

Operating Efficiently / Engaging Globally

FY 2013 Annual Report



Office of
**Nonproliferation
and International
Security (NIS)**



“Peace with justice means pursuing the security of a world **WITHOUT** nuclear weapons...”

President Barack Obama at the Brandenburg Gate, 19 June 2013

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Operating Efficiently / Engaging Globally

The U.S. Department of Energy/National Nuclear Security Administration's (DOE/NNSA) Office of Nonproliferation and International Security (NIS) serves an essential role in fulfilling the nation's commitment to nonproliferation. Our analysts are uniquely situated to integrate policy expertise and technical understanding as we engage with multiple partners to help ensure nuclear materials, technology, and knowledge are used strictly for peaceful purposes within the United States and around the globe.

To ensure success in meeting our obligations with external partners, in Fiscal Year (FY) 2013 we placed an emphasis on looking internally for ways we can improve our own efficiency. We conducted comprehensive reviews of our export control functions as well as our Next Generation Safeguards Initiative. The goal of each review was to determine whether NIS is properly aligned and allocating resources to address current threats and challenges.

In addition, we are examining our crosscutting policy functions that benefit all aspects of our organization. We need to be certain that our policy understanding is fully incorporated into our technical and engagement activities. We also have been taking a more disciplined approach to our project management practices and documenting consistent program plans across our activities.

As we assessed our operations to improve how we accomplish our mission, we have remained dedicated to our ongoing responsibilities. On any given day, NIS is working with agencies across the U.S. Government, U.S. National Laboratories, bilaterally with more than 70 foreign governments around the globe, and multilaterally with organizations such as the International Atomic Energy Agency (IAEA) and the Nuclear Suppliers Group.

NIS is present in every hemisphere. This year we brought a 20-year agreement with Russia to its successful conclusion, celebrated 25 years of coordination with Japan, formalized coordination with Kazakhstan, tested nuclear safeguards technologies in the Netherlands, trained law enforcement personnel in Kenya, helped Mexico join the Nuclear Suppliers Group, reviewed export license applications from U.S. corporations, and much more. We advise, train, coordinate, and support hundreds of officials, dozens of countries, and many organizations that share our nation's interest in nuclear nonproliferation.

It is a great honor to lead an organization that has such significant reach and impact on helping to prevent nuclear terrorism. I invite you to read our FY 2013 Annual Report to learn more about our significant accomplishments in nonproliferation and international security during FY 2013.



Kasia R. Mendelsohn
Assistant Deputy Administrator
DOE/NNSA Office of Nonproliferation and International Security

“The threat of nuclear terrorism is **REAL**, and the global nuclear security system needs to be **STRENGTHENED** in order to counter that threat.”

Director General Yukiya Amano, International Nuclear Security Conference, 1 July 2013

Office of Nonproliferation and International Security

Mission

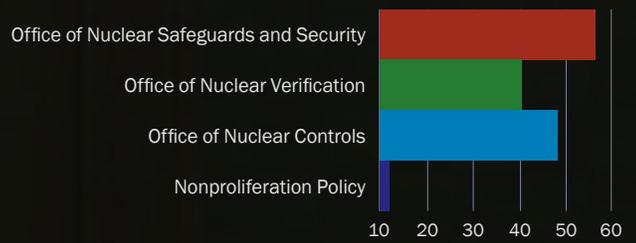
Prevent the proliferation of nuclear weapons, material, technology, and expertise

NIS plays a critical role in meeting the following objectives as detailed in the DOE Strategic Plan:

- Enhance nuclear security through defense, nonproliferation, and environmental efforts
- Reduce global nuclear dangers
- Enhance nonproliferation efforts and the security of nuclear materials
- Support the President’s arms control and nonproliferation agendas



NIS FY 2013 Program Funding (Millions)*



Total NIS Budget = \$154,534M.

*FY 2013 amounts shown reflect the P.L. 112-175 continuing resolution level annualized to a full year.

NIS supports NNSA efforts to prevent and counter the proliferation or use of weapons of mass destruction (WMD), including materials, technology, and expertise, by state and non-state actors. NIS focuses on strengthening the nonproliferation regime to reduce proliferation and terrorism risks by applying its unique technical and policy expertise to execute programs that:

- Safeguard and secure nuclear material and facilities to prevent diversion, theft, and sabotage;
- Facilitate legitimate nuclear cooperation by strengthening domestic and global capacity to control the illicit transfer of WMD dual-use material, equipment, technology, and expertise;
- Develop policy and technical solutions for transparent nuclear reductions and treaty monitoring and compliance; and
- Develop crosscutting policy and technical solutions and programs and strategies to reduce nuclear dangers.



Office of Nuclear Safeguards and Security



Preventing the diversion, misuse, theft, or sabotage of nuclear materials and facilities is a pressing international nuclear security priority. The NIS Office of Nuclear Safeguards and Security has two major program components to face these challenges: the Next Generation Safeguards Initiative (see pages 5–9) and International Nuclear Security Program (see pages 10–11). These two programs work in concert to institute nuclear safeguards and security practices to promote international confidence in the peaceful uses of nuclear energy. Their activities also help mitigate the threat of proliferation and nuclear terrorism.



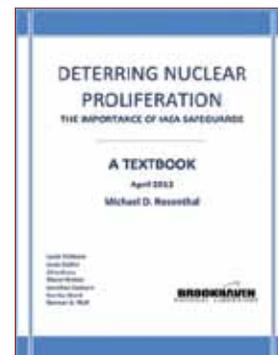
Next Generation Safeguards Initiative (NGSI)

NGSI uses multiple methods to strengthen the capability of the IAEA to address global nuclear safeguards and security issues. One area of focus has been on encouraging the next generation of safeguards professionals. In FY 2013, through the Human Capital Development (HCD) subprogram, NGSI sponsored ten university safeguards and nonproliferation courses for academic credit as well as eight short courses on policy and technical safeguards topics for students and professionals. NGSI also supported over 50 internships and post-graduate fellowships on safeguards projects at the U.S. National Laboratories. The NGSI HCD-sponsored textbook titled *Deterring Nuclear Nonproliferation: The Importance of IAEA Safeguards* was published in April 2013. The book can be downloaded free of charge at <http://www.bnl.gov/gars/NNS/IAEAtextbook.php>.

Additionally in FY 2013, NGSI initiated a second iteration of its international safeguards workforce staffing study, first published in 2010, which provides an empirical data set on the size, occupations, work activities, educational background, age, and

core capabilities of the scientist and engineer workforce supporting safeguards projects across the U.S. National Laboratory complex. In tandem with this effort, NGSI launched a multiyear knowledge capture effort focused on cataloguing, evaluating, and disseminating HCD-developed educational resources and projecting training needs for efforts in the future. NGSI continues to work with international partners to advance the safeguards human capital effort, including fostering student exchange opportunities and supporting the IAEA Nuclear Safeguards and Security Education and Training (NuSaSet) initiative, the Institute of Nuclear Materials Management, and the European Safeguards Research & Development Association.

Other NGSI subprograms described on the pages that follow help develop policies and technologies as well as encourage new concepts and approaches for safeguarding nuclear material and facilities.



The NGSI HCD-sponsored textbook titled *Deterring Nuclear Nonproliferation: The Importance of IAEA Safeguards* was published in April 2013. The book can be downloaded free of charge at <http://www.bnl.gov/gars/NNS/IAEAtextbook.php>.

Safeguards by Design

NGSI promotes moving the concept of “Safeguards By Design” from a slogan to standard practice for integrating safeguards into the design process of a new nuclear facility. The main objectives are to:

- Avoid costly and time-consuming redesign work or retrofits of new nuclear facilities; and
- Make the implementation of international safeguards more effective and efficient at nuclear facilities.

To aid facility designers and operators, NGSI has developed a series of guidance documents posted on the NNSA website in FY 2013: www.nnsa.energy.gov/safeguardsbydesign.





International Nuclear Safeguards Engagement Program (INSEP): First Engagement with Burma

As a subprogram of NGSI, INSEP cooperates annually with more than 25 bilateral and regional partners on over 100 technical projects to strengthen the international safeguards system. Among other activities, INSEP provides technical support to other countries as those countries develop the indigenous safeguards infrastructure necessary for effective nuclear material stewardship.

For example, in January 2013, INSEP supported DOE/NNSA in its first joint workshop on international safeguards and the IAEA Additional Protocol with the Myanmar Ministry of Science and Technology's Department of Atomic Energy (MOST/DAE). The workshop was attended by officials from MOST/DAE, the Ministry of Foreign Affairs, other ministries, and included participation from the U.S. Department of State and the IAEA.

The workshop promoted awareness of the international safeguards system, including the requirements and necessary infrastructure for the implementation of the IAEA Additional Protocol and the modified Small Quantities Protocol, in support of President Thein Sein's statement in November 2012 announcing his government's intention to conclude an Additional Protocol with the IAEA and to implement the text of the modified Small Quantities Protocol.



INSEP supported DOE/NNSA in its first joint workshop with government agencies in Burma as the country begins to establish its safeguards infrastructure.

DOE/NNSA and MOST/DAE also discussed additional opportunities for continued collaboration in the area of safeguards, which were captured in a joint roadmap.

A second workshop on the Additional Protocol held in August 2013 reflected Burma's commitment to continue nuclear safeguards collaboration.

NIS and Permanent Coordinating Groups (PCGs)

PCGs are formal mechanisms for annually reviewing areas of collaboration and cooperation between two parties. In FY 2013, INSEP supported PCG meetings with Brazil, Euratom, France, Indonesia, Japan, Korea, and Kazakhstan.

The PCG with Japan is the longest running; in FY 2013, we commemorated 25 years of formal cooperation.

The PCG with Kazakhstan is notable for being formally established in FY 2013 after many years of working together on nonproliferation issues. At the request of Kazakhstan, NIS is helping to develop national regulations for the physical protection of nuclear material, a unique opportunity to help a country develop a set of laws from the ground up.



Safeguards Technology Development

Another subprogram under NGSI, Safeguards Technology Development, supports the development of new technologies and their transition from laboratory to the field. In FY 2013, the subprogram's activities included field testing two technologies for uranium enrichment monitoring and pursuing alternate methods for neutron measurement.

Technologies to Strengthen Enrichment Plant Safeguards

NIS partnered with Euratom, the European Commission's safeguards inspectorate, to field test two promising new uranium enrichment monitoring technologies at a gas centrifuge enrichment plant (GCEP) in Almelo, the Netherlands. The resulting measurement campaign was the largest of its kind ever performed on uranium hexafluoride (UF_6) cylinders at an operational GCEP. The campaign and subsequent data analyses will help to validate and improve technologies with the potential to strengthen international safeguards applied to one of the most proliferation-sensitive types of nuclear facility.

The NGSI-developed Passive Neutron Enrichment Meter (PNEM) from Los Alamos National Laboratory and the Hybrid Enrichment Verification Array (HEVA) from Pacific Northwest National Laboratory enable prompt, full-volume measurements of UF_6 cylinders, allowing for more timely, accurate, and reliable verification of their contents.

Urenco, a multinational nuclear fuel company that runs the plant in the Netherlands, provided facility access, support to the NIS measurement team, and transportation of 45 cylinders for the measurement campaign. To achieve a proper stress test of the capabilities of the two technologies, each cylinder contained a unique, unspecified mixture of un-enriched gas, enriched gas, and radioactive byproducts. Urenco also included cylinders with reprocessed, non-homogenized, or very old UF_6 , each of which presents a set of significant measurement challenges for technology developers.

To take full advantage of this unique collaboration and commercial measurement opportunity at Almelo, representatives from Euratom and the Joint Research Centre (JRC)-Ispra participated in the testing campaign, which also included observers from the IAEA. While Euratom representatives evaluated gamma-ray detectors currently used by inspectors for enrichment verification, representatives from JRC-Ispra took measurements with Helium-3 ($He-3$) alternative technologies currently under development. This unprecedented combination of measurement approaches on UF_6 cylinders will allow for a direct, side-by-side comparison of old and new technologies, advancing joint capabilities for cylinder verification.

The UF_6 cylinder measurement campaign and subsequent data analyses will help validate and improve safeguards technologies that could be used at proliferation-sensitive nuclear facilities.

The measurement campaign in FY 2013 was the largest of its kind ever performed on UF_6 cylinders at an operational GCEP.





Building Solutions and Partnerships for Next Generation Neutron Detectors

Demand for He-3 gas for scientific and global security applications has exceeded its supply, which has resulted in the depletion of He-3 stockpiles and a consequent shortfall in its availability. NIS has been working to mitigate the impact of the He-3 supply shortage on international nuclear safeguards for several years.

The IAEA and regional safeguards inspectorates rely heavily on neutron assay techniques, and in particular, on coincidence counters for the verification of declared nuclear materials under safeguards and for monitoring purposes. While He-3 was readily available, the reliability, safety, ease of use, gamma-ray insensitivity, and high intrinsic detection efficiency of He-3 based detectors obviated the need for alternative detector materials. However, the shortage of He-3 has led to efforts to develop and field neutron detectors that make use of alternative materials.

In FY 2013, NIS efforts in this area included construction of the world's first neutron coincidence well counter based on boron-10, a comprehensive evaluation of a commercial boron-10 prototype neutron collar, and expert investigations into the feasibility of several other alternative detector materials for common measurements performed by international safeguards inspectors.

In addition, NIS launched an engagement effort to join forces with international partners pursuing complementary research and development to ensure that inspectors can perform critical safeguards verification measurements as the He-3 required by current instruments becomes unobtainable. In June, presentations and hands-on demonstrations served as the centerpiece of a workshop hosted by NIS at Los Alamos National Laboratory as part of an Action Sheet with Euratom, the regional safeguards inspectorate for the European Commission (EC). In addition to experts from NIS and Euratom, participants included scientists from the IAEA, the EC's Joint Research Centre, the Japan Atomic Energy Agency, the DOE/NNSA Office of Nonproliferation Research and Development, and the University of Michigan.

Participants exchanged information on their work to date and discussed requirements and best practices for evaluating detector performance in realistic measurement scenarios. The workshop also successfully identified opportunities for collaborative measurements and field trials with international partners next year to demonstrate technologies in real-world operating conditions and bring them closer to full deployment.

NIS is advancing the state-of-the-art for international safeguards neutron measurements using boron-10 through construction of the high-level neutron counter boron.





Safeguards Policy: IAEA Transit Matching Workshop

As an NGSF subprogram, Safeguards Policy leverages top U.S. safeguards experts to develop policies that ensure the IAEA international safeguards system can continue to provide confidence in the peaceful uses of nuclear energy.

In FY 2013, the Safeguards Policy Approaches Treaty Implementation and Education (SPATE) team conducted a small workshop on current IAEA and Member State approaches to matching imports and exports of nuclear materials for safeguards purposes. The IAEA refers to this matching process as “transit matching,” whereby IAEA matches declarations of shipments and receipts of nuclear material within non-nuclear weapons states (NNWS) and between nuclear weapons states (NWS) and NNWS.

Discussion at the NGSF workshop centered on how transit matching is used for IAEA safeguards, the U.S. experience with transit matching, and potential areas of improvement for transit matching. The meeting included a former IAEA transit matching expert and representatives from the Nuclear Regulatory Commission, NNSA Nuclear Materials Management and Safeguards System, and U.S. National Laboratories. The group identified several opportunities for improving transit matching including developing best practices for Member State reporting, standardizing reporting among NNWS and NWS, and expediting transmittal of reports to the IAEA and responses to IAEA queries where possible. Following the workshop, NGSF met with the IAEA Section responsible for transit matching to discuss the results and possibilities for future collaboration.

Transit Matching

In 2012, the IAEA received approximately 600,000 inventory change report entries generated by 55 Member States as part of the transit matching system. Typically, 3,000-4,000 transfers every quarter cannot be matched using the IAEA’s machine-based and human-based matching. In those cases, the IAEA sends Quarterly Import Communications and Semi-annual Statements to States to resolve the unmatched transfers. NGSF decided to examine current transit matching processes because in some cases, the matching process can take months if not years to resolve. While the IAEA handles transit matching separately from material transfer information provided under other arrangements (i.e., the Additional Protocol, Voluntary Reporting Scheme, INFCIRC/153 paragraphs 34(a) and 34(b) source material), all of this information is considered part of the IAEA’s State Level Approach.



International Nuclear Security (INS)

Within the Office of Nuclear Safeguards and Security, the INS Program has a three-pronged mission:

- Ensure the physical protection of U.S.-obligated nuclear material at foreign facilities,
- Train and engage with partner countries on matters of physical protection, and
- Provide technical and policy support to the IAEA.

During FY 2013, the INS Program led U.S. interagency physical protection assessment visits at 12 facilities in five countries to ensure that U.S. nuclear material exported to foreign countries is secure.



INS facilitates Regional Training Courses such as this course held in collaboration with the Japan Atomic Energy Agency that involved physical protection training for implementing the recommendations contained in INFCIRC/225/Rev.5.

In FY 2013, the INS Program trained roughly 500 officials in 44 countries through 24 courses (16 delivered on a bilateral basis and 8 in cooperation with the IAEA).

In the areas of training and engagement, the INS Program initiated capacity-building engagement in three new countries in addition to the ongoing cooperation with 11 countries. The INS Program also continued its strong partnerships with Japan and the Republic of Korea in developing and implementing their nuclear security Centers of Excellence.

In support of the IAEA, the INS Program provided subject matter experts for document and curriculum development as well as instructors for training courses in the areas of Insider Threat, Design Basis Threat, Cybersecurity, and INFCIRC 225/Rev 5. In addition, INS physical protection experts participated in four IAEA International Physical Protection Advisory Service (IPPAS) missions in Member States to review the security practices of their nuclear material and associated

facilities. INS experts also contributed to the development of two documents for IAEA's Nuclear Security Series (NSS): one on Cybersecurity and two implementing guides to accompany INFCIRC/225/Rev 5 for the *Physical Protection of Nuclear Material and Nuclear Facilities*.

In an advisory capacity to IAEA, INS experts represented the United States on the IAEA's Nuclear Security Guidance Committee (NSGC), which reviews, approves, and oversees the development of NSS documents and also provided the U.S. representative to serve as a member of the IAEA's Advisory Group on Nuclear Security (AdSec), which advises the Director General on current and emerging issues in nuclear security.

A person in a uniform is using a handheld radiation detector on a vehicle. The scene is dimly lit with a blue tint. The person is holding the detector up to the side of a vehicle. The detector has a small screen and a probe. The vehicle has some markings on it, including the number '4'.

Office of Nuclear Controls



Nations, terrorist groups, and insurgents are persistent in their attempts to obtain radiological and nuclear materials, technologies, and knowledge. Through science and technology collaboration, training, and partnerships, the Office of Nuclear Controls works with foreign and domestic partners to enhance global capacity to prevent the spread of WMD-related materials, equipment, technology, and expertise to those who would use them for harm.

In the area of nuclear forensics, the Office of Nuclear Controls strengthens the analytical capability of foreign partners so they are able to determine more effectively the source of intercepted material, which in turn helps deter illicit trafficking. Two specific activities in FY 2013 aimed at enhancing nuclear forensics abilities and strengthening technical exchanges included a joint technical forensics project on uranium age-dating initiated with China in April and a nuclear forensics workshop co-sponsored with the European Commission and the Government of Thailand under the Association of Southeast Asian Nations (ASEAN) Regional Forum (ARF) in September 2013 in Bangkok.

The Office of Nuclear Controls also provides technical support for U.S. Government export licensing and interdiction

activities as well as technical training for U.S. enforcement agencies to help prevent the exploitation of the U.S. industrial base by proliferators.

As an active member of interagency working groups supporting the Australia Group (AG) and the Missile Technology Control Regime (MTCR), the Office provides top-flight technical analyses on proposals to update their control lists. Further, these analyses often are used at regime meetings to help policymakers better understand technically complicated concepts so they can properly balance nonproliferation concerns and commercial/humanitarian trade. A case-in-point was the Office's analysis of the proposal to add spray-drying equipment to AG controls. Here—based in large part on the Office's scientific analysis—only biological proliferation-relevant spray dryers were added to the list; those necessary for powdered milk production were carved-out. This was the first time a new category of equipment was added to the AG control list in over a decade.

Additional ways that the Office of Nuclear Controls helped strengthen U.S. and foreign partner WMD export control systems during FY 2013 are highlighted on the following pages.

Licensing and Interdiction

In FY 2013, experts in the Office of Nuclear Controls reviewed U.S. export applications and technology procurements to prevent the transfer of critical military and dual-use technologies, equipment, or software that pose a real or potential threat to national security.

Number of statutorily mandated technical reviews of U.S. export applications	> 5,000	Number of annual technical reviews of foreign WMD-related technology procurements	> 3,000
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Strengthening Global Commodity Identification Outreach

In 2013, the International Nonproliferation Export Control Program (INECP) continued to support global efforts to prevent illicit transfers of materials, equipment, and technology related to WMD. Key to this effort is INECP's Weapons of Mass Destruction Commodity Identification Training (WMD-CIT), which trains frontline export enforcement officials to identify items whose trade between countries is regulated due to their potential WMD applications. Similarly, INECP's chemical/biological/radiological/nuclear explosive (CBRNe)-CIT effort trains frontline export enforcement officials to detect items non-state actors would need to build an improvised CBRNe device.

In 2013, INECP worked with a number of foreign partners so they could establish an independent WMD-CIT training capacity using local instructors. In February, the Japanese Ministry of Economy, Trade and Industry (METI) and Japanese Customs conducted their first WMD-CIT using Japanese instructors trained by INECP. The course was the culmination of a multiyear partnership between METI, Japanese Customs, and INECP aimed at strengthening the expertise needed to deliver WMD-CIT in Japan on a widespread basis.

During 2013, several other countries made progress towards developing the local cadre of instructors needed to deliver WMD-CIT and CBRNe-CIT. For example, the Malaysia CIT Working Group, led by Malaysia's Strategic Trade Secretariat, made significant progress toward developing Malaysia's WMD-CIT training capacity. In January, the Working Group conducted its first pilot CIT for Malaysian Customs. INECP experts observed and provided feedback. Malaysia held a second pilot CIT in September using Malaysian instructors.

Another notable achievement during 2013 was the progress Kenya made toward becoming the first country to complete INECP's new CBRNe-CIT National Course Development process. In February, Kenyan instructors taught the majority of a CBRNe-CIT workshop with INECP instructors providing support. In August, Kenyan instructors conducted a CBRNe-CIT workshop entirely on their own, with observers from INECP providing feedback.

Along with Malaysia and Kenya, several other INECP partners, including Mexico, the Philippines, Morocco, and Thailand, made progress in 2013 toward adopting WMD-CIT on a national basis.

INECP is supporting Kenyan interagency efforts to pilot a national CBRNe-CIT course and train Kenyan instructors to enable ongoing delivery of the course.



Building a Regional Nuclear Forensic Network



GIPP sponsored training in nuclear forensics skills for representatives of Georgia, Ukraine, Armenia, Azerbaijan, and Moldova.

Since 2009, the NIS Global Initiatives for Proliferation Prevention (GIPP) program has partnered with the European Union (EU) on the Nuclear Forensics Initiative through the Science and Technology Center in Ukraine (STCU). The Nuclear Forensics Initiative has two key goals: to develop a regional nuclear forensics network in Georgia, Ukraine, Azerbaijan, and Moldova (the GUAM countries) and to advance Ukraine's nuclear forensics expertise to establish it as the technical leader within that network.

Nuclear forensics is the scientific characterization, analysis, and evaluation of nuclear or radiological materials for the purpose of gaining insight into the material's place of origin and process history. Nuclear forensic analyses can be a powerful tool to combat illicit trafficking of nuclear materials and to help identify security gaps in the civilian nuclear fuel cycle.

In June 2013, representatives from the GUAM countries attended basic detection and analysis capability training sponsored by GIPP. The curricula was developed by experts from Lawrence Livermore National Laboratory (LLNL) and the Kiev Institute for Nuclear Research (KINR), utilizing nuclear forensics mobile laboratories provided by the



Building a Regional Nuclear Forensic Network – Continued

EU and incorporating practical exercises using both standard materials and interdicted samples. Each country also prepared and presented a report on its state system for combating the illicit trafficking of nuclear and radioactive materials. Future technical exchanges will involve the development of joint operational plans and procedures.

To establish Ukraine as the regional nuclear forensics leader, the Nuclear Forensics Initiative works to strengthen forensic analytic capacity at both KINR and at the Kharkiv Institute of Physics and Technology (KIPT), designated by presidential decree as Ukraine's main organization for the characterization of seized nuclear and radioactive materials. These institutes collaborate with EU and U.S. experts, including LLNL, on joint research and development projects and the development of new forensic analytic techniques and standards based on material unique to Ukraine.

These training and capacity-building activities bring together all the key technical players in the GUAM countries and signal a significant advancement in both nuclear forensic capacity and collaboration in the region. The GIPP-supported training provides GUAM experts with critical practice in utilizing modern, EU-provided nuclear forensics equipment. The sessions are also an important first step toward collaboration in a region lacking both the tradition and formal agreements to support the sharing of forensics expertise. Through training, outreach, and scientific collaboration, these programs lay the foundation for a powerful, complementary regional approach to combat and respond to illicit nuclear trafficking.





NIS Contributes to Mexico's Participation in WMD Multilateral Supplier Regimes

In August 2013, the Australia Group (AG) welcomed Mexico as its newest member. This is the third multilateral export control regime to grant membership to Mexico over the past two years. Mexico was welcomed into the Nuclear Suppliers Group (NSG) and the Wassenaar Arrangement (WA) in 2012. These informal, non-legally-binding groups of like-minded countries contribute to global nonproliferation objectives by developing common guidelines that enable all suppliers to more effectively regulate the trade of WMD-related equipment, materials, and technology in order to ensure they are used only for peaceful purposes.

Working in coordination with the Department of State's Export Control and Related Border Security (EXBS) Program, NIS's International Nonproliferation Export Control Program (INECP) has provided capacity-building support across the licensing, enforcement, and industry outreach functions of Mexico's export control system. This support has helped to hasten Mexico's entry into multilateral supplier regimes and enabled Mexican specialists to play a critically important role in the regional promotion of nonproliferation export control norms.

With the support of experts from INECP and the U.S. interagency, an outreach strategy was outlined, leading to Mexico's first WMD-related export control awareness seminar for industry. EXBS and the Government of Mexico (GOM) have since conducted over 20 outreach events throughout the country. INECP also worked with Mexican specialists to establish and strengthen licensing procedures

through a series of progressively advanced licensing analysis courses that built on a licensing officer training curriculum developed by EXBS. By ensuring that license reviewers understand the control lists and have the technical knowledge and resources needed to assess proliferation risk, these workshops helped build Mexico's capacity to detect and thwart illicit procurement activities.

INECP has simultaneously partnered with a new GOM interagency WMD Commodity Identification Training (CIT) Sub-Working Group, which is part of the EXBS-sponsored trilateral Nonproliferation Working Group with the United States, Canada, and Mexico to develop Mexico's capacity to implement a national training program that enables frontline customs and enforcement personnel to recognize WMD-related items and to prevent their illegal export. Working together at an accelerated pace, INECP and Mexico have undertaken one of the fastest transfers of CIT training capacity to an international partner to date. Since September of 2012, Mexico has had a dedicated cadre of INECP-trained CIT instructors from seven separate participating agencies. Mexico has successfully conducted two independent training courses for Mexican Customs and enforcement personnel in FY 2013, with a third scheduled for October 2013. Mexican instructors also have participated as instructors in INECP activities with Panama. In addition, five representatives from Panama's Customs Administration participated during the most recent CIT instructor development activity in Mexico City, providing an initial base to further develop a regional CIT training capability.

Office of Nuclear Verification





The Office of Nuclear Verification (ONV) develops policy and technical solutions for transparent arms reductions, treaty monitoring, and verification of compliance with treaties and other commitments. For example, experts representing the Office of Nuclear Verification, who had a significant role throughout negotiation and Senate deliberation over the New START Treaty, continue to support ongoing implementation of the Treaty. In FY 2013, ONV representatives led negotiations related to radiation detection equipment (RDE) use and telemetric information exchanges at the Bilateral Consultative Commission meetings in Geneva, Switzerland, and also supported the inspection and testing of Russian New START RDE that led to its acceptance at both U.S. inspection points of entry.

Through its Nuclear Noncompliance Verification (NNV) Program, the Office of Nuclear Verification develops tools and technologies to support the verifiable dismantlement of nuclear programs. One example is the course that NNV developed to train IAEA inspectors on hot cell and glovebox sampling in reprocessing facilities. In FY 2013, the IAEA decided to add this course to its regular curricula. Another example is the research reactor sampling conducted this year in Tashkent, Uzbekistan, in support of the Isotope Ratio

Method (IRM) project. The collaborative work is improving the Office of Nuclear Verification's ability to use IRM on samples collected from ex-core materials in research reactors. This will enable the U.S. Government to determine the operational history of research reactors in countries of concern, even if core materials are unavailable for sampling.

The Office of Nuclear Verification also provides policy and technical expertise to protect sensitive nuclear stockpiles. In FY 2013, ONV's Warhead Dismantlement and Fissile Material Transparency Program hosted a workshop to develop two interagency-informed hypothetical monitoring and verification concepts to inform and support NNSA's "End-to-End" Warhead Monitoring Field Demonstration activity. These theoretical monitoring concepts will be used by the research and development community to determine what technologies need to be developed in support of future monitoring regimes.

Additional ways that the NIS Office of Nuclear Verification provided policy, technical, and implementation expertise in FY 2013 to support treaties and agreements are described on the following pages.



Eliminating Russian HEU: 20 Year Commitment Nearing Completion

The United States and Russia have reached a major nuclear nonproliferation milestone under the 1993 HEU Purchase Agreement. By the end of 2013, the Highly Enriched Uranium (HEU) Transparency Program within NIS will have monitored the conversion of 500 metric tons (MT) of Russian weapons-origin HEU into low enriched uranium (LEU), which is enough material for about 20,000 nuclear weapons. The resulting LEU is delivered to the United States and put into peaceful use, providing about half the fuel used in U.S. commercial nuclear power reactors and generating nearly 10% of all U.S. electrical power.

Since 1995, the HEU Transparency Program has been successful in reducing the dual risks from nuclear proliferation and nuclear terrorism by confirming the elimination of large stocks of excess fissile materials from nuclear weapons. The 500 MT eliminated at the end of October 2013 under the 1993 Agreement is substantially greater than the combined planned total for all other major worldwide fissile material reduction initiatives. In addition, the HEU Transparency Program has helped make nuclear arms reductions irreversible by monitoring the transparent and permanent elimination of HEU removed from Russian nuclear weapons.

The United States Enrichment Corporation (USEC) has served as the U.S. executive agent for the commercial aspects of the Agreement. USEC purchased the downblended LEU from the Russian executive agent, Techsnabexport (Tenex). In addition to revenue generation, HEU downblending has provided stable employment for hundreds of nuclear scientists, engineers, and technicians in Russia for two decades.

Over the past 20 years, HEU transparency monitoring activities by the United States has included 24 Special Monitoring Visits (SMVs) to four Russian HEU processing facilities each year. To demonstrate that LEU purchased under the Agreement has been used exclusively for peaceful purposes, the HEU Transparency Program has hosted reciprocal Russian SMVs to facilities in the United States. In addition, at each blending facility in Russia, the HEU Transparency Program designed and deployed a Blend Down Monitoring System to continuously and independently measure the enrichment and flow rate of HEU as it was blended into LEU.

Two U.S. monitors reviewing transparency data from the Blend Down Monitoring System during an SMV to the Siberian Chemical Enterprise in March 2013



Enhancing International Nuclear Explosion Monitoring and Verification



Lassina Zerbo, then Executive Secretary-elect of the CTBTO Preparatory Commission, and Jean-Michel Vanderhofstadt, Managing Director of IRE in Belgium, signed the first pledge to cooperate to mitigate the effects of noble gas emissions on nuclear explosion monitoring.

NIS is working to improve the effectiveness of the monitoring and verification system operated by the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) to monitor compliance with the Comprehensive Nuclear-Test-Ban Treaty (CTBT). When completed, the CTBTO's International Monitoring System (IMS) will include, in addition to seismic, hydroacoustic, infrasound, and radionuclide particulate stations, up-to 80 stations capable of detecting radioactive isotopes of the noble gas xenon to help determine if an explosion was nuclear.

Radioxenon is also a by-product of fission-based medical and industrial isotope production and can interfere with highly sensitive nuclear explosion monitoring measurements. With help from NIS,

producers of these isotopes are looking at methods to achieve emissions reductions, including exploring alternative production techniques. In June 2013, senior representatives of the CTBTO and the Belgium-based medical isotope producer the Institute for Radioelements (IRE) signed a pledge to cooperate to mitigate the effects of radioxenon. IRE's commitment will have a significant impact on reducing the radioxenon background level in Europe and should encourage other producers to join the effort. NIS experts are working with other producers as well, with the goal of reducing emissions worldwide in order to increase the sensitivity of the IMS to low-yield nuclear explosions.

To highlight advances in CTBT monitoring and verification and strengthen its relationship with the



Enhancing International Nuclear Explosion Monitoring and Verification – Continued

broader scientific community, the CTBTO held a science and technology conference in Vienna, Austria, in June. U.S. experts joined over 750 participants from nearly 100 countries at the international conference. NIS-sponsored contributions included presentations on the three conference themes: the Earth as a complex system; events and their characterization; and advances in sensors, networks, and processing.

NIS experts at the U.S. National Laboratories also play a major role in advancing CTBT on-site inspection (OSI) readiness. They assist the international effort to establish an effective OSI capability; help establish a pool of trained “surrogate inspector candidates” ready for nomination as CTBT OSI inspectors; and help ensure that equipment, training, and procedures are ready when the Treaty enters into force. Los Alamos, Lawrence Livermore, and Pacific Northwest National Laboratories hosted the CTBTO OSI Division Director in July to discuss NNSA contributions, with Sandia National Laboratories experts joining at Los Alamos. NIS experts are playing key roles in preparing for a large-scale OSI exercise planned for late 2014 in Jordan, including leading the Task Force developing the exercise scenario, leading the radionuclide sub-team for the Inspection Team, and participating on the Control Team, Evaluation Team, and Inspected State Party.



OSI Division Director Oleg Rozhkov from the Preparatory Commission for the CTBTO (left) viewed the Smart Sampler at Lawrence Livermore National Laboratory.





Uranium Sourcing Database

In FY 2013, the Office of Nuclear Verification's Nuclear Noncompliance Verification (NNV) Program significantly improved the U.S. Government's Uranium Ore Concentrate (UOC) sourcing capabilities by nearly tripling the number of samples represented in the Uranium Sourcing Database. The Uranium Sourcing Database, together with an Internet-accessible query tool known as the Discriminate Analysis Verification Engine (iDAVE), enables users to effectively and quantitatively estimate the likely origin of uranium materials that are interdicted in illicit trafficking or encountered in verification missions in countries of concern.

The Uranium Sourcing Database is a National Nuclear Forensics Library containing data for materials involved in the early stages of the fuel cycle: uranium ore, uranium ore concentrate (UOC or yellowcake), and uranium tetrafluoride (UF₄). It is a multilaboratory effort involving experts from Lawrence Livermore National Laboratory (LLNL), Oak Ridge National Laboratory, and Los Alamos National Laboratory. The project includes sample acquisition, sample analysis, relational database development, database population, and data evaluation. It has been used for general queries for basic research and for specific national and international nuclear forensic cases. Additionally, the Uranium Sourcing Database project is ideally suited for international nuclear forensics technical engagement and has been the launching pad for many of NIS's international outreach efforts in nuclear forensics.

The Uranium Sourcing Database now contains over 185,000 data points, representing over 6,300

uranium samples from 133 distinct sources and 31 different countries around the world. The database stores approximately 80 analytes per sample including elemental and isotopic measurements, sample images (photographic and scanning electron microscope), visible and near-infrared spectra, and X-ray diffraction data.

Given the large number of samples represented in the database and the large range of data parameters for each sample, it is essential to have a query tool that can quickly utilize the critical parameters for origin identification and ferret out the likely origin of an unknown sample. iDAVE, developed by LLNL, is a statistical pattern classification application that uses the Uranium Sourcing Database for uranium sample attribution. iDAVE quantitatively and statistically compares data from a uranium sample to the data stored in the Uranium Sourcing Database.

In a recent exercise to evaluate query response processes and procedures, NNV's Uranium Sourcing team correctly identified the origin of a hypothetical sample and presented the defensible results within a four-hour window.

Increasing the number and breadth of samples represented in the database greatly improves the confidence in the results derived from the tool. NNV continues to acquire samples from around the world, analyze the multitude of parameters associated with each sample, incorporate the data into the relational database structure, and evaluate data for the future sample attribution needs of the U.S. Government and international community.

Nonproliferation Policy



Containing global proliferation and implementing the Administration's initiatives requires development of innovative policies and approaches.

Within NIS, the Nonproliferation Policy function provides policy and technical solutions to reduce nuclear dangers and support the implementation of bilateral, multilateral, Presidential-directed, or Congressionally-mandated nonproliferation and international security initiatives, agreements, and treaties.





NIS Leads Part 810 Rulemaking Process

DEPARTMENT OF ENERGY

10 CFR Part 810

RIN 1994-AA02

Assistance to Foreign Atomic Energy Activities

AGENCY: National Nuclear Security Administration (NNSA), Department of Energy (DOE).

ACTION: Supplemental notice of proposed rulemaking and public meetings.

SUMMARY: On September 7, 2011, DOE issued a notice of proposed rulemaking (NOPR) to propose the first comprehensive updating of regulations concerning Assistance to Foreign Atomic Energy Activities since 1986. The NOPR reflected a need to make the regulations consistent with current global civil nuclear trade practices and nonproliferation norms, and to update the activities and technologies subject to the Secretary of Energy's specific authorization and DOE reporting requirements.

10 CFR Part 810 implements Section 57 b. of the Atomic Energy Act, as amended, which controls the export of unclassified nuclear technology and assistance. The regulation prohibits U.S. persons from directly or indirectly engaging in the production of special nuclear material outside the United States and empowers the Secretary of Energy to authorize such transfers provided they are determined to be non-inimical to the interest of the United States. During the review process, DOE must obtain concurrence from the Department of State and consult with the Nuclear Regulatory Commission, the Department of Defense, and the Department of Commerce.

Today, the nuclear market is more global and more complex. There are new vendors, new technologies, and new markets. At the same time, there are new national security concerns. For these reasons, DOE, with NIS as the lead, is coordinating the U.S. interagency effort to update 10 CFR Part 810.

Nuclear Suppliers Group (NSG)

The NSG was formed in 1974 to help prevent the proliferation of nuclear weapons through the implementation of export control guidelines by NSG Participating Governments (PGs) for nuclear and nuclear-related material, dual-use material, equipment, software, and technology. It seeks to avoid hindering international trade and supports cooperative efforts to use nuclear energy for peaceful purposes. Throughout the group's history, the NSG has sought to update its Trigger and Dual-Use Lists to keep pace with technology and respond to other considerations but historically has made such changes individually. At the 2010 Christchurch Plenary, the Group recognized the need to conduct a comprehensive view of its control lists and initiated a three-year technical review to do just that. The so-called Fundamental Review recently came to a close at the 2013 Prague Plenary, where PGs reached agreement on 54 amendments to the Trigger and Dual-Use Lists across seven thematic areas—reactors, isotope separation, reprocessing, conversion and fuel fabrication, weaponization, industrial equipment, and miscellaneous. Given the success of the Fundamental Review and recognizing the value of refocusing the Group towards its technical roots, the 2013 Prague Plenary instituted a standing Technical Experts Group to continue such technical reviews.



In order to update 10 CFR Part 810, NIS issued a Notice of Proposed Rulemaking (NOPR) on September 7, 2011 (76 FR 55278). Following the public comment period for the NOPR, NIS reviewed the comments received—formally, in writing, and informally, at meetings and in other exchanges—and addressed them in a Supplemental Notice of Proposed Rulemaking (SNOPR) on August 2, 2013. As with the NOPR, DOE also welcomed additional comments for the SNOPR. Originally, the comment period was set to conclude at the end of October 2013, but it was extended to the end of November 2013 to address time lost during the federal government shutdown. Based on comments received for the SNOPR, NIS will revise relevant sections, if appropriate, when it issues the revised Part 810 regulations.

The SNOPR clarified the technical scope of the regulations; only activities included in the scope require DOE authorization. It also defined activities that are generally authorized and therefore, do not require specific approval from the Secretary of Energy.

Generally authorized activities, however, still carry reporting requirements that the SNOPR has clarified. Finally, it explained where case-by-case inimitability determinations are required and the process that will be used.

In parallel with the rulemaking process, NIS also is using the process improvement technique known as “Six Sigma” to make the application process more transparent, predictable, and efficient. In keeping with NNSA’s efforts to be ISO-9001-compliant, the ultimate goal is to get the 810 process ISO-9001-certified. One of the changes that NIS has considered to achieve ISO-9001 compliance is to design and develop a Part 810 e-licensing system that would make applications easier to complete, streamline the review process, increase transparency by enabling applicants to track their submissions, and provide a search archive of past decisions. NIS is collaborating with the NNSA Office of the Chief Information Officer to develop an effective web-based system, which will be hosted on the NNSA cloud.

In addition to completing the Fundamental Review, other important objectives were achieved during the 2012-2013 U.S. NSG Chairmanship—a role the United States assumed for the second time upon hosting the 2012 Seattle Plenary. Accomplishments that were realized through U.S. leadership include: strengthened NSG Troika (previous, current, and future Chairs) outreach efforts, including a two-day technical meeting about export licensing and enforcement; approval of language clarifying physical protection requirements, specifically referencing IAEA INFCIRC 225; PG sponsorship of a United Kingdom paper on industry engagement; and the introduction of Mexico and Serbia as PGs, bringing the number of PGs up to 48.

Working closely with the Departments of State, Commerce, and Defense and the Nuclear Regulatory Commission, NIS plays a key role in developing U.S. policy for the NSG. Among other responsibilities, NIS provides ongoing support to facilitate information sharing within the NSG, technical expertise to the NSG Consultative Group Chair, and most recently—as a member of the NSG Troika—assistance to the current and incoming NSG Chairs.

The United States was the 2012-2013 Chair of the NSG. The NIS policy office played a key role in hosting the 2012 Seattle Plenary as well as other NSG events held during the U.S. chairmanship.



Young South Asians Engage in Confidence-Building Measures

As a continuation of its Colombo Process missile elimination program, NIS has sponsored the production of an instructional video by young Indian and Pakistani strategic analysts. The video and its attendant website focus on missile elimination as part of NIS's ongoing outreach to the nuclear "heirs" in South Asia that seeks to acculturate a younger generation in the norms of arms control and nonproliferation. India and Pakistan each have missiles in active service dating back to the 1980s. As the young South Asians learned from discussions and observing the signs of decay on Soviet-era missiles during arms control exercises, these aging weapons may be as dangerous to the nation that owns them as to a potential adversary. The Colombo Process enables young South Asian scholars to practice a variety of techniques to support unilateral or bilateral missile elimination. They were supported in their discussions by experts from Sandia National Laboratories, Lawrence Livermore National Laboratory, and Savannah River National Laboratory.

The video, produced by Sandia National Laboratories under the auspices of NIS, documented the interactions and hands-on exercises the Pakistani and Indian scholars went through as they examined possible transparency measures their countries could use to build confidence. The scholars demonstrated that something as simple as e-mailing a photograph of a retired missile taken with a cell phone to the other government could build mutual confidence. They also practiced more intrusive arms control measures, such as managed access techniques, and technologies, such as tamper indicating tags and seals.

An integral part of this workshop captured on film was the young analysts experiencing the entire process of creating, negotiating, and implementing an arms control or transparency measure. In some cases, it was the first time these young Indians and Pakistanis worked together on issues important to their countries.



Generation Why

In September 2013, NIS in partnership with The Stimson Center launched South Asian Voices: Generation Why (www.southasianvoices.org), the first website built to foster discussion and promote engagement between next generation Indian and Pakistani strategic analysts. This initiative complements and builds from existing Track II dialogue and other confidence-building measures in the Subcontinent, while creating a space specifically for young commentators to address current and emerging security issues in South Asia.

South Asian Voices: Generation Why features articles and multimedia examining the full spectrum of factors that have shaped India and Pakistan's security environment. All southasianvoices.org's content is produced by rising analysts and academics in the two countries. This new virtual space also facilitates commentary from authors and guests to cultivate free-flowing interaction across borders. Such a forum not only encourages innovative solutions to security challenges, but also invites participants to invest in a more transparent and interactive future for the Subcontinent.

This website is part of a series of NIS activities that focus on the Subcontinent's nuclear heirs and promotes dialogue and confidence-building measures among them.





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