IAEA
International Atomic Energy Agency

IAEA NUCLEAR SECURITY

Achievements **2002–2012**

Strengthening a **global response** to a **global threat**

Building a continuously improving nuclear security framework, which is **suitable for today and sustainable for tomorrow**, is a widely held priority of the international community.

Foreword

The threat of nuclear terrorism is real. Much progress has been made in tackling this threat, nationally, regionally and globally, but more needs to be done.

Primary responsibility for ensuring nuclear security lies with national governments. However, governments have recognized that international cooperation is vital. Terrorists and other criminals do not respect borders and no country can respond effectively on its own.

All countries must take measures to ensure that nuclear and radioactive material is properly controlled and that criminals cannot gain access to such material, or to associated facilities.

In 2001, the IAEA Board of Governors tasked the IAEA to contribute to improve nuclear security worldwide. Since then, we have worked tirelessly, through a series of Nuclear Security Plans, to help establish the necessary framework.

An effective international nuclear security framework requires the sharing of knowledge and experience, coordination among States, and collaboration with international organizations, as well as with industry.

Our Member States have reaffirmed the central role of the IAEA in "ensuring coordination of international activities in the field of nuclear security, while avoiding duplication and overlap."

The IAEA's central role reflects our extensive membership, our mandate, our unique expertise and our long experience of providing technical assistance and practical guidance to countries. The aim is to help them to use nuclear energy and nuclear applications safely, securely and peacefully.

Our work focuses on helping States to minimize the risk of nuclear and other radioactive material falling into the wrong hands, or of nuclear facilities being subjected to malicious acts.

This report provides an overview of the IAEA's accomplishments over the last 11 years in responding to the challenges which the world faces in nuclear security.

As Director General, I am committed to strengthening our cooperation with all States in this vitally important field.

Yukiya Amano
IAEA Director General

Executive Summary

Since the 1970s, the IAEA has been hard at work providing assistance to States and supporting their national efforts to establish and improve nuclear security. It began with a focus on the physical protection of nuclear material. In response to the IAEA Board of Governors and General Conference Resolutions, the IAEA developed the first Nuclear Security Plan for 2002–2005. Two plans of action followed and one for 2014–2017 is being prepared.

The risk that nuclear or other radioactive material could be used with malicious intent is regarded as a serious threat to international peace and security. The responsibility for nuclear security rests entirely with each and every State. Effective national nuclear security infrastructure is central to facilitating the peaceful use of nuclear energy and enhancing global efforts to combat malicious acts. The Office of Nuclear Security, in particular, works to help States secure nuclear and radioactive material and related facilities against theft, unauthorized access, illegal transfer, sabotage or other malicious acts.

Today, nuclear security activities take place all over the world with even more intensive coordination and technical support than ever before. Ongoing international cooperation and support contribute to a 'nuclear security culture' that transcends borders and provides a common basis of understanding and action at local, regional and global levels. The threat is global and the response must be global.

Two important milestones were reached in 2012. First, the Director General established the Nuclear Security Guidance Committee to further engage Member States in the development of Nuclear Security Series (NSS) publications. Second, the Board of Governors approved the Nuclear Security Fundamentals, the primary publication in the NSS.

Going forward, we must continue to work towards strengthened nuclear security measures globally. In particular, this includes the universal ratification and implementation of international legal instruments relating to nuclear security in general and the 2005 Amendment to the Convention on the Physical Protection of Nuclear Material, the introduction of detection and nuclear forensics techniques supported by the scientific community, capacity building, including education and training, and the promotion of research and development needs. Enhanced international coordination and cooperation, the sharing of technical expertise and response preparedness for any location are also vital.

Around 80% of the funding for the activities set out in this publication has come from voluntary contributions to the Nuclear Security Fund. The IAEA expresses its gratitude to those contributors whose help has made this work possible. Our commitment to a more secure world continues.

Khammar Mrabit
Director of the
Office of Nuclear Security

NUCLEAR SECURITY is the prevention and detection of, and response to, theft, sabotage, unauthorized access, illegal transfer or other malicious acts involving nuclear material, other radioactive substances or their associated facilities.

With material and interest, there is **RISK** that demands continuous attention.

The nuclear sector is vast and its applications many. More than 430 nuclear power reactors, more than 240 operational research reactors and more than 200 fuel cycle facilities are in operation worldwide.

Hundreds of thousands of high activity radioactive sources are in use in medicine and industry.

The latest IAEA Annual Report stated that more than 177 400 significant quantities of nuclear material were declared to the IAEA.

UNDERSTANDING the problem

Security of nuclear material, in particular high enriched uranium (HEU) and plutonium, has always been a priority of the international community. Yet, the context of security was different in the past. It was assumed that radioactive material was self-protecting, in that the radioactivity itself would act as a deterrent and that the use of material in terrorist acts was beyond the scope of possibility for any one person.

The attacks of 11 September 2001 redefined the context of nuclear security. It was clear that actors were operating without borders, that acts were increasingly more brutal and that there was no limit to the willingness and desire to cause harm. Radioactive material could potentially be a tool used for malicious purposes. This understanding dramatically accelerated work to improve nuclear security, which was recognized as being a vital but also very difficult task.

In this new light, the need to secure vulnerable material, wherever used, stored, or transported, was urgent. Equally, a new framework for nuclear security had to be defined and established to ensure that the benefits from nuclear energy and nuclear applications would continue, but without the material and associated facilities being used with malicious intent.

As many States continue to express their interest in initiating or expanding the use of nuclear power and other related applications — as a result of their energy supply needs, in response to climate change concerns, or to meet development requirements — there is no room for complacency. As more nuclear facilities are built, more material produced and more transport undertaken, securing material and building a framework that meets long term needs is critically important.

The IAEA supports States, upon request, in making their nuclear security programmes robust, sustainable and effective. It strengthens a global response to a global threat.

What is the threat?

- Theft of nuclear material, including that used in nuclear weapons and for use in improvised explosive devices
- Theft of other radioactive material for use in radiological dispersal devices (RDDs)
- Sabotage of nuclear installations or transport

What poses the biggest risk?

- The State that does not recognize the threat of nuclear terrorism
- The State that does not take preventive action
- The State that is complacent

Terrorists will find and exploit the weakest link in **any security system.**

Nuclear Security's Three Lines of Defence

Given the high number of possible targets and scenarios, nuclear security demands a comprehensive approach.

FINDING a solution

With help from the IAEA, States:

Prevent people from gaining access to material and using it with malicious intent

This includes:

- putting barriers and fences in place to protect material in use and in storage
- protecting material while it is being transported and placed in temporary or long term storage
- creating in-depth protection in nuclear facilities
- improving accountancy and control of nuclear material
- creating a nuclear security culture
- returning HEU back to the supplying State
- establishing effective registries of material and its location
- assessing possible threats to material or related facilities and enabling feedback in the security systems
- ensuring well and suitably educated and trained staff

Detect and **interdict** illicit trafficking and other illegal activities involving radioactive substances

This includes:

- detecting the illegal possession and movement of material and attempts to sell, purchase or use it
- establishing effective border controls and employing radiation detection equipment to monitor and detect the movement of material
- enhancing the security of major public events to detect movement of material and a potential RDD
- helping States to establish nuclear security support centres to ensure sustainability in the use of radiation detection equipment and access to training programmes and nuclear security expertise

Respond to malicious acts or threats in a quick and coordinated way

This includes:

- coordinating the work of different security forces to deal with a radiological event
- minimizing possible radiological consequences
- developing national nuclear forensic capacities to identify the material used and to manage a radiological crime scene
- recovering and returning lost or stolen material to its owner and ensuring its secure transport

The Nuclear Security **FRAMEWORK**

The global nuclear security framework encompasses, inter alia, the binding and non-binding international legal instruments, nuclear security guidance developed and documents published by the IAEA in the Nuclear Security Series (NSS), and the mechanisms for their application and use. For the implementation of the framework, a State may establish a **national nuclear security regime**, which also recognizes the practical and institutional arrangements needed for its implementation.

IAEA legal and or regulatory assistance in the field of nuclear security is available to States upon request. This includes help to facilitate adherence to specific treaties and to establish national legislative and regulatory systems.

A particular challenge in this area is that the legal framework is built on several international legal instruments. There is no single instrument that addresses nuclear security in a comprehensive manner. Accordingly, global effectiveness requires States' adherence to, and implementation of, all relevant legal instruments. The sovereign rights of States in relation to their acceptance, or not, of international treaties may delay the establishment of a common, universal foundation for nuclear security. The IAEA has published an overview of, and information on, the legal instruments that are relevant for nuclear security and related obligations and responsibilities, for States and the functions of IAEA.

An effective global nuclear security framework requires all States to recognize the importance of the legal framework — those with active nuclear programmes and those conducting more limited nuclear activities. Any State may be a transit country, with or without nuclear or radiological activities.

The **NSS publications** help States to meet the requirements set out in binding international legal instruments. Eighteen publications had been issued by the end of 2012. The NSS, developed in close coordination with States' experts, bring together best practices which are acceptable to the international community for broad implementation. They cover a range of issues such as security culture, design basis threat methodology and nuclear forensics methodology, as well as protection measures.

The **Nuclear Security Guidance Committee** (NSGC) was established by the Director General in 2012 to make recommendations to the IAEA on the development and review of the NSS publications. The objective is to contribute to greater transparency, consensus, quality, coherence and consistency by engaging more Member States in the development of international publications for nuclear security. The NSGC is a standing body of senior experts in the area of nuclear security and open to all Member States.

Publications are issued in four categories:

- *Nuclear Security Fundamentals (objectives, concepts and principles)*
- *Recommendations (best practices that should be adopted by Member States)*
- *Implementing Guides (further technical elaboration of recommendations)*
- *Technical Guidance (reference manuals, training guides, service guides)*

The IAEA offers peer reviews and advisory services to help States evaluate their nuclear security systems with respect to the requirements and practices identified in the nuclear security framework, including the binding legal instruments and the internationally accepted nuclear security guidance outlined in the NSS publications.

IAEA peer reviews and advisory missions are recognized as important tools in building confidence with the general public in a country and with its neighbours. The IAEA works towards having advisory services that are useful and used regularly by all States.

Legal instruments related to **nuclear security**

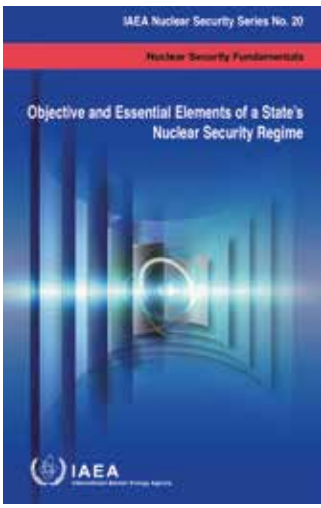
A combination of binding and non-binding International legal instruments comprise a comprehensive framework for nuclear security:

- The Convention on the Physical Protection of Nuclear Material (1987) and its Amendment (2005)
- The Convention on Early Notification of a Nuclear Accident
- The Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency
- The International Convention for the Suppression of Acts of Nuclear Terrorism
- Code of Conduct on the Safety and Security of Radioactive Sources and the Supplementary Guidance on the Import and Export of Radioactive Sources
- UN Security Council resolutions 1373 (2001) and 1540 (2004)
- Safeguards Agreements and Additional Protocols

Nuclear Security Fundamentals

Nuclear Security Fundamentals, the top level publication in the NSS, was endorsed by the Board of Governors in September 2012. It sets out the objective and the essential elements of a State's nuclear security regime. These provide the basis for NSS publications and are based on a synthesis of the provisions in international instruments, the experience of Member States in their nuclear security regimes, and the IAEA's experience in nuclear security and other related areas.

This publication is intended to assist Member States in enhancing nuclear security by providing national policy makers, legislative bodies, competent authorities, institutions and individuals with the objective and essential elements of a nuclear security regime.



By the end of 2012, the **Convention on the Physical Protection of Nuclear Material** has become a widely accepted **international legal instrument** with **148 States Parties**.

Over **30 different nuclear security training courses** provided to States,

MAKING SURE people have the right know-how

Developing human resources is essential to advancing a State's nuclear security system.
The IAEA offers general training, specialized training and training of trainers in the areas of prevention, detection and response.

During 2002–2012

IAEA training reached more than **13 800 persons** in some **120 States**

Education and training is geared towards a varied audience, ranging from nuclear regulators, facility operators, carriers, customs officers, police and border forces to instructors and research institutions. Courses also range widely, from ad hoc training to laboratory based in-depth training.

Working with 14 academic institutions and nuclear security experts, the IAEA developed a guidance document setting out modules leading to a Master of Science programme in nuclear security. A number of academic institutions around the world are currently offering programmes and/or courses that are in line with IAEA Nuclear Security Series No. 12 (Educational Programme in Nuclear Security).

Nuclear Security Support Centres

Tools for establishing long term capabilities in States

Establishment and maintenance of a national nuclear security support centre (NSSC) is viewed as a means to ensure nuclear security sustainability in a State. An NSSC's basic purpose is to provide a national focal point for passing ownership of nuclear security knowledge and associated technical skills to competent authorities involved in nuclear security. The NSSC concept describes processes and methodologies that can be used by a State to analyse essential elements of information in a manner that addresses several aspects of long term, systemic sustainability of nuclear security.

The International Network for Nuclear Security Training and Support Centres was established by consensus of **47 participants** from **30 Member States** in **February 2012.** By the end of the year, it had **74 Members** from **36 Member States** and **5 international organizations**.

Nuclear Security Education

Previously, nuclear engineers and others that embarked on a nuclear related education had few, if any, opportunities to study nuclear security related topics. As a first effort to remedy this situation, the IAEA helped launch a module on nuclear material protection, control and accountability at the Sevastopol National University of Nuclear Energy and Industry in Ukraine in 2005. This achievement has subsequently given rise to developments with universities for a Master of Science and certificate programme in nuclear security.

with more than **80 events** conducted annually.

International Nuclear Security Education Network (INSEN)

The IAEA made an important advancement in promoting nuclear security educational through the creation of INSEN in 2010. The network provides a forum for the IAEA, educational institutions and research bodies to collaborate in practical activities for the development of nuclear security education. Members collaborate in developing instructional texts and computer tools, conducting joint research activities and arranging for student and faculty exchange programmes.

INSEN supports the preparation of educational material and relevant textbooks using a peer review process and professional development of faculty members and instructors in the different topical fields of nuclear security. All educational materials are available to INSEN member universities free of charge through the network.

E-learning

In addition to classroom training, the IAEA has developed an interactive computer based training programme intended for front line officers, custom officials and law enforcement officers who use hand-held radiation detection instruments. Through the E-learning course, made available to Member States in 2010, a basic understanding is obtained of why, when and how radiation detection equipment is employed at borders or other checkpoints. It can also be used as a refresher course on previously obtained knowledge and skills.

In 2010, the IAEA completed its **largest project to date in physical protection** — the completion of the nuclear security training facilities at the Interdepartmental Special Training Centre (ISTC) in Obninsk. The ISTC provides in-field training with hands-on exercises on the use of equipment and in system design for staff from nuclear operators and authorities.

Understanding the Threat

Designing protection systems for nuclear material and nuclear facilities requires an understanding of the particular threat that a State must protect against. These threat assessments address questions, not only about **whom** and **why,** but capabilities, tactics and support considerations. Both demonstrated behaviour and potential behaviour are taken into account.

Sabotage of a nuclear facility, of a location where radioactive substances are used or stored or during transport is a concern which requires careful planning and a systematic approach at a national level. This includes designing a system which makes it difficult for any criminal or terrorist to carry out any act involving radioactive material. States must put various layers of defence in place so that such material is not used to cause harm, death or serious social disruption.

Understanding the threat involves a detailed description of potential adversaries and their skills, equipment and competencies. Such a description is referred to as the **design basis threat or DBT**. An appropriately designed protection system reflects the DBT. This dynamic link to the prevailing threat provides confidence that protection is effective and up to date.

The IAEA developed — together with academics and nuclear security experts from several Member States — a guide entitled Educational Programme in Nuclear Security that consists of a model of a Master of Science framework and a Certificate Programme in Nuclear Security. The guide was published as IAEA Nuclear Security Series No. 12 — Educational Programme in Nuclear Security[1] (NSS 12) in April 2010 and aims at assisting universities or other educational institutes to develop academic programmes in nuclear security.

[1] For download: http://www-pub.iaea.org/MTCD/publications/PDF/Pub1439_web.pdf

More than **500** nuclear security workshops and training courses have been delivered to over **13 800** persons in some **120** States.

HELPING States identify areas for improvement

IAEA experts assist, upon request, in identifying ways to enhance nuclear security measures by undertaking field visits and assessing States' individual needs. They visit nuclear fuel cycle facilities, hospitals, research reactors, disused radioactive source storage sites, border checkpoints, maritime ports, airports, rail facilities, cargo processing centres, medical facilities, mine sites, research institutes and industrial and commercial enterprises.

International State Systems of Accounting for and Control of Nuclear Material (SSAC) Advisory Service (ISSAS) missions assist States in enhancing their national systems for accounting and control of nuclear material. **13** ISSAS missions were conducted during 2002–2012.

International Nuclear Security Advisory Service (INSServ) missions are presented in flexible modules that can be tailored to provide a general overview of the nuclear security regime in a State or a specific area of interest, such as detection and response systems and measures, major public events and nuclear forensics. **61** INSServ missions were carried out during 2002–2012.

International Physical Protection Advisory Service (IPPAS) missions serve as the IAEA's chief tool for evaluating existing physical protection arrangements, States' systems and arrangements at facilities and locations. **45** IPPAS missions were carried out during 2002–2012.

A number of international legal instruments, binding and non-binding, make up a legal platform for protecting against nuclear terrorism. International teams of experts (ITE) missions are convened as a primary mechanism in promoting and facilitating States' adherence to these legal instruments. **28** ITE missions were carried out during 2002–2012.

Integrated Regulatory Review Service (IRRS) missions help States to improve the effectiveness of national regulatory bodies and implement national safety and security legislation and regulations. The Office of Nuclear Security has supported **9** such missions since 2002.

Integrated Nuclear Security Support Plans (INSSPs) provide comprehensive work plans for States' efforts in improving nuclear security and serve as an instrument for increased coordination. As of 2012, **42** States had approved their INSSPs, **9** had finalized them, and **17** States were provided draft INSSPs.

Over **200** visits to more than **350** sites conducted.

Repatriating fresh **HEU** in transport containers such as these is a vital step in securing weapons grade material.

REDUCING the stock of vulnerable material

During the past thirty years, the IAEA has worked hard to reduce the use of **HEU** in global commerce by supporting fuel conversion as well as the return of HEU fuel to the country of origin.

In addition to carrying out research and development, research reactors are the primary producers of the radioactive isotopes used in medicine and industry. Originally, they used HEU as fuel and targets, but worldwide efforts continue to be made to replace this with **low enriched uranium** (LEU), a less attractive target for terrorist or criminal groups. One way in which the IAEA has supported initiatives for reducing and ultimately eliminating HEU fuel in research reactors is by collaborating with the **Global Threat Reduction Initiative**. Through such initiatives, both non-irradiated (fresh) fuel and irradiated (spent) fuel is repatriated.

The **IAEA**

- Supported the conversion of research reactors from HEU to LEU in six States. This included procurement of replacement LEU fuel, provision of equipment, human resource development, implementation of inspection capabilities and return of fresh HEU to the country of origin.
- Procured and made available high capacity dual purpose (storage and transport) spent fuel casks for the movement of HEU research reactor fuel. The casks have been employed four times since 2007.

Case Study: **VINČA**

In December 2010, an eight-year IAEA project culminated in the repatriation of HEU and LEU spent fuel elements from the research reactor at Serbia's Vinča Institute of Nuclear Sciences to the Mayak Fissile Materials Storage Facility in the Russian Federation. Because the material had degraded significantly during several decades of storage, it was necessary to repackage all fuel elements using custom designed equipment prior to shipment. Extensive physical protection upgrades were implemented to protect the material while the preparations for shipment were being made.

Nearly 400 Serbian and international experts, including 76 IAEA staff members, participated in the work, which, in addition to being the largest fuel repatriation project in the IAEA's history, was also the largest nuclear security project. The securing of this spent nuclear fuel marked an important step in placing such nuclear material beyond the reach of terrorists or other criminals.

Over **1850 kg** of HEU research reactor fuel repatriated.

MALICIOUS ACTS with dispersal of radioactivity may occur if radioactive material is inadequately controlled and protected. **States must protect against this.**

COLLECTING radioactive sources

Radioactive sources are used throughout the world in a wide variety of applications in industry, medicine, research and education.

With their widespread use, continued international attention to developing uniform approaches for their control and management, based on strong regulatory controls, is vital to ensuring the security of radioactive sources.

To reduce the risk that radioactive sources could be stolen and used for an RDD, the IAEA assists States in applying appropriate controls to their protection, including dismantling and bringing disused vulnerable sources to safe and secure storage, and helping return them to their country of origin.

The **Tripartite Initiative** for **securing and managing of radioactive sources** was established between the IAEA, the Russian Federation and the United States of America to facilitate the identification and securing of high activity, vulnerable radioactive sources. A total activity of 2120 TBq was secured in connection with this Initiative.

Developed in 2004, the **mobile hot cell** is a device which may be locally assembled and used to recover radioactive sources in States without proper facilities and in States where recovery would otherwise be very difficult. In the mobile hot cell, the sources are removed from their respective shielding and then moved into special capsules, specifically designed for safe and secure long term storage. *This process ensures that the sources will not fall into the wrong hands.*

38 HIGHLY RADIOACTIVE SOURCES HAVE BEEN SECURED WITH THE USE OF THE MOBILE HOT CELL.

Over **6000** radioactive sources secured in **35** States.

Over **75 sites** — including waste storage facilities, research institutes and hospitals — received upgrades to the security of radioactive material located on their premises.

BUILDING better barriers

There are over **1000** different nuclear facilities worldwide, including nuclear power plants, research reactors and other fuel cycle facilities. With considerable amounts of material in transit and in storage, improved physical protection is an essential preventive measure against acts of theft and sabotage.

Physical protection requires a mix of hardware (security devices), procedures (*organization of guards and performance of their duties*) and facility design (*including layout*). An effective physical protection system takes into account the particular nuclear facility, the type of nuclear material used there and the threat, as well as the consequences (radiological and other), should prevention fail. A graded approach with increased levels of defence in place, is central to the design of the physical protection system.

Vulnerabilities at nuclear facilities can make them susceptible to malicious acts and create opportunities for terrorists or criminal groups. The objective of physical protection is, therefore, to prevent access to, or control over, the nuclear facility or nuclear material through the use of protective measures, technical means and/or the use of guards and response forces. In some cases, facilities may be designed and technical systems engineered in a way that reduces vulnerability significantly.

- **Protective measures include:** physical barriers, controlled and restricted access to identified locations, material or equipment, specific vehicle gates, fences and categories of personnel badge
- **Technical control measures include:** radiation detection portals, surveillance cameras, X ray scanners to detect weapons or explosives, and interior and exterior intrusion detection sensors

Over **110** physical protection upgrades carried out in nuclear facilities in **34** States.

EQUIPPING front line officers and building their expertise in radiation detection.

ESTABLISHING effective border control

Nuclear and other radioactive material is on the move every day, whether authorized and subject to national and international rules of transport (export and import), unauthorized, or being handled by those who wish to avoid detection. Effective border control measures help to ensure that only authorized movement occurs and that material stays under control. Equipping front line officers, such as customs officials, with radiation detection instruments, and assisting law enforcement agencies in developing appropriate detection and response concepts of operation and standard operating procedures helps them to implement effective border control and secure border crossing points. Such measures help to identify any illegal or unauthorized movement of material and thereby reduce the risk.

- More than **700 instruments** were provided in the course of projects for ensuring the nuclear security of major public events.
- **386 instruments**, including personal radiation detectors, radionuclide identification devices, neutron search devices, portable radiation scanners and expert level equipment, were acquired by the IAEA to loan to States, with more in the process of being procured.
  - The **nuclear security team** was established to strengthen the technical assistance provided to States by the IAEA on nuclear security instrumentation and its quality of implementation. It has contributed to improved functional standards for radiation detection instruments and improved user-friendliness of equipment, through the provision of equipment for detecting and responding to the unauthorized movement of nuclear and other radioactive material, including illicit trafficking.
  - **5 deployments** of the **Integrated Nuclear Security Network** (INSN) package were completed. The INSN links all central alarm stations deployed at border posts with a national data analysis centre.
  - **21 remote monitoring systems** were deployed to facilitate the transfer of alarm systems to an external alarm station in a State, guaranteeing automatic notification of national response forces.
  - **469 radionuclide identification devices** and **56 radiation portal monitors** were provided to States.

More than **3300** instruments have been provided to **61** States.

Proceedings at **INTERNATIONAL CONFERENCES** contribute to increased collaboration and a better understanding of nuclear security and its component parts.

CONFERENCES and **SEMINARS**

States take action on a national level to ensure that all radioactive and nuclear material is secured within their jurisdiction and that transfers and transports are performed in accordance with prevailing treaties and national legislation. Conferences enable States to exchange information and promote common goals and best practices on an international level.

International Conference on Security of Radioactive Sources / *Vienna 2003*
751 participants from 123 States

International Conference on Nuclear Security: Global Directions for the Future / *London 2005*
288 participants from 68 States

International Conference on the Safety and Security of Radioactive Sources / *Bordeaux 2005*
86 participants from 65 States

International Conference on Effective Nuclear Regulatory Systems / *Moscow 2006*
200 participants from 57 States

Pan American Meeting on Strengthening Implementation of International Instruments in the Americas for Enhanced Nuclear and Radiological Security / *Quito 2006*
91 participants from 35 States

International Symposium on Minimization of Highly Enriched Uranium (HEU) in the Civilian Sector / *Oslo 2006*
130 participants from 45 States

Seminar on Strengthening Nuclear Security in Asian Countries / *Tokyo 2006*
105 participants from 19 States

International Conference on Illicit Nuclear Trafficking: Collective Experience and the Way Forward / *Edinburgh 2007*
300 participants from 60 States

International Symposium on Nuclear Security / *Vienna 2009*
500 participants from 76 States

International Conference on Effective Nuclear Regulatory Systems / *Cape Town 2009*
250 Participants from 54 States

International Conference on Challenges Faced by Technical and Scientific Support Organizations (TSOs) in Enhancing Nuclear Safety and Security / *Tokyo 2010*
227 participants from 46 States

International Conference on the Safe and Secure Transport of Radioactive Material: The Next Fifty Years of Transport — Creating a Safe, Secure and Sustainable Framework / *Vienna 2011*
255 Participants from 60 States

12 international conferences organized for over **3000** participants.

A **global threat** demands a **global response** from the international community.

PARTNERS in nuclear security

Increased interest in, and commitment to, nuclear security is reflected in the work of other international organizations and in the establishment by States of new nuclear security initiatives. For the IAEA, promoting common principles and goals, as well as collectively carrying out high priority activities, requires close coordination and cooperation with other international organizations and non-governmental organizations.

- United Nations Security Council Resolution 1540 Committee
- United Nations Counter Terrorism Implementation Task Force
- United Nations Office on Drugs and Crime
- International Civil Aviation Organization
- International Criminal Police Organization
- International Maritime Organization
- Sub-Committee of Experts on the Transport of Dangerous Goods
- United Nations Interregional Crime and Justice Research Institute
- Universal Postal Union
- World Customs Organization
- Organization for Security and Cooperation in Europe
- American Police Community
- European Police Office
- Global Partnership
- Global Initiative to Combat Nuclear Terrorism
- Global Threat Reduction Initiative
- World Institute for Nuclear Security

17 partners in nuclear security.

COORDINATED RESEARCH PROJECTS (CRPs) **PROMOTE** and **FACILITATE** research and development.

Research and development is important for nuclear security's continued effectiveness and sustainability. Improving technical measures in response to illicit trafficking, making detection equipment more user-friendly and applying nuclear forensics to traditional investigative measures are three specific areas in which the IAEA, together with State institutions and laboratories, contribute to this effort.

Nuclear Forensics

CRPs on nuclear forensics provide new technologies to preserve material for nuclear forensic examination, to ensure that evidence in any criminal investigation is secure and that no nuclear material is compromised.

The goal of the programme is to assist States in:

(i) Categorizing seized material at the site of an interdiction;
(ii) Developing the means to secure, preserve and protect forensic evidence (including seized material) and transport the evidence back to a dedicated nuclear forensics laboratory;
(iii) Performing nuclear forensic analysis;
(iv) Enable credible nuclear forensic interpretation to includes development of a national nuclear forensic library;
(v) Facilitating nuclear forensic support for networks and laboratories for requesting States.

Case Study on Nuclear Forensics: Linking people to places, events and materials

Nuclear forensics is a key element of assistance to States, as part of national preparedness and response to address the threat of nuclear and other radioactive material being out of regulatory control. Exploiting the chemical compositions, isotope ratios and physical attributes inherent to nuclear and radioactive material

introduced by geological and production processes, nuclear forensics provides insight into the origin and history of this material. It is a scientific methodology that utilizes the persistent signatures of nuclear and other radioactive material to facilitate law enforcement investigations, as well as to ensure the security of this material.

Nuclear forensic interpretation involves comparisons between samples out of regulatory control and known holdings of material produced, used or stored. A national nuclear forensics library allows States to assess that their holdings of radioactive material remains secure at all times. This discipline serves as a bridge between law enforcement and nuclear/scientific experts. It also serves as a preventive measure against the unauthorized diversion of nuclear or other radioactive material, by providing information on material origins and, potentially, the point of diversion.

Through a programme of assistance to States, the IAEA is promoting technical capacity and confidence in nuclear forensics among States. In particular, goals include:

1. Best pursuit of a nuclear forensic investigation consistent with the 'model action plan,' including categorization and characterization of seized material.
2. Training to include awareness and understanding of nuclear forensics as well as hands on practice in the laboratory for nuclear forensics practitioners.
3. A research programme focused on the identification of persistent nuclear forensic signatures important to the development of national nuclear forensics libraries.
4. Providing technical guidance to States in organizing existing information regarding their nuclear fuel cycle and holdings of other radioactive material into a national nuclear forensics library.
5. Expanding the use of laboratories in nuclear forensics.
6. Exploring voluntary agreements among States to harmonize and implement the further development of nuclear forensics to support international nuclear security objectives.

The Improvement of Technical Measures to Detect and Respond to Illicit Trafficking of Nuclear Material and other Radioactive Material was the first CRP established under the IAEA's Nuclear Security Programme. It was undertaken to address technical challenges associated with the practical use of detection instruments.

Development and Implementation of Instruments and Methods for Detection of Unauthorized Acts Involving Nuclear and other Radioactive Material follows on from the first CRP and focused on enhancing responses to the seizure of nuclear and other radioactive material in illicit trafficking, obtaining improved equipment and improving detection capabilities.

Application of Nuclear Forensics in Illicit Trafficking of Nuclear and other Radioactive Material began in 2008 and was completed in 2011. Because of the scale of developments in the field of nuclear forensics, a new CRP will be proposed to follow this one.

The IAEA has initiated a new CRP on the identification of high confidence nuclear forensics signatures for the development of national nuclear forensics libraries. This research is focused on identifying key forensic signatures at each stage in the nuclear fuel cycle for inclusion in States' national nuclear forensics libraries.

Development of Methodology for Risk Assessment and State Management of the Nuclear Security Regime began in 2009 and was completed in 2012. It aimed to develop methodologies for identifying nuclear security risks and for self-assessment within a State, as well as informing government and policymakers in managing nuclear security regimes.

More than **60** research institutions from **40** States and the European Union participated in **5** CRPs.

MAJOR Public Events

Major public events, with their many participants and spectators, could be a vulnerable target for RDDs or improvised nuclear explosive devices. States must put nuclear security measures in place to ensure that nuclear or radioactive material is not used to disrupt events such as the Olympics or the Football World Cup.

Adding nuclear security measures to traditional arrangements for, and organization of, a major public event requires sharing information on the illicit movement of nuclear and radioactive material, active radiation monitoring of the flow of persons and goods, training of front line officers in the use of radiation detection instruments and knowledge of how to respond to radiological incidents. The complexity of the planning and the high levels of coordination and interaction needed between different national authorities and institutes encourage the conduct of preparatory exercises and the establishment of coordination bodies. The IAEA provides assistance to States that host such events, including provision of detection equipment and training of staff and the sharing of expertise and knowledge.

The IAEA has been involved in ensuring the security of the following major public events:

- **Olympic Games in Greece — 2004**
- **Football World Cup in Germany — 2006**
- **Pan American Games in Brazil — 2007**
- **Olympic Games in China — 2008**
- **Latin American and Caribbean–European Union Summit in Peru — 2008**
- **South American Games in Colombia — 2010**
- **Football World Cup in South Africa — 2010**
- **XIX Commonwealth Games in India— 2010**
- **XVI Pan American Games in Mexico — 2011**
- **Under-20 World Cup in Colombia — 2011**
- **UEFA European Football Championship in Poland and the Ukraine — 2012**
- **G20 Summit in Mexico — 2012**
- **African Cup of Nations in Gabon — 2012**

Traditional security is not enough.

INCIDENT and **TRAFFICKING** Database (ITDB)

The ITDB system was established in 1995 to record and analyse incidents of illicit trafficking in nuclear and other radioactive material. It incorporates all incidents in which nuclear and other radioactive material is out of regulatory control and facilitates the exchange of authoritative information on incidents among States. As of 31 December 2012, 120 States participate in the ITDB programme. In some cases, non-participating States have provided information to the ITDB.

Its scope covers all types of nuclear material as defined by the Statute of the IAEA (i.e. uranium, plutonium and thorium), naturally occurring and artificially produced radioisotopes and radioactively contaminated material, such as scrap metal. States are also encouraged to report incidents involving scams or hoaxes where material is purported to be nuclear or otherwise radioactive, i.e. scams.

In 2012, a new title was proposed to reflect more accurately the scope of the programme. The proposed title is **"Incident and Trafficking Database (ITDB): Incidents of Nuclear and Other Radioactive Material Out of Regulatory Control**.

From January 1993 to December 2012, a total of 2331 incidents were reported to the ITDB by participating States and some non-participating States. Of the 2331 confirmed incidents, 419 involved unauthorized possession and related criminal activities. Incidents included in this category involved illegal possession, movement or attempts to trade illegally in or use nuclear material or radioactive sources. Sixteen incidents in this category involved HEU or plutonium. There were 615 incidents reported that involved the theft or loss of nuclear or other radioactive material and a total of 1244 cases involving other unauthorized activities, including the unauthorized disposal of radioactive material or the discovery of uncontrolled sources.

Information reported to the ITDB demonstrates that:

- The availability of unsecured nuclear and other radioactive material persists
- Effective border control measures help to detect illicit trafficking, although effective control is not uniformly implemented at all international border points
- Individuals and groups are prepared to engage in trafficking this material

2331 incidents have been confirmed to the ITDB since 1995.

120 PARTICIPATING STATES in the IAEA ITDB 2002–2012

Albania
Algeria
Argentina
Armenia
Australia
Austria
Azerbaijan
Bangladesh
Bahrain
Belarus
Belgium
Bolivia
Bosnia and Herzegovina
Botswana
Brazil
Brunei Darussalam
Bulgaria
Burkina Faso
Canada
Central African Republic
Chile
China
Colombia
Costa Rica
Cote d'Ivôire
Croatia
Cuba
Cyprus
Czech Republic
Democratic Republic of the Congo
Denmark
Dominican Republic
Ecuador
Estonia
Ethiopia
Finland
France
Georgia
Germany
Ghana
Greece
Haiti
Hungary
Iceland
India
Indonesia
Iran, Islamic Republic of
Iraq
Ireland
Israel
Italy
Jamaica
Japan
Jordan
Kazakhstan
Kenya
Korea, Republic of
Kuwait
Kyrgyzstan
Latvia

Lebanon
Lithuania
Luxembourg
Madagascar
Malawi
Malaysia
Mali
Malta
Mauritania
Mauritius
Mexico
Mongolia
Montenegro
Morocco
Namibia
Netherlands
New Zealand
Niger
Nigeria
Norway
Oman
Pakistan
Panama
Paraguay
Peru
Philippines
Poland
Portugal
Qatar
Republic of Moldova
Romania
Russian Federation
Saudi Arabia
Serbia
Sierra Leone
Singapore
Slovakia
Slovenia
South Africa
Spain
Sri Lanka
Sweden
Switzerland
Tajikistan
Tanzania
Thailand
The Former Yugoslav Republic of Macedonia
Tunisia
Turkey
United Arab Emirates
Uganda
Ukraine
United Kingdom
United States of America
Uruguay
Uzbekistan
Venezuela
Vietnam
Yemen
Zimbabwe

NUCLEAR SECURITY in a Computer World

Computer and information security at nuclear facilities represent a far greater breadth of challenges than those faced in the non-nuclear world. While the main concern is malicious attack that threatens the security of nuclear and/or radioactive material and associated facilities by either direct or indirect consequences, non-malicious acts including human error can lead to a reduction in nuclear security posture and the loss of sensitive information.

Since 2005, the IAEA has promoted computer and information security awareness with specific focus on nuclear material, other radioactive material and associated facilities or associated activities. This includes the development of technical resources, guidance documents and regional training courses to support the growing need for computer security awareness to combat information loss and cyber attacks against nuclear facilities.

The objective of the IAEA's Computer and Information Security Programme is to provide the guidance, technical expertise and outreach in supporting States in developing a comprehensive and resilient computer and information security programme. Further, it assists States in preventing computer acts that could directly or indirectly lead to:

- unauthorized removal of nuclear/other radioactive material
- sabotage against nuclear material or of nuclear facilities
- theft of nuclear sensitive information

The Nuclear Security Information Portal (NUSEC) is an important new resource developed by the IAEA to support nuclear security efforts worldwide. NUSEC is designed to facilitate communication and provide the most up-to-date information on the IAEA's activities related to nuclear security. It is a collaborative, centralized and non-public, password-protected online platform through which Member States and other IAEA partners can report their nuclear security activities, including related publications and contact details. Through NUSEC, national and international stakeholders can contribute and discuss information pertaining to nuclear security.

Objectives of the **NUSEC** portal

- Keep the nuclear security community informed about IAEA, multilateral and national nuclear security related activities
- Provide a collaborative environment for community building
- Provide rapid access to national contact points and related data
- Provide user groups with a secure and centralized web environment for optimum information exchange

RESOURCES

So far, States and other organizations have provided generous financial and in-kind resources to the I**AEA's Nuclear Security Programme**. Contributions to the Nuclear Security Fund since it was established in 2002 amount to approximately **US $200 million**.

However, continued support is critical as we work together to build and improve a global response to a global threat.

PROGRAMME in Numbers (2002–2012)

Funding received:
$200+ million

Training provided:
500+ workshops and courses to over 13 800 individuals from 120 States

Field visits conducted:
200+ to more than 350 sites

ITDB incidents confirmed:
2331 (since 1995)

Research reactor fuel repatriated:
1850+ kg

Radioactive material secured:
6000+ sources in more than 35 States

Radioactive sources repatriated:
170+ to supplier States

Physical protection upgrades conducted:
100+ sites in 34 States

Detection equipment provided:
3300+ instruments to 61 States

"Without our radiotherapy machine, I don't know where
If we cure them, it improves their lives, their families, e
If the machine breaks down for one day, it makes nati
source itself went missing. The whole country would be in turmoil
hope. We must make sure that it is properly protected, that our fac

We cannot let anything threaten hope…"

Dr. Verna Vanderpuye, Clinical Oncologist, Ghana

we would be. A lot of our young women have breast cancer.
everything. It is a light for our patients and it gives them hope.
onal news. You can imagine what would happen if the cobalt-60
. If it was stolen, the loss would be horrendous, people would lose
cility is secure. Nuclear security measures matter.

IAEA
International Atomic Energy Agency

Vienna International Centre
PO Box 100, 1400 Vienna, Austria
E-Mail: info@iaea.org

Printed by the IAEA in Austria, May 2013
13-1817

For more information visit *www.iaea.org*