online at: <http://www.intlsecconf.sandia.gov/goldembert_05isc.pdf>.

In the mid-1960s, the United States, the Soviet Union, the United Kingdom, France, and China were the only countries to possess nuclear weapons. In 2005, at least India, Pakistan, and Israel should be added to that list. Several other countries have flirted with such weapons: Sweden, South Africa, Brazil, Argentina, Libya, Taiwan, Iran, Iraq, South Korea, and North Korea. This list indicates that President Kennedy's nightmarish vision of a world with "fifteen, twenty, or twenty-five nuclear powers" was not very far off. In almost all of these countries the bureaucratic self-aggrandizement of the nuclear establishment has played an important role.

By the end of the 1960s, widespread testing of nuclear weapons in the atmosphere by the US and the Soviet Union sparked serious concern about radioactive fallout and led to the banning of such tests. At the same time, the increased destructive power of nuclear weapons convinced the two great nuclear powers that a proliferation of nuclear states was totally undesirable and should be prevented. Together they succeeded in approving the Nonproliferation Treaty (NPT) in 1968.

Immediately after the NPT entered into force in 1970, an array of instruments was put in place to avoid proliferation efforts, including the activities of the International Atomic Energy Agency (IAEA), the Nuclear Suppliers Group (NSG), and even sanctions. They did work to some extent but did not deter India from exploding a nuclear device in 1974 and Pakistan

in 1998, not to mention that Israel has had such weapons for a long time. In the same vein, despite all existing restrictions on the movement of nuclear materials that could lead to weapons, Iraq had an advanced nuclear program, which was dismantled after 1991.

The rationale behind the refusal of Argentina and Brazil to join the NPT was to keep the nuclear option open. It is therefore not surprising that Brazil and Argentina initially followed a path similar to those of India and Pakistan and others that started with nuclear reactors for power production. In Brazil, Westinghouse installed the Angra I reactor in 1968. In the mid-1970s a huge West Germany-Brazil nuclear deal was signed, which was supposed to lead Brazil in 20 years to complete nuclear independence, including reprocessing and enrichment. This deal crumbled under US pressure and its own weaknesses. Brazil has abundant hydroelectric resources, so the deal never made much sense from an economic viewpoint.

When the US under the Carter Administration canceled the supply of enriched uranium to the Angra I reactor, the Brazilian military started three uncoordinated parallel programs in the Navy, the Air Force, and the Army. Such programs were viewed with great suspicion by the United States, and it probably didn't pass unnoticed by the Carter administration that the military government in power at the time had ambitions for development of weapons. For that

reason, access to some modern technologies was made unavailable to Brazil, and Brazil was placed on a surveillance list of countries suspected of conducting secret programs for the production of nuclear weapons.

By 1990, the political situations in Argentina and Brazil changed dramatically, with the end of military regimes and the election of civilian presidents. The return of democratic rule to Brazil and Argentina, by itself, changed the priorities of governments that were hard pressed by economic concerns and social pressures. The response was to abandon expensive prestige-seeking programs such as the nuclear one. Argentina and Brazil quickly negotiated an agreement, very similar to the EURATOM system, whereby the two countries established their own agency for the control of nuclear materials, which signed agreements with the IAEA. Shortly afterward, both countries joined the NPT.

What one can learn from these experiences in avoiding a nuclear path is that only the removal of the reasons why states proliferate is effective. For example, when it became clear that South Africa was not going to suffer a total onslaught of black Africans, its nuclear weapons program was abandoned. Sweden had concluded a long time before that there was no pressing reason to go that way. Brazil and Argentina realized that their dreams of grandeur, of becoming great powers served more civilian and military special interest groups than the interests of the nations.

Denuclearization is a difficult goal to achieve but the above examples show that it can be achieved by removing the causes that drive nations to become nuclear states.

José Goldemberg has played a central role in moving Brazil toward full compliance with the nonproliferation regime and has been a strong advocate for continuing commitment. Dr. Goldemberg currently holds the position of Secretary for the Environment for the State of São Paulo. He has also served as president of the Energy Company of the State of São Paulo, Secretary of Science and Technology for Brazil, Minister of Education for Brazil, and Acting Secretary for the Environment for Brazil. Dr. Goldemberg has served as President of the Brazilian Association for the Advancement of Science, on the advisory board of the Alliance for Global Sustainability, on the environmental advisory board of Asea Brown Boveri (ABB), as chairman of the World Energy Assessment, and as chairman of the board of the International Energy Initiative. Dr. Goldemberg's memberships have also included the World Commission on Dams, the Brazilian Academy of Sciences, the Third World Academy of Science, and the National Council for Energy Policy of Brazil.

José Goldemberg earned his PhD from the University of São Paulo (Brazil) after receiving a Bachelor of Science at the same university and completing graduate work in physics at the University of Saskatchewan (Canada) and the University of Illinois. Dr. Goldemberg, the author of many technical articles and books about nuclear physics, the environment, and energy, has served as rector of the university and director of the Institute of Physics in addition to his current position of full professor of physics at the University of São Paulo. Dr. Goldemberg has held a professorship and/or served as a research associate at the University of Paris (Orsay), the University of Toronto (Canada), Princeton University, the International Academy of the Environment (Geneva, Switzerland), and Stanford University.

Honors received by Dr. Goldemberg include DSc "Honoris Causa" by Technion (Israel Institute of Technology), corecipient of the Mitchell Prize for Sustainable Development (US), establishment of the José Goldemberg Chair in Atmospheric Physics at Tel Aviv University (Israel), and corecipient of the VOLVO Environment Prize 2000.

Opinions expressed by guest editors are not necessarily the opinions of Sandia National Laboratories.



Leaders around the world and across the ideological spectrum agree that the global nonproliferation regime is facing a serious test. The emergence of sophisticated terrorist networks, black markets in nuclear technology, and technological leaps associated with globalization have conspired to threaten one of the most successful examples of international cooperation in history.

Although experts readily concede the existence of many pathways to proliferation, the threat posed by the misuse of the civilian nuclear fuel cycle has received considerable recent attention. From the possibility of diversion or theft of nuclear material or technology to the use of national civilian programs as a cover for weapons programs – what many have called *latent proliferation* – the fuel cycle appears to many to represent a glaring proliferation vulnerability. Some fear that the NPT has been or could be used to legally develop the knowledge and tools necessary for a nuclear weapons program. These latent nuclear weapon states could then withdraw from the NPT without consequence, a scenario referred to as *breakout*.

Just as recognition of these risks is not new, neither is recognition of the many positive benefits of nuclear energy. In fact, a renewed interest in exploiting these benefits has increased the urgency of addressing the risks. Global energy demand is expected to at least double by the middle of the century and could increase even more quickly. This growth in demand is paralleled by concerns about global warming and the long-term reliability of carbon-based fuel supplies, concerns that expanded use of nuclear power can help to address. For these reasons and others, many countries in Asia have already clearly signaled that nuclear energy will play a key role for years to come.

Any successful approach to resolving these issues will require the creative input of experts from both the nuclear energy and the nonproliferation communities. Against this backdrop, Sandia National Laboratories (SNL) organized its Fourteenth International Security Conference

(ISC) around the theme *Strengthening the Nuclear Nonproliferation Regime: Focus on the Civilian Nuclear Fuel Cycle*. The conference was held April 4 through 6, 2005, in Chantilly, Virginia, just outside Washington, DC. The goal of the conference, which was attended by approximately 125 participants from fifteen countries, was to begin a constructive dialogue between the nuclear energy and nuclear nonproliferation communities.

The ISC agenda was structured to produce a systematic review of the connection between civilian nuclear energy programs and the proliferation of nuclear weapons and to identify constructive approaches to strengthen the nonproliferation regime. The conference began by reviewing the energy and security context that has raised the profile of this issue once again. A discussion of the risks associated with the civilian nuclear fuel cycle informed the analysis of several potential risk-management tools. The conference concluded by looking for lessons from the past as well as looking forward to future opportunities, with a particular focus on East Asia. Panelists sought to put the proliferation risk of the civilian nuclear fuel cycle into a larger perspective and addressed their concerns with several proposals for managing the risk.

The following key judgments reflect points on which the conference organizers believe participants and panelists were able to reach substantial consensus:

- The civilian nuclear fuel cycle is not the greatest risk to proliferation.
- Distinguishing between positive and negative tools for managing the risk is necessary.
- Further restrictions on trade could be counterproductive.
- Technological solutions have limited value in reducing risk.
- Multinational approaches such as confidence-building measures have both proponents and critics.
- Reducing demand for nuclear weapons is critical.

Recommendations for practical steps that could be taken in the near term fell into three general categories:

reinforce and strengthen existing mechanisms, increase incentives for countries not to develop the entire fuel cycle, and decrease the risk of breakout.

Reinforce existing mechanisms Pushing for universal compliance with the Additional Protocol and strengthening states' abilities to implement and enforce existing export control mechanisms were recommended as being important near-term priorities. Offering technology cooperation that could advance nuclear energy programs or enhance nuclear security in exchange would be in the interests of all parties and was viewed as more likely to succeed than negative tools that focus only on prohibition and denial. Strengthening the physical security for facilities containing sensitive material and technology should also be pursued. In addition, some suggested that more robust use of the Proliferation Security Initiative for interdiction of suspicious shipments would be more effective than imposing additional restrictions on trade.

Increase incentives for not developing the entire fuel cycle Some argued that the highest priority should be placed on the development of solutions for spent fuel disposition as a way to reduce incentives for near-term reprocessing. They argued that overcoming political barriers to new international approaches should be a near-term goal. Others argued that a high priority should be placed on developing methods to increase the confidence in the existing market to provide fuel supplies well into the future. They also suggested encouraging trade within the legitimate nuclear market as a way to limit clandestine activities. Some suggested that the prospect of increased technical cooperation could be an incentive to forgo development of the entire fuel

cycle. Topics for technical cooperation could include proliferation-resistant fuel cycles, physical security, and nuclear safety.

Decrease the risk of breakout Most participants agreed that the problem of states withdrawing from the NPT after acquiring the means to produce fissile materials was a threat that the tools discussed during the conference largely failed to address. Systematically looking at breakout scenarios for fuel cycle states and assessing the institutional, legal, and security mechanisms that might inhibit withdrawal, or at least limit its consequences, was suggested as a worthwhile exercise. Negotiating and implementing a fissile material cutoff treaty was suggested as a means to universally ban the production of fissile material for weapon purposes. Its associated verification regime could also allow increased monitoring of enrichment and reprocessing facilities. Some also suggested developing another addition to IAEA safeguards that would make safeguards commitments irreversible. This would preclude states from keeping unsafeguarded material or facilities after withdrawal from the NPT.

Although none of the above judgments were unanimously endorsed, all received substantial support from both nuclear energy and nonproliferation experts. Undertaking additional work involving both communities, particularly focusing on the specific issues affecting East Asia, offers the promise of a growing international consensus on the most useful, sustainable paths to reducing the proliferation risk of the civilian nuclear fuel cycle.

Source: Arian Pregoner 6920, MS 1373, 505-844-4967, fax 505-284-5055, alprege@sandia.gov; David Saltiel 6924, MS 1373, 505-844-0231, fax 505-284-5055, dhsalti@sandia.gov

More details on the conference agenda and many of the presentations are available at the conference website:

<<http://www.intlsecconf.sandia.gov/>>

US and Russia Plan Nonproliferation Partnership



Representatives of three US nuclear weapons laboratories and three Russian Federation nuclear weapons institutes met in Moscow, Russia, on April 25 through 28, 2005. The purpose of the meeting was to discuss the potential partnership agreed upon in the May 2004 meeting of the directors of those organizations. (See “US-Russian Partnership for Enhancing Responses to Nonproliferation Challenges” on page 12.) Specific objectives for this meeting were agreed upon in advance and included the following:

1. To understand current thinking by the US and Russian nuclear weapons laboratories regarding the nonproliferation of nuclear materials and technology
2. To review current technical work being undertaken in support of overall nonproliferation policy, the IAEA Safeguards/Additional Protocol, and domestic technical needs
3. To identify and discuss possibilities for collaborative technical work in nonproliferation that would be supported by both the US and Russian governments and would leverage the existing work and expertise at the laboratories and institutes

During the meeting, representatives of SNL, Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), the All-Russian Scientific Research Institute of Automatics (VNIIA), the All-Russian Scientific Research Institute of Experimental Physics (VNIIEF), and the All-Russian Scientific Research Institute of Technical Physics (VNIITF) heard presentations and engaged in discussions on current activities at the institutes and laboratories that have been sponsored both through various internal programs and through joint programs. Participants reviewed methodologies for assessment of proliferation resistance in civilian



Inaugural meeting of the six-lab partnership on enhancing responses to future nuclear nonproliferation challenges

fuel cycles. Technical extrinsic proliferation-resistant features in civilian fuel cycles were identified, such as safeguards and export controls, as they apply to mining, milling, conversion, and enrichment. Participants also discussed technical extrinsic proliferation-resistant features that apply to reactors, spent nuclear fuel storage, recycling and reprocessing, waste disposal, and transportation.

Meeting participants identified future areas for technical collaboration to enhance responses to nonproliferation challenges. Vigorous and technically rich discussion addressed technical issues and opportunities for enhancing responses to nonproliferation challenges and the need to assure that technical advances will be meaningful in the context of current institutions, such as the IAEA, and constraints, such as economics.

The following general observations emerged during the April meeting. Institutes and laboratories are engaged in a wide spectrum of activities and technical efforts that are relevant to addressing current and future global nonproliferation challenges. US and Russian nuclear weapons laboratories have a special responsibility to play a key role in helping their respective governments and the international community to assess proliferation

risks associated with the future global use of nuclear energy. The history of successful technical collaborations indicates that coordinated efforts to address future nonproliferation challenges are likely to be productive. Scientific collaborations have been established, and the technology produced through these efforts to date is both relevant and effective. Treating technical safeguards measures and procedures as integrated systems and evaluating their effectiveness as systems is important. The full scope of nonproliferation challenges represents a multifaceted problem that includes both declared and undeclared activities, that must encompass measures taken at facility and regional levels, and that must look forward to the expanding global nuclear future.

Meeting participants identified a number of prospective areas for future nonproliferation collaboration. These range from specific technology development to the identification of overarching safeguards systems and integrated implementation strategies. The prospective areas for future collaboration include:

- the detection, identification, and categorization of dangerous materials and sensitive technologies
- the development of conceptual and specific technical approaches for enhancing international safeguards systems

- the limitation of the proliferation risk of current and future peaceful applications of nuclear technologies

The detection, identification, and categorization of dangerous materials and sensitive technologies first requires development of methodologies for identifying and prioritizing risks. Identification of technology gaps associated with current and future material and/or technology nonproliferation strategies is essential. The risks associated with a range of conceptual nuclear fuel cycle subsystems must be understood, including mining, enrichment, fuel fabrication, transportation, reactors, storage, reprocessing, and disposal. Finally, methods and procedures for detecting activities and/or facilities must be identified.

Enhancement of international safeguards systems requires development of conceptual and specific technical approaches. These approaches include discrete measurement and monitoring technologies, data acquisition and management, and integrated systems and systems analysis.

Limiting the proliferation risk of current and future peaceful applications of nuclear technologies requires developing and applying methods and criteria for evaluating proliferation risks. Tasks include identifying specific approaches for enhancing

US and Russia Plan continued on page 15

Laboratory Directors' Action Plan, July 2002

In July 2002, six national laboratory directors, subsequently joined by a seventh, wrote Secretary Abraham urging the DOE to implement a plan to develop nuclear energy and to manage nuclear materials. The action plan set forth three goals:

- Goal #1: Reduce air pollution and global climate risk and improve energy security by meeting an increasing fraction of future US and world energy needs through safe and economic nuclear energy solutions
- Goal #2: Achieve a 90-percent reduction of reactor waste requiring repository disposal by 2050 by significantly reducing the amount of uranium, plutonium, and minor actinides in disposed waste
- Goal #3: While expanding the use of nuclear technology worldwide, reduce the threat of nuclear weapons proliferation

Laboratory Directors Meeting, May 2004

At a meeting in May 2004, the nuclear weapons laboratories' directors called for the weapons laboratories to work together to provide support for strengthening the nonproliferation regime. With this direction, the three DOE nuclear weapons laboratories and three Russian nuclear weapons laboratories are working together in a strategic lab-to-lab partnership known as the 3x3 to enhance responses to current and future nuclear nonproliferation challenges.

2004 Lab Directors' Meeting

Moscow, Russia

The third meeting of the Directors of the U.S. and Russian nuclear weapons laboratories was held in Moscow May 17 - 18 2004. Senior administrators from the U.S. National Nuclear Security Administration and the Russian Ministry for Atomic Energy also attended.

The participants agreed that lab-to-lab engagements continue to be essential for enhancing nuclear weapons safety and security, developing hazardous materials detection systems, expanding scientific collaborations, and building confidence between the countries. The participants discussed expanding collaborations to address new international security threats. In particular, they discussed methods for strengthening international compliance with the Nuclear Nonproliferation Treaty, and proposed working together, on topics approved by both governments, to support the IAEA in this effort.

Finally, the participants congratulated Director Barmakov and the VNIIA Institute on the occasion of its 50th anniversary and thanked him for hosting an outstanding meeting.



NSA is a multi-program laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under Contract DE-AC04-94NA16000.





Toward a Global Nuclear Future

The time has come to develop a comprehensive and realistic plan to ensure the development and deployment of nuclear energy. Access to nuclear energy sources for all countries of the world must be preserved, while significantly reducing the risks of nuclear arms proliferation and nuclear terrorism, and hazardous impacts on environment and population health.



Toward a Global Nuclear Future
A Joint Document of Directors of Russian and U.S. National Laboratories -
State Research Centers
Concerning a Sustainable Nuclear Energy for the XXI Century

A Global Nuclear Future
vital to human civilization. It underpins national

growing growth in worldwide energy demands, countries, requires significant use of nuclear energy, nuclear energy must be safe, proliferation

It is possible where the world can achieve... The U.S. and Russia, as the founders... a worthy contribution, so that nuclear... both have a special responsibility in

It is the time to implement a comprehensive... vision will be an essential ingredient... of nuclear weapons proliferation

There is no doubt that there... Russia, given ever increasing... sources that fuel economic... understood in the develop

- A small amount... gasoline, mulls... nuclear water... years without... resources, c... facts.

Глобальные перспективы атомной энергетики
Совместное заявление директоров российских институтов и американских национальных лабораторий - государственных научно-исследовательских центров об устойчивой атомной энергетике для XXI века
Июль 2004
Создание мировой атомной энергетики будущего
Энергетика является важным для сохранения инновационной и мировой стабильности.
Ускорение роста мировых энергетических потребностей в сочетании со все более жесткими экологическими ограничениями приводит к необходимости широкого использования атомной энергии как в настоящее время, так и в будущем. Чтобы служить на благо человечества, атомная энергия должна быть безопасной, экологичной, чистой и надежной; кроме того, должны быть обеспечены как ее проблемы, так и устойчивость в распространении ядерных материалов.
Возможны в также будущее, когда мир сможет достичь глобальной и стабильности. Атомная энергетика является ключом к решению экологических проблем.
Настало время для создания и внедрения в жизнь всемирной атомной энергетической системы, ориентированной на выживание и развитие ядерной энергетической системы. Этот план ставит атомной энергия будет соответствующим образом создавать условия для мирной атомной энергетической системы. Такой план может быть реализован при сотрудничестве ученых и специалистов распространения ядерного оружия, ядерной безопасности или нежелательных последствий на окружающую среду и здоровье населения.
Факты
Принимая во внимание... которые оказывают... безопасности.



NNSA Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-04-OR21400.

Energy Summit, July 2004

An energy summit in July 2004 was supported by the seven DOE national laboratories and nine Russian nuclear energy laboratories. The summit resulted in a joint statement of principles for action and a vision for the future. The summit called for a new paradigm to jointly develop a comprehensive and realistic plan to ensure the development and deployment of nuclear energy, accessible as an energy source for all countries of the world, while significantly reducing the risks of nuclear arms proliferation and nuclear terrorism and minimizing hazardous impacts on the environment and population health.

US-Russian Partnership for Enhancing Responses to Nonproliferation Challenges



US and Russian nuclear weapons laboratories are establishing a strategic partnership in direct response to recent calls to action from President Putin of Russia, President Bush of the United States, and other international leaders:

The world must create a safe, orderly system to field civilian nuclear plants without adding to the danger of weapons proliferation... Proliferators must not be allowed to cynically manipulate the *Treaty on the Nonproliferation of Nuclear Weapons* to acquire the material and infrastructure necessary for manufacturing illegal weapons.

*President George W. Bush,
On Weapons of Mass Destruction and Proliferation,
National Defense University, February 2004*

We need to renovate and improve the UN mechanisms... We should reliably block the ways for spreading of nuclear weapons... But more importantly, the incineration of plutonium and other radioactive elements creates prerequisites for the final solution of the radioactive residues problems. It opens up fundamentally new horizons for secure life on the planet.

*President Vladimir V. Putin,
Address to Millennium Summit,
September 6, 2000*

It is time to begin designing a framework more suited to the threats and realities of the 21st century. Nuclear energy systems should be deployed that... have built-in features that prevent countries from diverting material to weapon production, prevent misuse of facilities... and facilitate efficient oversight to ensure continual peaceful use.

*Dr. Mohamed ElBaradei, Director General,
International Atomic Energy Agency, October 16, 2003*

We will develop new measures to ensure reliable access to nuclear materials, equipment, and technology, including nuclear fuel and related services, at market conditions, for all states, consistent with maintaining nonproliferation commitments and standards.

G-8 Sea Island Summit 2004

Since 1999, the directors of three US nuclear weapons laboratories (LANL, LLNL, SNL) and three Russian nuclear weapons institutes (VNIIEF, VNIITF, and VNIIA) have met periodically to review the progress of joint collaborations and to identify future areas of cooperative efforts. During the May 2004 meeting of US and Russian weapons laboratory directors, participants agreed to initiate a six-lab strategic partnership to enhance the nonproliferation of nuclear materials used in the nuclear fuel cycle.

In this partnership, the US and Russian nuclear weapons laboratories will address scientific and technical nonproliferation issues related to the continuing worldwide development of nuclear energy and the need to understand its implications in terms of managing the spread of nuclear materials and nuclear technology. The effort draws upon the core competencies of the six US and Russian nuclear weapons laboratories in a manner similar to past joint lab-to-lab initiatives in basic science and technology, combating terrorism, dismantlement transparency, and warhead safety and security. These laboratories possess unique technical capabilities and experiences that can be more effectively applied in a partnership with each other. Additional US national laboratories and Russian institutes will join and strengthen the partnership as it matures.

A joint laboratory steering committee has been formed to guide the partnership, to coordinate with government officials, and to ensure linkages to other global nonproliferation initiatives.

Source: Robert M. Huelskamp 6926, MS 1371, 505-844-0496, fax 505-284-8870, rmhuels@sandia.gov

Sandia Establishes Global Nuclear Futures Initiative



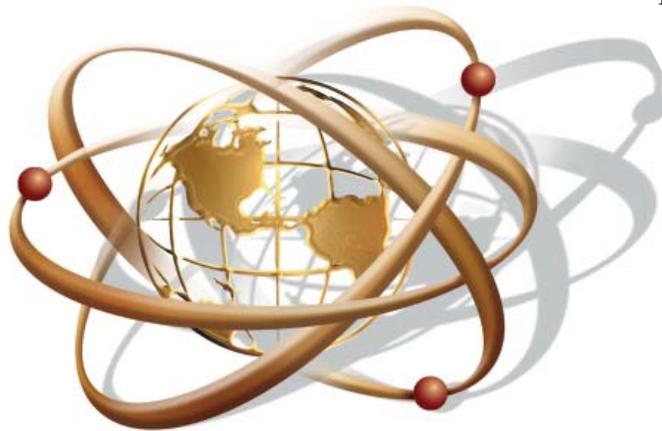
Over the years, Sandia National Laboratories' participation in the Global Nuclear Futures Initiative (GNFI) has been to address the nuclear nonproliferation, safety, and waste issues that are impeding the growth of nuclear energy in the United States. With the growth of nuclear energy globally, ensuring a safe, secure, sustainable, and proliferation-free future for nuclear energy, both domestically and globally, will require significant international cooperation. Countries such as France, Japan, China, Russia, and South Korea have moved boldly, with nuclear capacity additions planned well into the future. Cooperation with these countries as an integral part of GNFI is certainly in the US interest.

Strengthening domestic nuclear energy capabilities through international collaboration and engagement will provide the United States with the nuclear energy credibility necessary to help shape a secure, proliferation-free development path for civilian nuclear energy across the world. Perhaps even more than other technical and industrial activities, nuclear energy requires a global approach: Problems with nuclear safety, security, proliferation, and waste management anywhere pose a threat to peaceful nuclear programs everywhere. Developing universal standards and a worldwide consensus on these and other issues will be crucial to US security and energy security interests. In addition, partnerships will allow the United States to more fully benefit from revitalization of nuclear energy.

Even before GNFI was established, Sandia was pursuing projects that supported GNFI goals. These projects, which involve nuclear waste management, nuclear reactor safety, physical security, and nuclear nonproliferation, offer a substantial basis upon

which future work may be built. In all these areas, particularly nonproliferation, a primary focus of Sandia's work is the definition of global standards.

One of Sandia's projects is the East Asia Fuel Cycle Working Group. Working with regional partners the Republic of Korea, Japan, Indonesia, and China, Sandia has established a working group of nonproliferation and energy experts to investigate how to reduce the proliferation risk of the civilian nuclear fuel cycle in East Asia. Multilateral approaches will be a particular focus of the group's work. Additional technical cooperative projects within East Asia might be initiated through this venue. (Also see "Reducing Proliferation Risk in East Asia" on page 14.)



Sandia actively participated in the seven-laboratory directors' study on nuclear energy involving Argonne National Laboratory, Idaho National Laboratory, LLNL, LANL, Oak Ridge National Laboratory, and Pacific Northwest National Laboratory as well as SNL. In May 2005, the laboratory directors proposed a nuclear energy action plan: *Technology Leap to Power for the 21st Century*. The plan listed three goals: 1) to reduce air pollution and global climate risk and to improve energy security by meeting an increasing fraction of future US and world energy needs through safe and economical nuclear energy solutions; 2) to achieve a 90-percent reduction of reactor waste requiring repository disposal by 2050 by significantly reducing the amount of uranium, plutonium, and minor actinides in disposed waste; and 3) to expand the use of nuclear technology worldwide, while reducing the threat of nuclear weapons proliferation.

Source: Nancy Jackson 6901, MS 1376, 505-845-7191, fax 505-284-9043, nbjacks@sandia.gov

Reducing Proliferation Risk in East Asia



Although clearly a global issue, the proliferation risk of the civilian nuclear fuel cycle poses a particularly acute problem in East Asia. Analysts agree that Asia will experience the fastest, and possibly only, growth in nuclear generating capacity over the next two decades. China alone could construct forty new reactors by the middle of the century. Talk of the need for enrichment, reprocessing, and spent fuel management services has already begun and with that has come a growing concern about risk of proliferation.

The demand for nuclear energy is just one part of an unprecedented increase in overall energy demand in the region, of which China and India account for the largest part. Fueled by economic growth and the accompanying emergence of a middle class, energy needs have become top-tier security issues for many, if not most, of the states in the region. Militaries are being realigned to protect energy imports, and the hint of untapped reserves has reawakened long-slumbering territorial disputes in all directions. In a region long characterized by conflict and mistrust, competition over increasingly scarce energy resources only heightens tensions.

With a couple of notable exceptions, most Asian states are remarkably energy resource poor. This fact, taken in combination with the increasingly intense competition for imported resources, makes nuclear energy an extremely attractive option. Most states, however, are also lacking both uranium reserves and available land on which to construct spent fuel storage and disposal facilities – key elements of a robust, sustainable nuclear energy program. With energy security a growing concern and energy independence a much sought-after goal, countries in the region will very soon need to make decisions that will affect the course of both nuclear energy and nonproliferation regionally and globally.

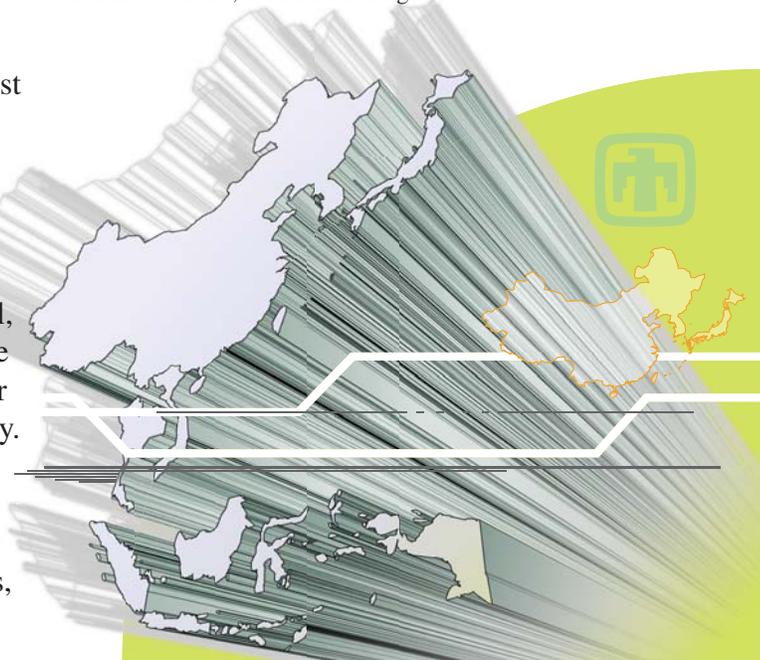
In the push for energy independence, states may pursue national control of the full fuel cycle, including enrichment and reprocessing capabilities, as Japan has done. Alternatively, states may seek

regional or global solutions to the supply of fuel cycle services. Both choices have implications for the nonproliferation regime and will need to be carefully considered. In either case, nonproliferation goals will likely have to be tied closely to the promotion of a sustainable nuclear energy enterprise.

In partnership with the Korean Nuclear Society, Sandia has begun studying this problem. In the first phase, nonproliferation and nuclear energy experts from around the region are being asked to contribute to a careful analysis of the fuel cycle service needs of the region. These experts will also identify the kinds of challenges a growing nuclear power sector poses to the nonproliferation regime.

Following this analysis, technical and conceptual ideas for reducing the proliferation risk will be explored and demonstrated. Ideas are expected to span from strengthened export controls to greater regional cooperation to advanced transparency tools. It is hoped that some of these new tools and ideas might not only reduce tensions and risk in Northeast Asia, where the nuclear industry is fairly mature, but also in Southeast Asia, where states such as Indonesia, Thailand, and Vietnam are just beginning to plan for nuclear energy programs.

Source: David Saltiel 6924, MS 1373, 505-844-0231, fax 505-284-5055, dhsalti@sandia.gov



APS Study on Nuclear Power Proliferation Resistance



The Nuclear Energy Study Group of the American Physical Society Panel on Public Affairs has issued a new report entitled *Nuclear Power and Proliferation Resistance: Securing Benefits, Limiting Risk*. This report examines technological steps that the US can take to enhance the resistance of nuclear power systems to theft, diversion, and breakout and to reduce the likelihood that a global expansion of nuclear energy would contribute to increased nuclear weapon proliferation. The technical steps will be most effective when coupled with changes in institutional arrangements.

The report provides several general recommendations:

1. Significantly strengthen the federal Technical Safeguards research and development program: increase resources, identify near-term technology goals, formulate a technology roadmap, and improve interagency coordination
2. Increase the priority of proliferation resistance in design and development of all future nuclear energy systems
3. Develop and strengthen international collaborations on key proliferation-resistant technologies
4. Align federal programs to reflect the fact that no urgent need exists to initiate reprocessing or to develop additional spent fuel repositories in the US



Source: Tom Sellers 6900, MS 1363, 505-284-9473, fax 505-284-5974, taselle@sandia.gov

The complete report can be downloaded from:

<http://www.aps.org/public-affairs/proliferation-resistance>

US and Russia Plan continued from page 9

proliferation resistance of current nuclear power reactors and other nuclear fuel cycle elements, e.g., strengthening extrinsic technical measures, and formulating ways to improve the extrinsic proliferation resistance of future reactor designs and other nuclear fuel cycle elements. Fuel cycle elements of interest include integrating nonproliferation strategies into the design phase of future fuel cycles, conducting joint reviews of vulnerability analyses, using actual data to validate results, using an example of a specific system as a test bed for assessing proliferation resistance and other nonproliferation issues, and strengthening the toolkit of extrinsic technical measures for future fuel cycles.

Source: Robert M. Huelskamp 6926, MS 1371, 505-844-0496, fax 505-284-8870, rmhuels@sandia.gov

Supporting International Collaborations Outside the US: CMC-Amman

The Cooperative Monitoring Center (CMC)-Amman was established at the Royal Scientific Society in October 2003. Recently Sandia staff, Patricia Dickens and Alan Runyan-Beebe, traveled to Amman, Jordan as representatives of the CMC to provide support for the CMC-Albuquerque's sister facility. Patricia is the team leader for the International Business Services Department, which has been responsible for the operation of the CMC in Albuquerque since 1995. Alan is the principal technologist supporting the installation and development of the international outdoor test facility at the CMC-Amman, which is similar to the test facility in Albuquerque. The CMC-Amman Director, Major General (retired) Mohammad Shiyab, warmly received the Sandia staff and shared the current status and future plans for the CMC-Amman and its successful interactions with other Middle Eastern partners.

Patricia met with the CMC-Amman's Head of Administration, Mrs. Amani Abu Ruqa'a, and the director's executive administrator, Mrs. Jumana Horsman, for an exchange of ideas and training on administrative operations. The week-long session

provided an invaluable opportunity for Sandia to gain insight regarding the cultural norms of our associates in the Middle East. The meetings included a complete review of the administrative processes and procedures developed and implemented in support of Sandia's International Security Programs, including conference management, tour guide training for the technology display area, the CMC Visiting Research Scholars Program, facility management, and foreign travel.

Mrs. Abu Ruqa'a presented a report on the performance of the CMC-Amman and the achievements of the numerous workshops and business collaborations hosted by the CMC-Amman. The center has made excellent progress toward achieving its mission of hosting several significant workshops. In collaboration with Sandia, the CMC-Amman has hosted the Advanced Workshop on Border Security Operations in the Middle East with the National Nuclear Security Administration (NNSA), the National Defense University, and the Defense Threat Reduction Agency (DTRA); the Amman Workshop on Radiological Issues in Iraq with NNSA, the Department of State, and the IAEA; the Iraq Workshop on Seismological

Amani Abu Ruqa'a (center) with the current CMC Visiting Research Scholars at Sandia Peak in New Mexico



Analysis conducted by the Arkansas Center for Earthquakes with NNSA and LLNL; and the Jordan Training Course on Cooperative Monitoring Technologies with DTRA. The center has become a vital resource in the region and is expected to further expand operations within the year.

The Sandia staff had an opportunity to visit with a former participant in the CMC's Visiting Research Scholars Program, General (retired) Mazen Qojas, who is now a director at the United Nations. General Qojas, a Visiting Research Scholar at Sandia in 1998, is the author of the CMC Occasional Paper, *Cooperative Border Security for Jordan: Assessment and Options* (SAND98-0505/8), which can be read at <http://www.cmc.sandia.gov/links/cmc-papers/sand-98-0505-8/sand-98-0505-8.html>. After so long a time, Alan and Patricia found it very rewarding to renew the business and friendship association with

General Qojas. The incredible hospitality of General Qojas contributed greatly to a very memorable trip and a valuable business experience.

For a second phase of the training, Mrs. Abu Ruqa'a visited the CMC at Sandia National Laboratories in June 2005 for a two-week follow-on session. She met with several members of the International Security Center staff and Sandia's International Procurement team regarding project and contract management; to review the Training Course for Cooperative Monitoring, financial administration, and infrastructure operations; and for an overview of the Visiting Research Scholars program and the CMC Technology Training and Demonstration area. Marcie Jordan, program lead for the Sandia Foreign Travel Office, hosted Amani for a two-day management training class.

Acronyms

ABB	Asea Brown Boveri	NA-241	Dismantlement and Transparency Division of the Office of Nonproliferation and International Security (DOE/NNSA)
ABSA	American Biological Safety Association		
CMC	Cooperative Monitoring Center	NA-242	Global Security Engagement and Cooperation Division of the Office of Nonproliferation and International Security (DOE/NNSA)
DOE	Department of Energy (US)		
DTRA	Defense Threat Reduction Agency (US)		
EIVR	Exchange of Information by Visit or Report	NNSA	National Nuclear Security Administration (US)
GNFI	Global Nuclear Futures Initiative	NPT	<i>Treaty on the Nonproliferation of Nuclear Weapons</i>
IAEA	International Atomic Energy Agency	PI-31	Office of International Affairs (DOE)
IMPRSS	Integrated Management Program for Radioactive Sealed Sources in Egypt	SNL	Sandia National Laboratories (US)
INMM	Institute of Nuclear Materials Management	USAID	US Agency for International Development
ISC	International Security Conference	VNIIA	All-Russian Scientific Research Institute of Automatics
LANL	Los Alamos National Laboratory (US)	VNIIEF	All-Russian Scientific Research Institute of Experimental Physics
LLNL	Lawrence Livermore National Laboratory (US)	VNIITF	All-Russian Scientific Research Institute of Technical Physics
NA-10	Defense Programs (NNSA)		
NA-24	Office of Nonproliferation and International Security (NNSA)		

Lynn Fitzpatrick, manager of Sandia's Cooperative International Programs Operations Department, reviewed and enhanced the training manuals for the Jordan and Albuquerque sessions and presented an informative seminar on successful project proposal writing, a view of doing business with American companies. Mrs. Abu Ruqa'a commented that it gave her a better understanding and that the topic would be well received at one of the CMC-Amman workshops.

This collaboration involved the successful teaming of all areas of the International Business Service

Department to provide administrative support and outstanding customer service to Sandia's International Security Center and specifically to the Regional Security Program in the Middle East funded by the NNSA Office of Nonproliferation and International Security (NA-24). Patricia especially appreciates this tremendous opportunity afforded to the International Business Services Department by Dr. Mohagheghi, Program Manager of the Middle East Regional Security Program, and other technical staff, so that the department may better assist their programs.

Source: Patricia Dickens 60361, MS 1378, 505-284-5033, fax 505-284-5030, pdicken@sandia.gov

Information on the CMC-Amman and its activities can be found at

<http://www.cmc-amman.gov.jo>



(left to right) Amani Abu Ruqa'a, Patricia Dickens, and Jumana Horsman review training manuals at the CMC-Amman

Sandians Participate in 46th Annual INMM Conference

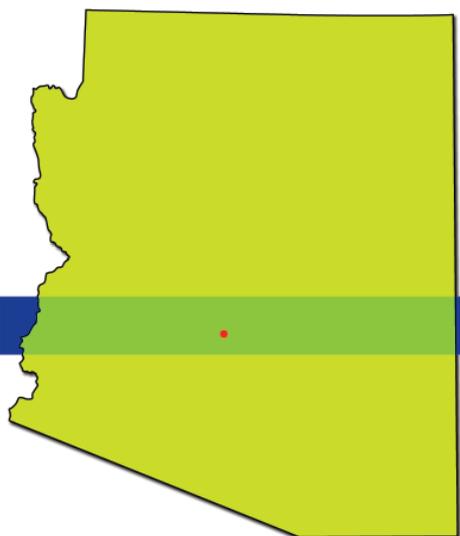
The 46th Annual Institute of Nuclear Materials Management (INMM) Conference, held July 10 through 14, 2005, in Phoenix, Arizona, was attended by a number of Sandians who presented papers, chaired topical sessions, and hosted special events. Sandians involved in planning the conference as INMM board members and committee chairs included Dennis Mangan, Technical Editor of the *Journal of Nuclear Materials Management*; Ken Sorenson, Packaging and Transportation Division Chair; and John Matter, Immediate Past President and Nominating Committee Chair.

Two center directors attended the conference: Dori Ellis of the International Security Center and Mike Hazen of the Safeguards and Security Center. Mike chaired the Physical Protection Security Systems topical session. Michael Vannoni, Regional Security and Multilateral Affairs Department, cochaired the session on Nonproliferation and Arms Control: Nuclear Material Management in South Asia: Potential for Cooperation. Jeffrey Danneels, manager of the Material Transportation Risk Assessment and Security Department, cochaired a session on Nonproliferation and Arms Control/Packaging and Transportation: Global Threat Reduction Initiative; and Richard Yoshimura, Material Transportation Risk Assessment and Security Department, chaired a session on Physical Protection/Packaging and Transportation: Detection Technologies and Methodologies.

Sandia presentations focused on the specific INMM technical divisions—International Safeguards, Materials Control and Accountability, Nonproliferation and Arms Control, Packaging and Transportation, and Physical Protection. Steve Ortiz, manager of Sandia's Security Technology Department, was elected Member at Large of the Executive Committee, with his term to begin October 1, 2005. John Matter, manager of Sandia's International Safeguards, Security, and Systems Engineering department, was named INMM Fellow at the awards banquet. John also hosted a chapter president luncheon for the individual chapter chairs, a new event at the annual conference.

As in past years, the INMM Japan Chapter visited various nuclear facilities prior to attending the annual INMM conference in Phoenix. Sandian Mark Aspelin escorted the visitors for the briefings and tours. The purpose of the bilateral visit was to familiarize the visitors with US nuclear programs and facilities related to nuclear material management. Sandians also took advantage of the opportunity to meet with many of their international colleagues during the INMM conference. Bilateral discussions were related to ongoing collaborative programs. Future opportunities for collaboration were also discussed at the various meetings.

Source: John Matter 6923, MS 1361, 505-845-8103, fax 505-284-54347, jcmatte@sandia.gov



46th Annual Conference

Phoenix, Arizona



Calendar: Visits, Workshops, and Conferences

November 28 – December 2 Albuquerque, NM: Sandia hosts IAEA representative at International Programs Building to discuss safeguards technology topics. (NA-242) Don Glidewell 6923, 505-844-9261

December 12-13 Albuquerque, NM: Sandia hosts the United Kingdom Atomic Weapons Establishment/Ministry of Defense, LANL, and LLNL for information exchange under EIVR-58. (NA-241) Dusty Rhoades 6927, 505-284-43419; Chris Aas 5925, 505-284-5792

February 7-9, 2006 Amman, Jordan: CMC-Amman hosts the American Biological Safety Association (ABSA) and Sandia National Laboratories for Train the Trainers Biosafety Workshop to train Iraqi scientists in modern laboratory biosafety concepts and procedures. The scientists will establish biosafety programs at their institutions and will form an Iraqi Biosafety Committee. A member of the newly formed committee will present progress on establishing biosafety in Iraq at the ABSA annual meeting in October 2006. Jennifer Gaudioso 6928, 505-284-9489

February 25 – March 9, 2006 Tucson, AZ, and Albuquerque, NM: Sandia hosts officials of the Egyptian Atomic Energy Authority at the Waste Management '06 conference in Tucson February 25 – March 2. At Sandia, the officials will participate in a semiannual program review of the IMPRSS (Integrated Management Program for Radioactive Sealed Sources in Egypt) project March 2-9. (USAID through DOE/PI-31) John Cochran 6143, 505-844-5256

February 2006 Albuquerque, NM: Sandia hosts the Distinguished Advisory Panel on Arms Control and Nonproliferation, a group of prominent experts in nonproliferation, regional security, and arms control that advises the International Security Center on programs and strategic initiatives. Nancy Jackson 6901, 505-845-7191

Spring 2006 Albuquerque, NM: Sandia hosts mid-career (under 40 years of age) experts from US national laboratories (SNL, LLNL, LANL) and Russian nuclear institutes (VNIIEF, VNIITF, VNIIA) from across various technical fields for a Next Gen Workshop to examine interdisciplinary issues. (NA-10) Jim Arzigian 6927, 505-844-2747

International Security News is on the Web
<http://www.cmc.sandia.gov/newsletter.htm>

International Security News is on the SNL Internal Restricted Network
<http://www.csu836.sandia.gov/organization/div6000/ctr6900/newslet/newslet.htm>

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