

# IAEA BULLETIN

INTERNATIONAL ATOMIC ENERGY AGENCY

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**GLOBAL VIGILANCE**  
**STRENGTHENING NUCLEAR SECURITY**



The International Atomic Energy Agency's mission is to prevent the spread of nuclear weapons and to help all countries — especially in the developing world — benefit from the peaceful, safe and secure use of nuclear science and technology.

Established as an autonomous organization under the United Nations in 1957, the IAEA is the only organization within the UN system with expertise in nuclear technologies. The IAEA's unique specialist laboratories help transfer knowledge and expertise to IAEA Member States in areas such as human health, food, water and the environment.

The IAEA also serves as the global platform for strengthening nuclear security. The IAEA has established the Nuclear Security Series of international consensus guidance publications on nuclear security. The IAEA's work also focuses on helping to minimize the risk of nuclear and other radioactive material falling into the hands of terrorists, or of nuclear facilities being subjected to malicious acts.

The IAEA safety standards provide a system of fundamental safety principles and reflect an international consensus on what constitutes a high level of safety for protecting people and the environment from the harmful effects of ionizing radiation. The IAEA safety standards have been developed for all types of nuclear facilities and activities that serve peaceful purposes, as well as for protective actions to reduce existing radiation risks.

The IAEA also verifies through its inspection system that Member States comply with their commitments under the Nuclear Non-Proliferation Treaty and other non-proliferation agreements to use nuclear material and facilities only for peaceful purposes.

The IAEA's work is multi-faceted and engages a wide variety of partners at the national, regional and international levels. IAEA programmes and budgets are set through decisions of its policymaking bodies — the 35-member Board of Governors and the General Conference of all Member States.

The IAEA is headquartered at the Vienna International Centre. Field and liaison offices are located in Geneva, New York, Tokyo and Toronto. The IAEA operates scientific laboratories in Monaco, Seibersdorf and Vienna. In addition, the IAEA supports and provides funding to the Abdus Salam International Centre for Theoretical Physics, in Trieste, Italy.

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Cover Photo:

An empty protective capsule  
for a radioactive source.

(Louise Potterton/IAEA)

# STRENGTHENING NUCLEAR SECURITY WORLDWIDE

## Foreword

Nuclear terrorism is a continuing threat. Progress has been made in recent years in ensuring that nuclear and other radioactive material, as well as associated facilities, are properly protected everywhere in the world. But much remains to be done.



International cooperation is of vital importance. The IAEA plays the central role in helping countries to improve nuclear security.

Nuclear security is the responsibility of each individual country. However, governments recognize that no country can respond effectively on its own to the transboundary threat posed by terrorists and other criminals. International cooperation is of vital importance. The IAEA plays the central role in helping countries to improve nuclear security.

Our central role reflects the IAEA's extensive membership, our mandate, our unique technical expertise and our long experience of providing specialist, practical guidance to countries.

We focus on helping States to minimize the risk of nuclear and other radioactive material, or of nuclear facilities being subjected to malicious acts, including terrorist acts. We provide specialist training and equipment, such as radiation detectors, for police and border guards. In the past ten years, the IAEA has trained over 12 000 nuclear security practitioners in more than 120 countries.

With our assistance, a considerable amount of high enriched uranium has been placed in more secure storage. The IAEA has conducted dozens of International Physical Protection Advisory Service missions, which provide expert advice on securing nuclear and other radioactive materials and identify possible improvements in security.

The IAEA's Incident and Trafficking Database is an authoritative global source of information on thefts or other unauthorized activities involving nuclear and other radioactive material.

This edition of the IAEA Bulletin is published to coincide with the IAEA International Conference on Nuclear Security: Enhancing Global Efforts in July 2013. It provides an overview of the IAEA's work in all areas of nuclear security.

I hope readers will find it interesting and informative.

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Yukiya Amano, IAEA Director General.

# NUCLEAR SECURITY AND THE WAY FORWARD

Nuclear security has always been taken seriously. There is ample evidence that traditional deterrence does not necessarily obstruct those with malicious intent, who can also operate across borders. This understanding of the threat has highlighted the need to adopt a vigorous approach to protecting nuclear materials, associated facilities and activities in order to strengthen nuclear security worldwide. States recognize that there is a credible threat of nuclear or other radioactive material falling into the wrong hands and that this threat is global. An international legal framework for nuclear security, national nuclear security infrastructures, and the IAEA's leading role are some of the building blocks of an effective international nuclear security framework that contributes to effectively addressing this threat.

An international legal framework for nuclear security, comprising both legally binding and non-binding instruments, is essential for the success of international cooperation. In this respect, States have provided welcome support for the recent development of guidance such as *Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities* (INFCIRC/225/Revision 5) (IAEA Nuclear Security Series No.13). In addition, the entry into force of the 2005 Amendment to the Convention on the Physical Protection of Nuclear Material (CPPNM) is an important step in establishing a more comprehensive basis for global nuclear security. Its principles have been reflected in the most recent IAEA recommendations on the security of nuclear material and nuclear facilities. It expands the scope of the CPPNM, by obliging States Parties to protect nuclear material in domestic use, storage and transport, and in nuclear facilities.

The 2005 Amendment needs to be brought into force as other existing international instruments do not address States' responsibility for having and implementing a physical protection regime applicable to nuclear material and facilities. States have analysed, recognized, and identified a global nuclear security threat in eight successive General Conference resolutions. Ratifying the 2005 Amendment is a logical and effective response to these realities and represents a timely demonstration of international resolve and commitment.

A national nuclear security infrastructure is the key to effective and sustainable nuclear security and enables a State to address nuclear security

in a holistic manner. It requires States to ensure, inter alia, that appropriate laws and regulations are in place, that authorities know their roles and responsibilities and that nuclear security systems and measures for prevention, detection and response are designed, implemented, maintained and sustained. Without relevant laws in place, a State is vulnerable. Without adequate nuclear security infrastructure and a nuclear security culture in place, a State is not managing its risk. It cannot be a secondary consideration. Any weakness in the chain of nuclear security matters, because those intending to do harm will find and exploit that weak link.

The IAEA helps States, upon request, to establish and strengthen their nuclear security infrastructure through the development and implementation of Integrated Nuclear Security Support Plans (INSSPs), which are comprehensive work plans for States' nuclear security activities and enable increased coordination. With an INSSP in place, States are able to address nuclear security in a comprehensive, systematic and harmonized manner, in order to avoid duplication and to cover all areas requiring improvements. Peer reviews, such as the International Physical Protection Advisory Service (IPPAS), are designed to enable States to further improve their nuclear security and reaffirm their commitment towards robust and sustainable nuclear security infrastructure.

An important component of such sustainability is for a State to have a sufficient number of well-educated and trained staff with the right competence, skills and security culture to advance and maintain nuclear security across many different disciplines. In practice, nuclear security culture is the assembly of characteristics, attitudes and behaviour of individuals, organizations and institutions which serves as a means to support and enhance nuclear security.

In conclusion, nuclear and other radioactive material remains on the move and is in demand in numerous peaceful applications around the world. Continued use of these materials demands constant and collective vigilance. Enhanced international cooperation and coordination are vital.

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Khammar Mrabit, Director, IAEA Office of Nuclear Security.



# NUCLEAR SECURITY ON THE FRONTLINE



An effective detection system is more than equipment, such as RPMs and pagers; it entails a system of national coordination and cooperation between different agencies and across disciplines.

(Photo: D. Calma/IAEA)

**P**ort Klang, on the Straits of Malacca outside Kuala Lumpur, the twelfth largest port in the world, handles over 18000 containers daily. Bustling around the clock, Port Klang is strategically located at a crossroads of trade routes in South East Asia and is a major transshipment hub for cargo moving from sea to land and air.

Cargo of all types passes through Port Klang. All of these goods are carefully monitored by the national authorities to detect radioactive signatures. The diversity of products causes daily challenges for nuclear security. False alarms for radioactivity can be triggered by commonly traded goods, including building materials like sandstone, and cement, food stuffs like bananas and coffee, and household items like TVs and smoke detectors. However, similar cargo can also contain nuclear and other radioactive material that may be illegally trafficked through ports, which are a prime transport pathway used by smugglers to move such materials around the world.

Traditional security measures like 'guns, gates and guards' cannot alone prevent malicious acts that could involve nuclear or other radioactive material. The IAEA's Incident and Trafficking Database reveals consistent patterns of nuclear and other radioactive material that

is outside regulatory control and could be used for malicious purposes. The authorities at transit points like container ports seek to screen cargo for nuclear or other radioactive material without significantly impeding normal operations.

The risk of illicit trafficking is an added challenge for customs officers, who can rely upon radiation portal monitors (RPMs) to help them detect radiation and subsequently interdict illicit material in transit or at border crossings. At Port Klang, 42 operational RPMs ensure that all goods for import, export or transshipment are scanned for radioactivity. As trucks carrying cargo containers pass through, RPMs detect the presence of radiation in real time. In addition, personal radiation detectors, or pagers as they are called in the field, are clipped onto the belts of customs officers to further detect the presence of radiation.

Siva Arravan, Senior Assistant Director of Customs at Royal Malaysian Customs, explained, "Without a pager, no one can go to the port or near a container." Such measures ensure that personnel are not inadvertently exposed to radiation. The pagers' presence is a constant reminder that nuclear security is a high priority concern on the front line.

If an RPM detects radiation, an alarm is triggered, and measurement data is transmitted to a central alarm station, where the information is analysed and processed. If the measurement is suspicious, all clearances and forms are further scrutinized for possible sources of radiation, which are transported legally. A secondary inspection of the cargo is subsequently conducted.

An effective detection system is more than equipment, such as RPMs and pagers; it entails a system of national coordination and cooperation between different agencies and across disciplines. Understanding a radiation measurement, and ensuring an appropriate response demands close coordination between the competent authorities such as the regulatory body, port authority officials, police, and fire brigade. This coordinated response is the basis for nuclear security in action.

The ability to detect and interdict illicitly trafficked nuclear and other radioactive materials, helps to make ports more secure, by minimizing the potential risk of harm to society and the environment, creating higher levels of transparency and assurance for trading partners, and helping to ensure that no radioactive material finds its way into exported cargo.

“We don’t want to undermine our ability to be a good trading partner. Nuclear security measures in place in Malaysia send a strong message to those looking to Malaysia to be a ‘mule’ for illicit trafficking. If there is a radiological dispersion device, it would create terror and we do not want that on our watch,” said Raja Adnan, Director General of the Malaysian Atomic Energy Licensing Board (AELB).

Nuclear security measures have significant implications for the security of the entire supply chain. “Being able to detect radiation allows for a level of checks and balances between security and revenue,” said Arravan. Nuclear security is a confidence-building measure, which helps to keep a State’s borders secure, and in turn keeps trade open and thriving.

After nuclear security measures are set in place the threat of nuclear and other radioactive material falling into the wrong hands nonetheless remains. Terrorists continually seek to locate and exploit the weakest link or point of entry. RPMs and pagers are deterrents that reduce the likelihood that illicitly trafficked radioactive material will remain undetected,

and traffickers will attempt to move these materials illicitly through less well-protected transit points. As a result, States need to be informed about such security measures, as well as properly equipped and trained to address this risk.

Customs officers can rely upon radiation portal monitors to help them detect radiation and subsequently interdict illicit material in transit or at border crossings.

The IAEA assists States in strengthening the global response to this global threat, and has worked closely with Malaysia on nuclear security, by providing expertise to develop and strengthen infrastructure, procure equipment, and deliver training.



At Port Klang, all customs officers have to be trained in radiation detection. “Without training,” explained Arravan, “we can’t do our job. The IAEA has trained us on how to use equipment to detect, locate and identify radiation. Even if we interdict one illicit shipment, it is a success.”

At Port Klang, Malaysia, cargo of all types is monitored carefully to detect radioactive signatures.

(Photo: D. Calma/IAEA)

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Danielle Dahlstrom, IAEA Office of Nuclear Security.



# NUCLEAR SECURITY IN ACTION AT



- 1 “For Malaysia, trade has to be a transparent”, explained Raja Adnan, the Director General of the Malaysian Atomic Energy Licensing Board (AELB). “Goods are imported and exported, not just between two countries, but are in transit between several countries. Nuclear security measures help to guarantee open trade and makes sure that everyone is trading responsibly,” emphasized Adnan.



- 2 Officials from AELB prepare for a joint Indonesian–Malaysian exercise in effective border control by reviewing their national standard operating procedures (SOPs) on nuclear security, which were developed in close coordination with the IAEA.



- 3 Malaysian experts from AELB train counterparts from Indonesia on how to keep their borders secure and develop their own SOPs. This includes the operation and deployment of radiation portal monitors (RPMs), which strengthen nuclear security, by detecting the presence of radioactive material and helping to prevent illicit trafficking across borders.



- 4 At the border with Thailand, over 300 commercial vehicles cross the border into Malaysia each day, carrying over 40,000 kilos of cargo each, mainly wood and rubber. RPMs at this border crossing keep international trade secure and minimize the risk ionizing radiation could pose to people, society, and the environment.



# MALAYSIAN BORDERS



- 5 Mohd Irwan of AELB, travelled to the Padang Besar border crossing with officials from Indonesia's Nuclear Regulatory Authority, Customs Department, and Ministry of Transport, to discuss RPM installation and use. "An RPM is more than a piece of equipment," he explained, "It is national coordination and cooperation between different agencies and disciplines."



- 6 An RPM detects radiation in real time and does not interrupt normal export operations at the border. In addition, cameras simultaneously identify containers, capturing images of the truck and detailed information including plate and container number. The measurement and images are transmitted to the Central Alarm Station (CAS) for further review.



- 7 At the CAS, if radioactive material is detected, customs officials check the information from the remote cameras on the RPMs, against the information provided in the export declarations on contents of the containers. Further details on the radioactive material are also displayed.



- 8 If customs officers determine the contents to be suspicious, they conduct a detailed radiation assessment using handheld radiation detectors. This equipment enables them to determine the exact radionuclide and the location of the material.





- 9 If undeclared radioactive material is confirmed, customs officers will inform AELB, as the response and regulatory authority, for further technical assessment of the container. This interaction is just one example of the national coordination that is essential in effectively and swiftly monitoring borders.



- 10 An AELB officer checks the radiation detection equipment before departing to inspect suspicious material.



- 11 AELB will confiscate the undeclared material and put it into safe and secure storage, eliminating the risk that these materials could fall into the wrong hands.



- 12 “Member States with shared borders, similar regulations and cultural values are well placed to share best practices and harmonize their approaches to nuclear security,” explains Peter Colgan, Head of the Detection and Response to Malicious Acts Section in the IAEA Office of Nuclear Security. Through the October 2012 Indonesian–Malaysian joint border control exercise, these officials reaffirmed their commitment to making their borders secure and to working together with the IAEA in achieving nuclear security worldwide.

Text: Danielle Dahlstrom; Photos: Dean Calma, October 2012

# GHANA'S INTEGRATED NUCLEAR SECURITY SUPPORT PLAN

At the Korle Bu Teaching Hospital outside Accra, Pearl Lovelyn Lawson checks the records of the next patient to undergo radiotherapy and adjusts the dose settings of the teletherapy machine. It is business as usual at the facility that treats over fifty patients each day. But Lawson's routine now includes additional procedures to ensure that the highly radioactive cobalt-60 source located inside the machine remains secure.

Nuclear security devices and systems such as double locks, motion sensors, and cameras that transmit images to a central alarm system have been installed to ensure that the source cannot be stolen, the facility sabotaged, or unauthorized access gained. At Korle Bu physical protection measures were upgraded as part of Ghana's Integrated Nuclear Security Support Plan (INSSP). Preventing, detecting and responding to criminal acts like the theft or illegal transfer of a radioactive source, is an international priority that could be addressed through an INSSP. As one of its key nuclear security services, the IAEA assists Member States in drafting such plans. An INSSP is developed jointly with the Member State, using a holistic approach to nuclear security capacity building. It reinforces the primary objective of a State's nuclear security regime to protect people, society, and the environment from the harmful consequences of a nuclear security event. Addressing five components — the legal and regulatory framework, prevention, detection, and sustainability — the jointly developed plan identifies the needs, responsible entities and organizations within the State, as well as the timeframe for the implementation of agreed nuclear security related activities.

Ghana's INSSP, tailored to its specific needs, is based on findings and recommendations from advisory service missions carried out in Ghana, including an International Nuclear Security Advisory Service mission and an International Physical Protection Advisory Service mission. Ghana's INSSP was recently reviewed to identify additional areas for improvement. Based on IAEA nuclear security guidance, it is designed to identify those actions required to ensure that Ghana's national nuclear security regime is effective and can be implemented over a period of time to ensure sustainability. The main objectives of an INSSP are to identify and consolidate the nuclear security needs of an



individual State into an integrated document. But it is more than a document; it is nuclear security in action. Joseph Gdadago, Manager of the National Nuclear Research Institute at the Ghana Atomic Energy Commission (GAEC), explains, "Nuclear security is very important. This reactor uses highly enriched uranium. We put all necessary security measures in place to protect this and prevent any sabotage or theft of any kind."

The research reactor plays a very useful role in economic development and environmental issues in these areas. Ghana is the second leading producer of cocoa in the world and has over 250 gold mines. Scientists at GAEC profile cocoa beans to ensure that they meet international trading standards and assist in mineral exploration. Students, including those from neighbouring African States, use the reactor for research projects. Such training is central to capacity building in a State. It is furthered by Ghana's Nuclear Security Support Centre (NSSC), which was initiated as part of its INSSP. The IAEA conducts courses at the NSSC, which also coordinates emergency response, maintains equipment, and provides technical support for detecting and responding to nuclear security events.

As Gdadago explains, "We don't leave any stone unturned as far as security is concerned." The threat that nuclear or other radioactive material could be used with malicious intent is an ongoing concern for States. Ghana's INSSP demonstrates a strong commitment to improve nuclear security, so that patients can continue to receive radiotherapy treatments at the Korle Bu Teaching Hospital and students on the GAEC campus can continue to be trained. The IAEA stands ready to support the development of INSSPs by those States that choose to develop these plans in future in an effort to strengthen the global response to a global threat.

Danielle Dahlstrom, IAEA Office of Nuclear Security.

Ghanaian officials and IAEA experts jointly developed an Integrated Nuclear Security Support Plan to ensure that Ghana's national nuclear security regime is effective and sustainable.

(Photo: D. Calma/IAEA)



# NUCLEAR SECURITY IN ACTION AT

*Ghana asked the IAEA to co-develop an Integrated Nuclear Security Support Plan (INSSP) to strengthen its national nuclear security regime.*



**1** Nuclear security is a national responsibility. An Integrated Nuclear Security Support Plan (INSSP) is a tool that enables States to address nuclear security in a comprehensive way and to strengthen its national nuclear security regime, beginning with the legislative and regulatory framework within a State.

**2** Operating areas in nuclear facilities like research reactors which use highly enriched uranium, require additional physical protection measures to ensure the security of the nuclear material and prevent acts of sabotage.



**3** Other radioactive materials, like sealed radioactive sources used in radiotherapy machines in hospitals for cancer treatment, need to be protected so that they are not stolen and used with malicious intent.



**4** Nuclear and other radioactive material needs to be kept in safe and secure storage, which incorporates various types of physical barriers to prevent theft and unauthorized access.

# FACILITIES IN GHANA

## *Nuclear Security Support Plan to strengthen*



5 Intrusion detection and assessment systems, like cameras and sensors, help to ensure timely and adequate responses to any security incident.



6 Responding to a nuclear security incident, and mitigating its consequences, requires specialized equipment like isotope identifiers, and competent and well trained personnel.



7 Nuclear Security Support Centres (NSSCs) focus on human resource development as well as technical and scientific support which contribute to the sustainability of nuclear security in a State.



8 Verna Vanderpuye, a Ghanaian clinical oncologist depends upon the radiotherapy machine, "Without our radiotherapy machine, I don't know where we would be. A lot of our young women have breast cancer. If we cure them, it improves their lives, their families, everything. It is a light for our patients and it gives them hope. Nuclear security measures matter. We cannot let anything threaten hope."

Text: Danielle Dahlstrom; Photos: Dean Calma, January 2013



# YOU CAN'T BE TOO CAREFUL

## The Challenges of Cybersecurity in the Nuclear Industry



Every year, the number of computers in use is growing, creating more opportunities for cyberattacks.  
(Photo: istockphoto.com)

**T**he number of computers people use and interact with is growing every year, creating more opportunities for cyberattacks. For example, contemporary automobiles contain no fewer than 12 digital input/output channels to control the engine, transmission, radio, antilock braking, keyless entry, anti-theft, telematics, etc. All of these potentially contain vulnerabilities susceptible to being 'hacked'.

Computer and information technology are evolving very quickly, at times outpacing our awareness of possible sources of cyber-vulnerabilities and ultimate attack. Additionally, cyberattacks are not limited to the workplace, but can also target the private lives of individuals.

One of the IAEA's main aims in improving cybersecurity is to enhance nuclear security culture, to change how people think, and change how they evaluate not just the adoption, but also the use, of technology.

"If nuclear professionals and their families are more aware of not just their physical space, but their digital space, they will be more cautious with regard to online information sharing and the use of technology. Information that seems innocuous can be combined with other information found elsewhere online and can

prove to be very damaging. Google and similar Internet search engines are often the first tool hackers use in developing an attack plan," says Dudenhoeffer.

Project Officer for the National Coordinator for Counterterrorism and Security of the Netherlands, Ben Govers says, understanding of the threat is slowly permeating the nuclear industry. "The nuclear industry is facing the challenge of having to both broaden and deepen its existing defences in computer and information networks set against cyberthreats. The industry is — more or less — at the starting point of developing, implementing and expanding robust measures for protecting the information and control systems of nuclear facilities".

"The IAEA can play a leading role in this dynamic development," says Govers.

### Community of Helpers

The computer virus Red October was discovered in October 2012. It is estimated to have gathered sensitive information in more than 60 countries for up to five years while remaining undetected. Information gathered from infected networks could be reused in



future cyberattacks. This level of sophistication in cybercrime is becoming more and more common, and is another challenge with which nuclear security personnel must grapple.

The IAEA supports States at every level in their efforts to build robust and tested information and computer security programmes. The IAEA organizes regional training programmes; creates courses for professionals in nuclear security; publishes cybersecurity guidelines for nuclear facilities; and conducts regular international meetings where professionals can share expertise and have their most pressing questions answered by fellow practitioners and by IAEA experts.

The IAEA also incorporates information security assessments into the IAEA International Physical Protection Advisory Service (IPPAS).

IPPAS, a comprehensive review available to all countries with nuclear materials and facilities, advises States on more effective ways to protect their nuclear and radiological material.

Many organizations are working to address the growing cyberthreat. Partnerships in these areas are important. The IAEA has worked in conjunction with the International Criminal Police Organization — INTERPOL and the European Network and Information Security Agency (ENISA) in international exercises and in the development of cybersecurity guidance documents and training activities.

The @TOMIC 2012 international exercise on cybersecurity and nuclear security events including nuclear forensics is one example of the IAEA's involvement in international activities to increase cybersecurity awareness for protecting nuclear and other radioactive material assets. The exercise, sponsored by the Netherlands, involved 150 participants from 40 countries. The next exercise will be held in 2014: @TOMIC 2014.

"Because the IAEA has a respected position in the nuclear world, it can play a stimulating and leading role in the realization of guidelines or protocols, and in raising awareness about cybersecurity measures," says Govers, organizer of the @TOMIC events.

## Same Old Threats

According to Dudenhoeffer, it's important Member States see the similarities between

current threats, and the ones they faced 50 years ago.

The IAEA has introduced a number of programmes to educate States about these issues, and to help them manage the problem, and fight back.

"The threat actors remain the same. There have always been criminal elements attempting to steal from you or blackmail you. There have always been those who oppose you and your work — terrorists, or disgruntled employees. Nuclear and radiological facilities have always



needed to be protected from these threats. The big difference now is that these threat actors can use computer systems on-site or remotely to do their dirty work," says the nuclear security expert.

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Sasha Henriques, IAEA Division of Public Information.

Cyberthreats are an international challenge. The IAEA supports Member States in their efforts to build and test computer security measures to protect nuclear facilities.

(Photo: istockphoto.com)

# DON'T DROP YOUR GUARD

## Securing Nuclear Facilities

You're never quite finished with nuclear security. "Even the most advanced security system for radioactive or nuclear material needs to be continuously updated to ensure that it remains effective," says Arvydas Stadalnikas, an IAEA Senior Nuclear Security Officer. "Security can always be improved. Even if you think you have the best system for today, it may require enhancements because of the changing environment," he said.

To help States with this daunting task, the IAEA offers support through its International Physical Protection Advisory Service (IPPAS) which includes in-depth analysis of the physical protection and nuclear security followed by expert advice. The IAEA has carried out 58 missions to 37 countries since the IPPAS programme was launched in 1996, helping States translate international conventions, codes and guidance on nuclear security into practice. Although each mission focuses on improving the security in a specific country, "the programme has benefits that reach far beyond the recipient State's national borders," Stadalnikas noted.

"Each IPPAS mission helps improve global nuclear security because enhanced security in one country means that you improve globally. Deficiencies in one country could open the way for malicious acts, which can have worldwide effects," he said.

In addition, the missions' generic recommendations feed into the development of the IAEA's nuclear security publications, which are updated from time to time to adapt to an evolving environment. This enables all States to benefit from lessons learned, even though the individual mission reports are treated as strictly confidential and shared only with the host country. "The missions have given us a stronger basis to provide advice," Stadalnikas said.

"Emphasizing that the IPPAS is a process," Stadalnikas said, "IPPAS missions can be a starting point for support programmes in the nuclear security area, with the IAEA providing training courses on security aspects or technical support such as more sensitive detection systems or intrusion-resistant doors." States welcome the service and take recommendations "very seriously," he added.

For the Swedish Radiation Safety Authority (SSM), which hosted an IPPAS mission in 2010 following a request by the Government to the IAEA to review the Swedish physical protection programme, the resulting mission recommendations served to justify proposals in a report to the Government, said Stig Isaksson, Government Specialist at SSM.

"Moreover, the discussions and interaction with the international experts in the IPPAS team were very useful for both SSM personnel and representatives from other participating national authorities as well as for the licensees visited during the mission," he said.

Sweden improved its physical protection programme following the IPPAS mission, for example by establishing in April 2013 a formal coordination group that includes the Swedish Radiation Safety Authority, the National Police Board, the Swedish Security Service, the Civil Contingencies Agency and the National Grid Authority. This group will coordinate various measures to ensure the effective protection of nuclear facilities, as well as nuclear material during transport, including by carrying out threat assessments.

"As security needs are evolving, so too is the IPPAS programme. A new modular approach has made it easier to adapt missions to the specific needs of each State," Stadalnikas said. Modules focus on topics such as the physical protection regime, facility review, transport and computer security. A module focusing solely on radioactive material has proved particularly useful for countries that do not have nuclear reactors but use radioactive material for a variety of beneficial purposes.

In addition, a series of regional workshops was launched in 2012 to explain the IPPAS programme and its benefits to States. A technical session to be held in France in 2013, will gather representatives of all countries that have hosted IPPAS missions, countries that have requested such missions, as well as countries with larger nuclear power programmes. These activities help the IAEA to improve the IPPAS programme and thereby to better assist States strengthen nuclear security.

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Susanna Lööf, IAEA Division of Public Information.

# MASTERS IN NUCLEAR SECURITY

Continuing global efforts to improve the security of nuclear and other radioactive material against the threat of malicious acts are being assisted by a new initiative, the development of a corps of professional experts to strengthen nuclear security. The IAEA, the European Commission, universities, research institutions and other bodies working in collaboration have established an International Nuclear Security Education Network (INSEN). In 2011, six European academic institutions, the Vienna University of Technology, the Brandenburg University of Applied Sciences, the Demokritos National Centre for Scientific Research in Greece, the Reactor Institute Delft of the Delft University of Technology in the Netherlands, the University of Oslo, and the University of Manchester Dalton Nuclear Institute, started developing a European Master of Science Programme in Nuclear Security Management.

In March 2013, the masters project was inaugurated when ten students commenced studies at the Brandenburg University of Applied Sciences in Germany for two weeks. In April, they moved to the Delft University of Technology in the Netherlands for a further two weeks of studies. The pilot programme consists of six teaching sessions in different academic institutions. At the inauguration in Delft, IAEA Director General Yukiya Amano commended this effort to train a new generation of experts who can help to improve global nuclear security. "It is clear that we will need a new generation of policy-makers and nuclear professionals — people like you — who will have a proper understanding of the importance of nuclear security," Mr. Amano told students and faculty members.

"The IAEA's goal is to support the development of such programmes on a global basis," said David Lambert, Senior Training Officer in the IAEA's Office of Nuclear Security. "An existing postgraduate degree programme focused on nuclear security at Naif Arab University for Security Sciences (NAUSS) is currently supported by the Arab League. Instructional materials from the Master of Science in nuclear security degree framework developed for the IAEA and the global education community by the International Nuclear Security Education Network (INSEN) are currently being incorporated into this programme."

Postgraduate level programmes in nuclear security have been offered by a number of

academic institutions in the Russian Federation and the United Kingdom for nearly a decade with IAEA support.

And since 2002, the IAEA has trained more than 11000 people from 120 States through a variety of activities to improve their capabilities in the area of nuclear security. But a survey in 2007 found that there was no comprehensive nuclear security programme in place worldwide. Three years later the IAEA published *Educational Programme in Nuclear Security* (IAEA Nuclear Security Series No.12) which outlines a Master of Science programme and certificate programme in nuclear security.

"There was significant interest in the proposals contained in it," said Lambert. INSEN's first meeting in August 2011 attracted 42 participants from 21 States, including from 26 universities, and two international organizations. "Through INSEN, the IAEA offers university accreditation guidelines and each university develops a curriculum as it sees fit," said Lambert. A technical university will offer something very different from an institution offering political science courses.

IAEA assistance to universities or other academic institutions consists of the development of textbooks, offering professional development support and reviewing academic curricula. In addition, the IAEA facilitates cooperation and collaboration among educational and research institutions. "The goal is to ensure the availability of nuclear security experts who are able to deal with future nuclear security challenges at the national or regional level," said Lambert. As some States prepare to introduce nuclear power, and nuclear techniques are used ever more widely in industry, agriculture, science and medicine, the demand for well qualified experts and specialists in nuclear security will likewise grow.

"INSEN's priorities for the near future are scaled to complement international efforts to strengthen nuclear security on a global scale," said Lambert. "Possible malicious acts involving nuclear or other radioactive materials are a real threat. We have to remain vigilant and constantly do more to meet this threat. Developing the skills of professionals is an important part of the defences we are building."

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Peter Rickwood, IAEA Division of Public Information.



# SECURING MAJOR EVENTS

When asked why the IAEA should provide nuclear security support to countries that organize large public events, Nuclear Security Officer Sophia Miaw answers quickly and without hesitation.

“Imagine any major public event such as the Olympics, a football championship, or an Expo. If a dirty bomb were to be exploded at a site where tens of thousands of people congregate, the radioactive contamination would worsen the effects of the bomb, increase the number of casualties, impede a rapid emergency response, and cause long term disruption in the vicinity,” she said.

Data from the IAEA Incident and Trafficking Database helps States assess potential threats that could arise from illicitly trafficked nuclear or radiological materials.

Avoiding such nightmarish scenarios is the driving purpose behind the assistance the IAEA offers States that host major sporting or other public events. The support can range from a single training course to a comprehensive programme that includes threat assessment, training, loaned equipment and exercises. The type and scope of assistance depends on the host country's needs.

“We incorporate nuclear security measures into their security plan. We don't create anything new,” Miaw said.

A key component of the support offered to host States is relevant data from the IAEA Incident and Trafficking Database, to help States assess potential threats that could arise from illicitly trafficked nuclear or radiological materials.

The IAEA has supported States' nuclear security arrangements for the 2004 and 2008 Olympic Games in Athens and Beijing, the 2010 FIFA World Cup in South Africa and the UEFA European Football Championship EURO 2012 in Poland and Ukraine. Current and future projects include the 2014 International Ice Hockey Federation World Championship in Belarus, the 2014 Olympic Games in the Russian Federation and several events to be held in Brazil from 2013 to 2016.

Organizing events is big business with many private companies involved, yet the IAEA support goes exclusively to the country's government, Miaw said.

In addition to ensuring nuclear security during the event itself, the IAEA support leaves a legacy of expertise and awareness in the country that hosts the event. The nuclear security arrangements during the event can also be a basis upon which a national framework for nuclear security can be built.

With the experience gained, the country will include nuclear security in its planning from the start when organizing future events. Brazil, for example, will not need to start from scratch in planning nuclear security at the FIFA Confederations Cup in June 2013, the World Youth Day in July 2013, the FIFA World Cup in July 2014, the Olympic Games in August 2016 and the Paralympic Games in September 2016. The country's authorities are building on the experience gathered through working with the IAEA in organizing nuclear security arrangements for the XV Pan American Games, held in 2007 in Rio de Janeiro.

Expertise gained during the Pan American Games enabled Brazil to assist Peru in organizing nuclear security at two major events in 2008. In 2009, the IAEA published a report on nuclear security measures at those Games, and in 2012, it published *Nuclear Security Systems and Measures for Major Public Events* (IAEA Nuclear Security Series No.18) to enable States to benefit from each other's experience.

Despite this growing capacity, Miaw sees a continued need for assistance of the type the IAEA is offering. Requests for support come regularly from States. Sports events make up the majority of requests, yet an increasing number relate to non-sporting events such as political meetings. Malaysia, for example, has asked for assistance in providing nuclear security at an Association of Southeast Asian Nations meeting to be held in November 2013.

Miaw's focus is prevention, “everything we do aims to help the host State in preventive measures. We do not want bad things to happen. This is the objective of our assistance,” she said.

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Susanna Lööf, IAEA Division of Public Information.

# A HARD MONTH'S WORK IN MANILA

## Securing Radioactive Sources



Security managers keep a watchful eye on spent radioactive sources. These disused sources, which served myriad purposes in medicine, industry and research, present a potential security threat; they could be obtained by terrorists to construct a dirty bomb. To ensure nuclear security and safety, it is essential to package, store and eventually dispose of these spent sources safely and securely.

In some cases, that is easier said than done. For instance, removing an old and highly radioactive source from a medical device is difficult and dangerous. Imagine doing this remotely, using manipulators, in temperatures of up to 35 degrees and over 20 times. This is exactly what the IAEA, together with the South African Nuclear Energy Corporation (Necsa), successfully achieved in March and April 2013 at the Philippine Nuclear Research Institute (PNRI) in Manila.

The mission was financed by the IAEA's Nuclear Security Fund, a voluntary fund established to contribute to support the implementation of

nuclear security activities. Conceived by the IAEA and built by Necsa in 2007, the mobile equipment may be used by the IAEA under a special arrangement with Necsa up to three times a year. Over six weeks in Manila, under an IAEA project, Necsa managed to remove the cobalt and caesium sources from 16 old, teletherapy devices, which had been used to treat cancer patients, and place them into two long-term storage containers. Six other sources were so badly corroded that they could not be 'conditioned', despite the Necsa team's best efforts to extract the sources in an attempt to place them in the storage containers.

Such sources are classified for security and safety reasons as 'category 1', meaning they are considered the most dangerous because they can pose a very high risk to human health if not safely managed or securely protected.

"What's important about disused sources from a nuclear security perspective is that they are vulnerable to loss, abandonment, theft or misuse. In the worst case scenario such sources could be used by terrorists or other criminals in

The sealed sources are slid through a passageway into a long term storage shield. The IAEA provided two of these shields for the Manila mission.

(Photo: P. Pavlicek/IAEA)

a so-called 'dirty bomb' to spread radioactive material," said IAEA Radioactive Source Security Officer, Christina George.

Speaking in Manila, George said: "What we're doing here is a process known as 'conditioning'. Conditioning means that the sources are prepared to be isolated from the environment and from weather conditions and are secured against loss and theft. If this is not done, the source may be lost and later found by an unauthorized person and misused."

She added that once the sources have been removed and stored in the new and more secure shields, it reduces the likelihood they can be stolen or misused. "These shields have inherent security features. The sources are welded into capsules, which are then placed in the storage shield. The storage shield is bolted, covered by a metal container and an additional cage sits over them," said George.

Due to the size and scope of this operation, it was necessary to bring in a specialized facility known as a 'mobile hot cell'. This was conceived by the IAEA and is owned and operated by Necsa.

Due to the size and scope of this operation, it was necessary to bring in a specialized facility known as a 'mobile hot cell'. This was conceived by the IAEA and is owned and operated by Necsa. The hot cell and all the equipment needed to erect, use and dismantle it fits into two shipping containers.

"A hot cell is a shielded radiation chamber," explained George, adding, "It's called 'hot' because the material handled inside the hot cell is highly radioactive."

"The people responsible for the operation therefore need to be protected from the radiation emitted by the sources they remove. So they stand outside the hot cell and operate the equipment inside remotely, using special manipulators. Similar to how you see a joystick being used in a video game."

The Necsa team observes the action within the hot cell via a shielded viewing window or a monitor outside of the cell, where live images captured by a camera inside the cell are displayed.

During a conditioning operation each device is lifted into the hot cell using a crane. The drawer within the device where the source is stored is extracted and the cap covering the source is removed — this step alone can take up to two hours.

Once the source is removed, it gets placed into a capsule within the hot cell. This is welded, checked to ensure it is airtight and then slid through a passageway into the long term storage shield.

Necsa's project manager, Leo Hordijk, said the Philippine operation was more difficult than previous hot cell missions: "Due to the conditions in which these devices have been stored over many years and the humidity in this country, around 80 per cent of them are badly corroded. This makes the mission more technically challenging since it's even harder to remove the sources and this has caused quite a lot of delay."

He added that a further challenge comes from the wide variety of devices being used in each country: "We need a different approach for each device and some have no design documents. We aim to do two a day, but sometimes need two days to condition just one source."

The radioactive waste storage facility at the PNRI is the only storage option for radioactive waste and disused sources in the whole of the Philippines. Out-of-use radiotherapy equipment has been coming to the facility for storage since the early 1970s. Editha Marcelo, head of the PNRI's Radiation Protection Services Section, said: "We're so pleased that this operation is finally taking place. It's been in preparation for around five years."

"These disused teletherapy heads were taking up so much space and now there's more room to receive more radioactive waste. This process also ensures that the public and the environment are protected from these radioactive sources."

Eventually, the institute hopes to move the radioactive sources to a new final disposal site in the north of the country. The IAEA, through a technical cooperation project is helping the institute to locate a suitable site for this kind of facility.

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Louise Potterton, IAEA Division of Public Information.



# KEEPING SEALED RADIOACTIVE SOURCES SAFE AND SECURE



## A Mobile Hot Cell in Action

Radioactive sources are used in a wide variety of devices in medical, industrial, agricultural and research facilities worldwide. These sources, such as cobalt-60 and caesium-137, emit high levels of ionizing radiation, which can treat cancer, measure materials used in industry and sterilize food and medical appliances.

Problems may arise when these sources are no longer needed, or if they are damaged or decayed. If these sources are not properly stored they can be a threat to human health and the environment and pose a security risk.

Procedures to secure these spent or 'disused' sources are often highly expensive and need specialized assistance. The IAEA helps its States find long term solutions for the safe and secure storage of disused sealed radioactive sources (DSRSs).

Vilmos Friedrich is a radioactive waste expert in the IAEA's Department of Nuclear Energy. Louise Potterton spoke to him during a source conditioning mission at the Philippine Nuclear Research Institute in Manila.

## What is a sealed radioactive source?

It's a small capsule which contains a very high concentration of radioactive material. The encapsulation ensures that the radioactive material is not dispersed into the environment under normal operating conditions. These high activity sources, which are usually a few centimetres in dimension, are put in various, large devices depending on the purpose for which they will be used. These devices provide the shielding that protects the operators, but allows the radiation beam to leave the device and enter the targeted area or object.

## When does a sealed radioactive source become 'disused' or spent?

There are various reasons. The most common is that the radioactive material is decaying, its activity is decreasing and it's no longer usable for the original purpose. Or there could be a newer technology that replaces the use of the device containing the source, for example an X-ray machine that has no radioactive material inside. Another reason could be that some natural disaster or impact has damaged the device. There are also cases in which a company, following bankruptcy, can no longer take care of the machines it owned that contain radioactive sources.

The hot cell and all the equipment needed to erect, use and dismantle it, fits into two shipping containers.

(Photo: P. Pavlicek/IAEA)



The team successfully extracts the source from the medical device.  
(Photo: P. Pavlicek/IAEA)

## Why did the IAEA develop the hot cell?

The IAEA wished to assist countries by constructing a mobile facility, which could be used on-site to make disused sources safe and secure. The conceptual design was developed at the IAEA. Necsa — the South African Nuclear Energy Corporation — was contracted to undertake the detailed design and construction.

The IAEA has a special arrangement with Necsa that allows it to use the hot cell up to three times a year. Funds from the IAEA's Nuclear Security Fund were made available to develop and manufacture the mobile unit and it was ready in 2007. Since then the mobile hot cell has been used in Sudan, United Republic of Tanzania and Uruguay and two more mobile hot cells are now also in operation.

## How does the hot cell process work?

All the parts needed to erect and operate it are loaded into two containers. These are shipped from South Africa to the part of the world where the hot cell is needed. The individual devices are lifted by crane into the hot cell. Once inside, the radioactive sources

are removed from these units using remote manipulators that the operators control outside of the cell. The sources cannot be removed outside of the hot cell because the high radioactivity would cause severe health damage to the operators. Once the source has been removed it's put into a protective capsule, which is welded.

Eventually these capsules are consolidated into a long term storage container that provides shielding and can accommodate many sources. These containers are then placed into an additional metal container, secured further with a metal cage, locked and then placed in a long term storage facility.

## How does the protective shielding of the hot cell work?

The walls of the hot cell must provide adequate shielding to protect the operators from the ionizing radiation emitted by the bare high activity sources after they have been removed from the shielded devices. High density materials such as lead or heavy concrete are typically used for shielding purposes in stationary facilities. However, for a mobile unit it's not feasible to transport tens of tonnes of lead or concrete blocks.

The mobile hot cell walls therefore have a sandwich structure. Outside and inside there are relatively thin steel plates, which can easily be transported to the site. The gap of 1.5 m between the plates is filled with sand that is available in any country. It's this thick sand layer that provides adequate shielding.

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Louise Potterton, IAEA Division of Public Information.

Once the sources have been removed they are placed into protective capsules within the hot cell.  
(Photo: L. Potterton/IAEA)





# KNOW YOUR RISKS

## Cataloguing Sealed Sources and Devices



In a partially demolished hospital facility, a forgotten teletherapy unit, once used to provide cancer treatment, is left unguarded and is stolen. Trying to extract valuable scrap metal, scavengers inadvertently puncture the capsule in which a highly active radioactive source is sealed. The scrap handlers, the scrap dealers, and the neighbourhood surrounding the scrap yard are exposed to dangerous levels of radioactivity. Eventually, the incident leads to fatalities, injuries, and contamination of the area, illustrating the risks arising from so-called sealed radioactive sources (SRSs) that leave regulatory control. Any malicious use of such sources could have much more damaging consequences.

National regulatory authorities are tasked to establish the means to ensure that SRSs are kept under constant control by authorized users. When a suspected 'orphan source' — an SRS that was lost, forgotten, or stolen — is discovered, the authorities must be able to identify the type of sources within the device in order to respond and prevent any harm to people and the environment.

The IAEA's online International Catalogue of Sealed Radioactive Sources and Devices (ICSRS) provides a searchable database of these vital technical details about sealed sources and devices. "The ICSRS assists responsible authorities in acquiring the information that would enable them to manage these sources and devices safely once no longer in use," said Julia Whitworth, Source Management Expert in the IAEA Waste Technology Section.

An online reference tool, the ICSRS lists manufacturers and sources according to

the model designations, dimensions, shape, markings, photographs of sealed devices, and even the period in which a particular model was manufactured. The information for the ICSRS has been collected from numerous open source databases and manufacturers' catalogues, as well as from missions undertaken by the IAEA.

In addition to the online Catalogue, States can request assistance from the IAEA's Incident and Emergency Centre for emergencies involving sealed sources. The IAEA also provides States with advice on the proper life cycle management of radioactive sources, promoting safe work practices, and enhanced security during use, transport and storage under the programme on the management of disused sealed radioactive sources. The programme assists States in implementing safe and cost effective technologies for recovering, conditioning and storing disused sealed radioactive sources. The IAEA also provides assistance in repatriating and recycling high activity disused SRSs, as well as conditioning disused radium sources.

Access to the Catalogue is controlled and only responsible entities identified by the Member State's regulatory authority are authorized to use it. The information in the Catalogue is frequently updated based on information received from States and other recognized authorities. The ICSRS makes a valuable contribution to the IAEA's efforts to promote safe and secure management of disused SRSs.

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Aabha Dixit, IAEA Division of Public Information.

(Left) A disused source in a storage bunker.  
(Right) A rusted, disused source before conditioning.

(Photo: IAEA Department of Nuclear Energy/Waste Technology Section)



# TRACKING TRAFFICKERS

## The IAEA Incident and Trafficking Database

Radioactive material is missing from a hospital. Contaminated metal is found in a scrap yard. Smugglers try to peddle nuclear-weapon-usable material. These different scenarios illustrate the risks that these materials can pose to human safety and security. To assess those risks and to develop strategies to reduce them, States must understand the implications and the scope of such incidents that are occurring around the world.

To better understand and respond to these events, the IAEA maintains an Incident and Trafficking Database (ITDB) which collects information from 122 participating States and some select international organizations. They are asked to share data on a voluntary basis about incidents in which nuclear and other radioactive material has fallen “out of regulatory control.” This could mean reporting cases of material that has gone missing, or discoveries of material where none was expected. The cases range from the innocent misplacement of industrial radioactive sources to criminal smuggling efforts which could aid terrorist acts.

This information is shared among ITDB participants, and IAEA analysts try to identify trends and characteristics that could help prevent the misuse of these potentially dangerous materials.

“The ITDB has become an internationally recognized tool for States to study the extent and nature of these incidents,” said John Hilliard, head of the Information Management and Coordination Section that administers the database. “We’ve learned a lot by studying them, and we hope the information helps us prevent accidents or crimes in the future.”

The IAEA established the database in 1995 after States became alarmed by a growing number of trafficking incidents in the early 1990s. The service was originally operated by the Department of Safeguards, but later moved to the Department of Nuclear Safety and Security, where the Office of Nuclear Security now administers all the data collection and analysis.

ITDB participants reported 2331 confirmed incidents between 1993 and late 2012. Of those, 419 incidents involved unauthorized possession and related criminal activities

(such as attempted sales), 615 involved the theft or loss of material (such as material missing from an industrial site), 1244 involved other unauthorized activities and events (such as detections of contaminated metal in scrapyards), and some incidents fell into multiple categories.

“The group of unauthorized possession and related criminal activities usually gets the most attention because it describes the bulk of the malicious security threats,” Hilliard said. Reports of incidents in this group have declined since the early 1990s, and they include 16 confirmed incidents involving the unauthorized possession of highly enriched uranium or plutonium. Some of these cases involved attempts to sell or traffic these materials across international borders.

“None of these cases involved material in sufficient quantities to make even a crude nuclear weapon,” said Hilliard, “but they do show that some bad guys believe they can sell this stuff on the black market.”

Also worrying are some incidents indicating the involvement of nuclear professionals, not just petty criminals.

“We’ve seen a new breed of trafficker,” Hilliard said, “as well as occasional signs of perpetrators working together in small networks.”

Reports in the other groups of incidents have increased significantly since 1993, and they appear to have peaked in the mid-2000s. But it can be challenging to identify trends in the statistics, as some of these increases may simply reflect better national detection and reporting capabilities, rather than the actual number of incidents.

“All in all, the ITDB has proven to be a fantastic international resource, and we’re working all the time to expand participation. As we add our 20th year of data in 2013, I’m confident the database will be an essential component of the IAEA’s nuclear security work for the future,” explained Hilliard.

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Greg Webb, IAEA Division of Public Information.

# NO MONEY DOWN

## Boost State Nuclear Forensics Capabilities With Less



Any mention of boosting nuclear forensics capabilities can have governments clutching their wallets reflexively. That's because it sounds very high tech, and therefore very expensive.

In a time of austerity measures, countries can find it difficult to take on additional financial responsibilities, even when those responsibilities have to do with nuclear security.

But according to the IAEA's Office of Nuclear Security, becoming proficient in nuclear forensics isn't as expensive as it initially appears. Nuclear forensics is the science of uncovering the origin and history of nuclear materials, especially those found at a crime scene. "And every country can engage in a nuclear forensics examination, using existing technical capabilities that are readily adapted as part of a nuclear security infrastructure," says David Smith, IAEA Nuclear Security Coordinator.

"They already have the right analytical equipment — spectrometry and inorganic chemistry equipment, for example — in universities, regulatory bodies and mining companies, just to name a few places. And they have much of the expertise — trained technicians and law enforcement officials —

but are unaware that putting these things together along with workable plans and strategies — that the IAEA can provide — can create an effective means for the practice of nuclear forensics."

### Have a Plan

The key, says Smith, is to have a plan ready to be implemented in case of a nuclear incident.

Searching for smuggled nuclear material in a shipyard. If found, the material's chemical and other properties will be analysed to uncover information about its history.

(Photo: D. Smith/IAEA)

The IAEA works closely with leading nuclear forensics laboratories, giving its members access to state of the art analytical facilities when investigating crimes.

If some nuclear material is seized at a border crossing, or found among discarded refrigerators in a junkyard, or used in a dirty bomb, national and local authorities must already have systems in place to contain this material and discover its origins. Law enforcement and security officials should already be trained in how to manage these crime scenes so that critical (often non-nuclear) evidence isn't lost or contaminated.

"Criminal cases involving nuclear material that has fallen off the government radar, we

say it's outside regulatory control, these cases are often won or lost based on the strength of the non-nuclear forensic evidence. Based on analysis of the lead container shielding the radioactive material, the type of glass vial encapsulating the material, or the mud on the fender of a car associated with a nuclear smuggling event," says Smith. "Authorities have to be prepared for this kind of evidence collection and this kind of analysis well in advance of an incident."

Experts advise that such plans and training need to be in place years before these capabilities are needed.

## Get it Right

The IAEA's model plan of action in *Nuclear Forensics Support* (IAEA Nuclear Security Series No. 2) sets out in detail the steps that a country would need to take to get their plan in shape. This publication has been well received by

States since its initial publication in 2006 and is currently being revised to reflect the latest advances and experience in nuclear forensics in support of investigations.

And for those States without nuclear analysis capabilities, the IAEA can facilitate introductions with institutions in countries that do have these capabilities. The IAEA works closely with leading Member State nuclear forensics laboratories as well as with a large network of partner international nuclear forensics laboratories. This network allows its members to have access to leading forensic experts and state of the art analytical facilities when investigating crimes. Some nations already have bilateral agreements with countries with significant expertise in nuclear analysis.

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Sasha Henriques, IAEA Division of Public Information.

## USING ATOMS TO SOLVE CRIMES

### Basic Nuclear Forensics

Nuclear forensics is the analysis of the isotopic signatures, chemical properties, and physical features of nuclear or other radioactive material to uncover information about the material's origin and history. Nuclear forensics is used in national or international legal proceedings, such as criminal cases involving smuggling or terrorism.

Being able to tell (with certainty) where nuclear/radiological material came from and all the places it's been helps countries determine if there are any holes in their nuclear regulatory infrastructure. Sensitive and potentially dangerous materials like these can't be removed from authorized control, ending up in the hands of the public or criminals, if the regulatory system is functioning as it should.

Nuclear forensics is important because the results from a nuclear forensics examination are vital for law enforcement investigations, and help States to make informed decisions that will improve their nuclear security practices.

How does it work? Rather than requiring expensive new investments, nuclear forensics uses existing technical capabilities in the State, including analytical instruments, scientific expertise and radiological facilities maintained by nuclear operators, regulators, environmental monitors, or scientific institutes. The IAEA and its international partners have developed international guidance on how to conduct nuclear forensics examinations. This guidance is contained in the model plan of action.

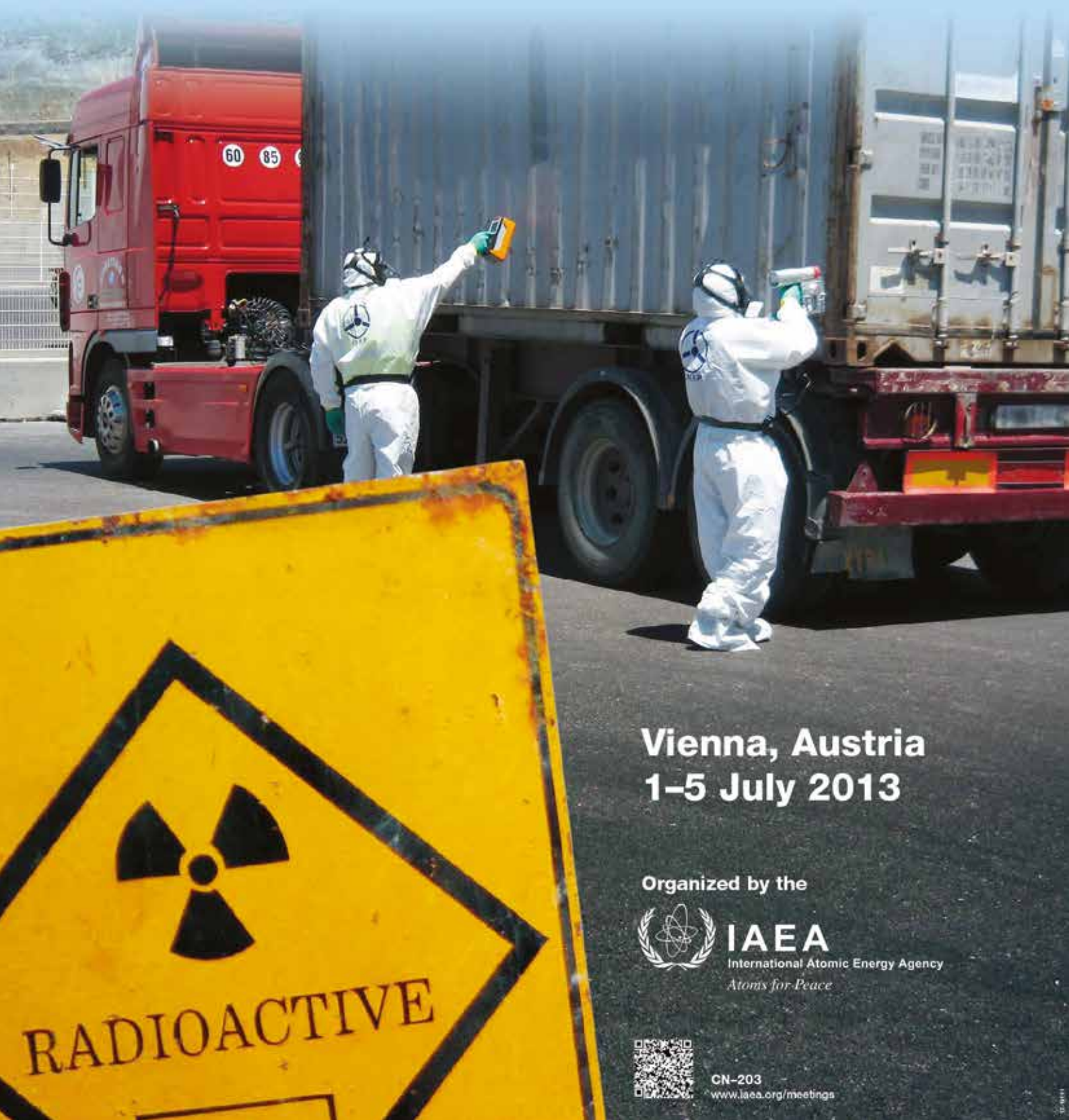
The IAEA helps States with nuclear forensics by publishing technical guidance on how to conduct comprehensive nuclear forensics examinations. The IAEA also conducts generalized training to increase awareness and understanding of nuclear forensics, and trains practitioners to improve analysis at the onset of a nuclear forensics examination. Finally, the IAEA encourages each Member State to develop a nuclear forensics library and helps them develop a common structure for the organization of their information.



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# International Conference on Nuclear Security: **ENHANCING GLOBAL EFFORTS**



**Vienna, Austria  
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