International Conference on

NUCLEAR SECURITY: Commitments and Actions

Summary of an International Conference

5–9 December 2016, Vienna, Austria

IAEA
International Atomic Energy Agency

INTERNATIONAL CONFERENCE ON NUCLEAR SECURITY: COMMITMENTS AND ACTIONS

The following States are Members of the International Atomic Energy Agency:

AFGHANISTAN
ALBANIA
ALGERIA
ANGOLA
ANTIGUA AND BARBUDA
ARGENTINA
ARMENIA
AUSTRALIA
AUSTRIA
AZERBAIJAN
BAHAMAS
BAHRAIN
BANGLADESH
BARBADOS
BELARUS
BELGIUM
BELIZE
BENIN
BOLIVIA, PLURINATIONAL STATE OF
BOSNIA AND HERZEGOVINA
BOTSWANA
BRAZIL
BRUNEI DARUSSALAM
BULGARIA
BURKINA FASO
BURUNDI
CAMBODIA
CAMEROON
CANADA
CENTRAL AFRICAN REPUBLIC
CHAD
CHILE
CHINA
COLOMBIA
CONGO
COSTA RICA
CÔTE D'IVOIRE
CROATIA
CUBA
CYPRUS
CZECH REPUBLIC
DEMOCRATIC REPUBLIC OF THE CONGO
DENMARK
DJIBOUTI
DOMINICA
DOMINICAN REPUBLIC
ECUADOR
EGYPT
EL SALVADOR
ERITREA
ESTONIA
ETHIOPIA
FIJI
FINLAND
FRANCE
GABON
GEORGIA
GERMANY
GHANA
GREECE
GUATEMALA
GUYANA
HAITI
HOLY SEE
HONDURAS
HUNGARY
ICELAND
INDIA
INDONESIA
IRAN, ISLAMIC REPUBLIC OF
IRAQ
IRELAND
ISRAEL
ITALY
JAMAICA
JAPAN
JORDAN
KAZAKHSTAN
KENYA
KOREA, REPUBLIC OF
KUWAIT
KYRGYZSTAN
LAO PEOPLE'S DEMOCRATIC REPUBLIC
LATVIA
LEBANON
LESOTHO
LIBERIA
LIBYA
LIECHTENSTEIN
LITHUANIA
LUXEMBOURG
MADAGASCAR
MALAWI
MALAYSIA
MALI
MALTA
MARSHALL ISLANDS
MAURITANIA
MAURITIUS
MEXICO
MONACO
MONGOLIA
MONTENEGRO
MOROCCO
MOZAMBIQUE
MYANMAR
NAMIBIA
NEPAL
NETHERLANDS
NEW ZEALAND
NICARAGUA
NIGER
NIGERIA
NORWAY
OMAN
PAKISTAN
PALAU
PANAMA
PAPUA NEW GUINEA
PARAGUAY
PERU
PHILIPPINES
POLAND
PORTUGAL
QATAR
REPUBLIC OF MOLDOVA
ROMANIA
RUSSIAN FEDERATION
RWANDA
SAN MARINO
SAUDI ARABIA
SENEGAL
SERBIA
SEYCHELLES
SIERRA LEONE
SINGAPORE
SLOVAKIA
SLOVENIA
SOUTH AFRICA
SPAIN
SRI LANKA
SUDAN
SWAZILAND
SWEDEN
SWITZERLAND
SYRIAN ARAB REPUBLIC
TAJIKISTAN
THAILAND
THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA
TOGO
TRINIDAD AND TOBAGO
TUNISIA
TURKEY
TURKMENISTAN
UGANDA
UKRAINE
UNITED ARAB EMIRATES
UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND
UNITED REPUBLIC OF TANZANIA
UNITED STATES OF AMERICA
URUGUAY
UZBEKISTAN
VANUATU
VENEZUELA, BOLIVARIAN REPUBLIC OF
VIET NAM
YEMEN
ZAMBIA
ZIMBABWE

The Agency's Statute was approved on 23 October 1956 by the Conference on the Statute of the IAEA held at United Nations Headquarters, New York; it entered into force on 29 July 1957. The Headquarters of the Agency are situated in Vienna. Its principal objective is "to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world''.

PROCEEDINGS SERIES

INTERNATIONAL CONFERENCE ON NUCLEAR SECURITY: COMMITMENTS AND ACTIONS

SUMMARY OF AN INTERNATIONAL CONFERENCE
ORGANIZED BY THE
INTERNATIONAL ATOMIC ENERGY AGENCY
AND HELD IN VIENNA, 5–9 DECEMBER 2016

INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA, 2017

COPYRIGHT NOTICE

Marketing and Sales Unit, Publishing Section
International Atomic Energy Agency
Vienna International Centre
PO Box 100
1400 Vienna, Austria
fax: +43 1 2600 29302
tel.: +43 1 2600 22417
email: sales.publications@iaea.org
http://www.iaea.org/books

Printed by the IAEA in Austria
September 2017
STI/PUB/1794

IAEA Library Cataloguing in Publication Data

Names: International Atomic Energy Agency.
Title: International Conference on Nuclear Security: Commitments and Actions / International Atomic Energy Agency.
Description: Vienna : International Atomic Energy Agency, 2017. | Series: Proceedings series (International Atomic Energy Agency), ISSN 0074–1884 | Includes bibliographical references.
Identifiers: IAEAL 17-01113 | ISBN 978–92–0–107017–3 (paperback : alk. paper)
Subjects: LCSH: Nuclear industry — Security measures. | Nuclear facilities — Security measures — Congresses. | Radioactive substances — Security measures. | Nuclear non-proliferation — International cooperation.
Classification: UDC 341.67 | STI/PUB/1794

FOREWORD

The International Conference on Nuclear Security: Commitments and Actions was organized by the IAEA and held in Vienna on 5–9 December 2016. The conference was organized in cooperation with the following organizations and initiatives: European Police Office (Europol); European Union; Global Initiative to Combat Nuclear Terrorism (GICNT); Institute of Nuclear Materials Management (INMM); INTERPOL; International Electrotechnical Commission (IEC); International Telecommunication Union (ITU); Nuclear Forensics International Technical Working Group (ITWG); Nuclear Threat Initiative (NTI); Organization for Security and Co-operation in Europe (OSCE); Police Community of the Americas (AMERIPOL); United Nations Office for Disarmament Affairs (UNODA); United Nations Office on Drugs and Crime (UNODC); 1540 Committee; World Customs Organization (WCO); World Institute for Nuclear Security (WINS); World Nuclear Association (WNA); and World Nuclear Transport Institute (WNTI). A total of 90 heads of delegation, including 47 ministers, participated in the ministerial segment of the conference, which adopted a ministerial declaration by consensus. Altogether, the conference attracted more than 2100 registered participants from 139 IAEA Member States and 29 organizations.

The conference was convened to discuss the international community's experiences and achievements in strengthening nuclear security, to enhance understanding of current approaches to nuclear security worldwide, to identify trends and to provide an inclusive forum at which ministers, policy makers, senior officials and nuclear security experts could formulate and exchange views on future directions and priorities for nuclear security.

This publication contains the President's summary of the conference, a summary of the ministerial segment, the full text of the ministerial declaration adopted by the conference, statements from the opening and closing sessions, an outline of the conference programme and a list of invited contributions. The attached CD-ROM contains the full conference programme, the list of conference participants, the national statements from the ministerial segment, and a selection of papers and presentations from the conference. For the first time, the IAEA invited students and young professionals to submit an essay on a topic related to the conference for review by a panel of international judges. The three winning essays are reproduced in this publication.

The IAEA gratefully acknowledges the cooperation and support of the organizations and individuals involved in this conference. The IAEA officers responsible for this publication were R. Evans, T. Gray and R. Raja Adnan of the Division of Nuclear Security.

EDITORIAL NOTE

The contents of this publication have not been edited by the editorial staff of the IAEA. The views expressed remain the responsibility of the named authors or participants. In addition, the views are not necessarily those of the governments of the nominating Member States or of the nominating organizations.

Although great care has been taken to maintain the accuracy of information contained in this publication, neither the IAEA nor its Member States assume any responsibility for consequences which may arise from its use.

The use of particular designations of countries or territories does not imply any judgement by the publisher, the IAEA, as to the legal status of such countries or territories, of their authorities and institutions or of the delimitation of their boundaries.

The mention of names of specific companies or products (whether or not indicated as registered) does not imply any intention to infringe proprietary rights, nor should it be construed as an endorsement or recommendation on the part of the IAEA.

The authors are responsible for having obtained the necessary permission for the IAEA to reproduce, translate or use material from sources already protected by copyrights. Material prepared by authors who are in contractual relation with governments is copyrighted by the IAEA, as publisher, only to the extent permitted by the appropriate national regulations.

Any accompanying material has been prepared from the original material as submitted by the authors.

The IAEA has no responsibility for the persistence or accuracy of URLs for external or third party Internet web sites referred to in this book and does not guarantee that any content on any such web sites is, or will remain, accurate or appropriate.

CONTENTS

PRESIDENT'S SUMMARY[1] OF THE CONFERENCE

INTRODUCTION

The International Conference on Nuclear Security: Commitments and Actions was convened at the IAEA's Headquarters in Vienna on 5–9 December 2016. This was the second conference of this type convened by the IAEA, following that held in July 2013. It included government ministers; senior officials and policy makers responsible for nuclear security; experts and representatives from a wide range of specialized disciplines and organizations that contribute to nuclear security; representatives of intergovernmental and non-governmental organizations with relevant competences; regulatory bodies and other national competent authorities; national security and crisis management agencies; law enforcement and border control agencies; and industry and other entities engaged in activities relevant to nuclear security.

The conference attracted some 2 100 registered participants from 139 Member States, 47 of which were represented at ministerial level, and 29 organizations. This high level of participation, even higher than in 2013, is a reflection of the continuing importance attached to nuclear security worldwide and of the value that States and organizations place on the inclusive forum provided by the conference. It also confirms the widespread recognition and experience that, while activities relating to nuclear security are the responsibility of individual States, there are regional and global interests in nuclear security matters that can be greatly enhanced through collective commitments supported by national actions and international cooperation.

The conference provided an inclusive forum where participants from all IAEA Member States could discuss progress and challenges and exchange ideas to identify trends and lessons learned. It was also a valuable forum to consider medium and long term objectives for international nuclear security efforts, and the conclusions from these discussions will be an important input to the development of the IAEA's Nuclear Security Plan for 2018–2021. This Plan will provide a blueprint for the IAEA's nuclear security activities over this period and will facilitate the evaluation of the IAEA's nuclear security programmes.

In his opening remarks, the IAEA Director General, Yukiya Amano recalled three key items that he had highlighted at the 2013 Conference. He welcomed the entry into force in May 2016 of the Amendment to the Convention on the Physical Protection of Nuclear Material (CPPNM) and urged all Member States to adhere to the CPPNM and its Amendment. He also urged Member States to make use of the IAEA's peer review and advisory services, as needed, to help them meet their obligations. And he noted the progress in developing consensus international guidance through the Nuclear Security Guidance Committee (NSGC), and urged all Member States to take part in the NSGC's work. He also highlighted a number of examples from around the world of concrete steps that have been taken by States, with support from the IAEA, to strengthen different aspects of nuclear security.

[1] The opinions expressed in this summary — and any recommendations made — are those of the participants and do not necessarily represent the views of the IAEA, its Member States or the other cooperating organizations.

In his remarks, the President of the Conference, His Excellency Mr Yun Byung-se, the Minister of Foreign Affairs of the Republic of Korea, highlighted the challenges that nuclear security still faces, and identified three ways to meet those challenges: a partnership of the IAEA's Member States working together in a spirit of innovation, creativity and consensus; commitments and actions by States and the international community to deliver timely and concrete actions; and an enduring nuclear security architecture based on international norms such as the CPPNM and its Amendment, the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT) and United Nations Security Council Resolution 1540. He urged States not to wait until an incident of nuclear terrorism occurs but to take steps now, and called on the IAEA to "take the helm" of global nuclear security efforts based on its decades of experience.

Both the Conference President and the Director General recognized the progress that has been made in nuclear security, but emphasized the need to avoid complacency by continuing to strengthen nuclear security worldwide and remaining vigilant against emerging and evolving threats.

The conference began with a ministerial segment, in which a total of 90 statements were delivered by Ministers and other Heads of Delegation on behalf of their States and regional groups. A Ministerial Declaration, adopted by consensus in the ministerial segment, is available on the conference web site.

The ministerial segment was followed by a scientific and technical programme comprising six high level discussions on broad themes central to nuclear security and 31 parallel technical sessions on specialized scientific, technical, legal and regulatory issues concerning nuclear security.

Working with the session co-chairs, rapporteurs recorded the main conclusions and key issues from each of the high level and technical sessions in rapporteur's reports. This President's Report highlights the main conclusions and key issues of the conference as a whole, drawing on these reports from the high level and technical sessions. While every effort was made to ensure that this Report is an accurate and balanced reflection of the Conference, ultimately it is the President's Report, not a consensus report.

The conference reaffirmed the principle that the responsibility for nuclear security within a State rests entirely with that State, but equally recognized the importance of international cooperation and the central role of the IAEA.

The six high level sessions of the conference developed these principles under the titles which follow, addressing not only frameworks for international cooperation but also the development and strengthening of national nuclear security regimes.

The technical sessions addressed in more detail a wide range of specific scientific, technical, legal and regulatory issues from all areas of nuclear security. Rapporteurs captured the main conclusions and key issues from each technical session. Key conclusions from the technical sessions are summarized briefly below under the most relevant High Level Session.

INTERNATIONAL LEGAL INSTRUMENTS

High Level Session 1

During High Level Session 1, several international instruments relevant to nuclear security were discussed, with a focus on the Convention on the Physical Protection of Nuclear Material (CPPNM) and its Amendment, which are key elements of the international

legal framework for nuclear security. The entry into force of the Amendment strengthens nuclear security due to the expanded scope of the Amended CPPNM compared to the original CPPNM, in particular in the areas of nuclear material in domestic use, storage and transport and the security of nuclear facilities.

Participants emphasized the importance of IAEA's efforts to universalize adherence to the CPPNM and its Amendment, and recognized the need to prepare for the CPPNM review conference due in 2021. In addition, some participants called for States to comply with Article 14 of the CPPNM Amendment by providing information on national laws and regulations.

The challenges regarding the implementation of legal instruments for nuclear security were recognized by the panellists, who also acknowledged the need for support at all levels in implementation of these legal obligations. Some types of non-binding instruments and tools, such as the IAEA Nuclear Security Series Fundamentals and Recommendations, were considered to be helpful in implementing legal obligations. However, it was also noted that legal instruments are not, on their own, solutions for all nuclear security issues.

Related technical sessions

During the technical sessions on international legal instruments, the discussion focused primarily on the implementation of the Amendment to the CPPNM. Participants stressed the importance of the IAEA continuing to assist States on request with the implementation of the Amendment to the CPPNM. They also urged IAEA to enhance its efforts to facilitate the exchange of information related to best practices for national implementation of obligations. In addition, participants stressed the need for further information exchange on national implementation of the CPPNM and its Amendment, including through submission of information pursuant to Article 14 and through the CPPNM Points of Contact.

Beyond the CPPNM and its Amendment, participants emphasized the importance of the IAEA's efforts in assisting Member States on request with the implementation of other relevant international instruments, such as the Code of Conduct on the Safety and Security of Radioactive Sources (Code of Conduct). They also noted the importance of coordination between the IAEA and other relevant international organizations and initiatives in order to provide harmonized assistance.

INTERNATIONAL BODIES AND INITIATIVES

High Level Session 2

During High Level Session 2, the role of international bodies and initiatives in nuclear security was discussed, focusing in large part on the IAEA and its roles and responsibilities. Participants reaffirmed the IAEA's central role in strengthening nuclear security globally and in coordinating international activities in the field of nuclear security.

Participants recognized that as the coordinating role of the IAEA develops, it needs to be allocated sufficient human and financial resources to carry out this role as well as to manage its nuclear security programme. In addition to the IAEA, the United Nations Security Council Resolution 1540 Committee and other organizations and initiatives such as the

Global Initiative to Counter Nuclear Terrorism (GICNT) were recognized by the panellists as important to nuclear security. A panellist stressed that these international organizations and initiatives should not duplicate efforts by the IAEA but supplement them. In addition, participants recognized industry as having an important role in implementing nuclear security, and the essential partnership between governments and NGOs.

One panellist noted that, because the global security environment is subject to rapidly evolving threats, such as the threats associated with emerging technologies and cyberattacks, national nuclear security regimes need to be flexible, adaptable and resilient. Some participants advocated a new binding legal instrument with more comprehensive coverage of nuclear security. Others argued that, due to this dynamic threat environment and the length of time a comprehensive convention would take to negotiate, such a convention is not appropriate at this time, and acting through voluntary measures remains a more flexible solution.

NUCLEAR MATERIAL AND NUCLEAR FACILITIES

High Level Session 3

During High Level Session 3, physical protection of nuclear material and of nuclear facilities was discussed. In particular, panellists and participants focused on how to achieve high levels of physical protection during all stages of a facility's life. Some States are addressing this objective through changes to their regulations. Others discussed the need to adopt new regulatory strategies, especially when facing the challenges of designing and siting new facilities as well as decommissioning and dismantling facilities at the end of their life. Participants shared the view that it was difficult to conclude that any particular stage was more challenging than another. It was recognized that many regulatory systems currently focus on the operating stage of the facility and need to be amended to apply to the earlier and later stages of its life. Participants were particularly concerned about responding to cyber threats at all stages of a facility's life.

Participants identified a number of practices that could enhance physical protection of nuclear material and nuclear facilities, including requesting IAEA peer review services, developing a robust nuclear security culture, updating regulatory frameworks, considering threat assessments and review of design basis threats (DBTs), taking effective measures against cyber threats, and sharing of non-sensitive information on a bilateral, regional and international basis, especially on good practices.

Related technical sessions

Participants in the technical session on threat assessment and DBTs for nuclear material and nuclear facilities highlighted a tendency for current DBTs to focus primarily on other physical protection considerations and not to take cyber threats fully into account. Nuclear operations and processes, including physical protection systems, have become increasingly reliant upon computer-based systems, and therefore it is necessary to consider computer security systematically in the threat assessment and DBT.

Participants in the technical session on the application of physical protection throughout the nuclear fuel cycle stressed the importance of the involvement of industry in the development, acceptance and validation of national nuclear security requirements. They noted that careful consideration of costs and benefits is needed when applying graded

approaches to nuclear security in different stages of the nuclear fuel cycle. It was also noted that there is potential, especially for countries embarking on new nuclear power programmes, to use technology to reduce reliance on human resources; however, this would reinforce the need to appropriately address computer security.

Participants in the technical session on physical protection approaches and evaluation noted that Member States recognize the value and utility of performance based evaluations and exercises used to validate physical protection systems and contingency response plans. They also noted that the IAEA has developed or is actively developing guidance and training courses for International Physical Protection Advisory Service (IPPAS) review and for contingency planning and performance based exercises. Participants encouraged Member States to use these courses to enhance their nuclear security regimes. Participants also highlighted other IAEA efforts in this area, notably Coordinated Research Projects (CRPs) on evaluation methods and provide a basis for Member States' competent authorities to work together for the improvement of these approaches and ultimately of physical protection systems.

In the technical session on regulatory aspects of physical protection, participants reaffirmed the importance of the role of the competent authority for verifying continued compliance with the physical protection regulations and licence conditions through regular inspections and for ensuring enforcement actions. The participants also stressed the importance of sharing the experience and expertise of advanced nuclear power countries with States embarking on new nuclear power programmes. The majority of participants identified the cyber threat and insider threats as leading threats that must be addressed by the national nuclear security regime, and stressed that keeping pace with these rapidly evolving threats represents a significant challenge. Finally, participants in a panel session addressing the insider threat noted that an atmosphere of trust is a prerequisite for a healthy environment where employees feel safe to report mistakes. If this is not the case, mistakes (e.g. leak of sensitive data) may not be discovered until it has already led to severe consequences.

During a discussion addressing the interface between safety and security regulations, it was noted that it could be difficult to integrate safety and security regulations, but that effective coordination between safety and security regulatory activities is necessary.

In the technical session addressing nuclear material minimization, participants urged States to request IAEA assistance in their efforts to convert research reactors and medical isotope production facilities from high to low enriched uranium (HEU to LEU). For example, participants encouraged the IAEA to continue to provide support in removing nuclear materials, arranging transport, procuring LEU cores, providing training on nuclear material transport, supporting emergency preparedness and assisting with other activities as needed.

In the nuclear material control and accounting (NMAC) session it was clear Member States need to understand the importance of a domestic NMAC programme and its objective. The objective of a domestic NMAC programme is "to maintain and report accurate, timely, complete and reliable information on all activities and operations (including movements) involving nuclear material" including "the locations, quantities and characteristics of nuclear material at the nuclear facility".

Three technical sessions addressed the topic of computer security. A technical session on regulations and policies for computer security in a national nuclear security regime called for efforts to be made, involving the IAEA, to develop guidance and share information on developing and implementing such regulations. This could include guidance on computer

security exercises and on computer security assessment, including lessons learned and examples of effective adaptation of other international or national standards.

An extended technical session addressed computer security for industrial control systems (ICS) in nuclear facilities. Participants urged the IAEA to develop and deliver dedicated computer security training for ICS, especially to address issues related to "computer security culture" and awareness of the impact of cyber attacks on these systems. Participants also highlighted the need to provide guidance and training on managing the greater exposure to cyber attacks on ICS networks resulting from increasing integration and convergence of operational technology and information technology networks. Participants also suggested that the IAEA should consider developing guidance on effective computer security plans and on managing information security projects. Participants also discussed the relationship between IAEA guidance on computer security and standards of the International Electrotechnical Commission.

Participants also called for continued efforts to increase awareness of and participation in the existing IAEA CRP "Enhancing Computer Security Incident Analysis and Response Planning at Nuclear Facilities", and for increased financial and human resources for the project. The project would particularly benefit from greater outreach to those research institutions that could provide resources for modelling cyber attacks, including the identification of attack vectors, and could conduct computer security exercises that have the potential to enhance computer security incident response. Presentations in the session also highlighted the difficulties in finding solutions to address the specific computer security challenges that the nuclear industry faces and discussed the importance of coordinating safety and security in this context. It was noted that IAEA publications could provide guidance in achieving better coordination between safety and security.

During the technical session focused on transport security, participants expressed appreciation for Member States' sharing of experience and knowledge in assessing sabotage risk, especially to nuclear material in transport, and recognized the need to provide support for guidance related to this topic. Session participants also urged the Secretariat to encourage Member States and stakeholders to contribute to the CRP on security of nuclear and other radioactive material in transport by participating in research and meetings.

RADIOACTIVE MATERIAL AND ASSOCIATED FACILITIES

High Level Session 4

During High Level Session 4, participants underlined the importance of nuclear security for radioactive material and associated facilities due to the widespread use of radioactive material for a range of applications. Participants shared the view that States need to address security of radioactive material and associated facilities in a comprehensive manner at all stages of the material's lifetime.

Participants also highlighted IAEA efforts to support security of radioactive material and facilities in this session. Several presenters called for the timely approval of the draft guidance on the management of disused sources by the IAEA Board of Governors. Participants also shared the view that the IPPAS is beneficial to States with only radioactive material and associated facilities, for reasons including the political visibility of missions and access to international experts, as well as the development of a comprehensive mission report which allows for the identification and implementation of security improvements. However, given the increase in the requests for IAEA services such as IPPAS, participants underlined

the need for increased resources for the IAEA to meet the needs of Member States in this area. They also acknowledged the importance of IAEA fora such as the Working Group on Radioactive Source Security and Code of Conduct meetings and participants stressed that States should better utilize these mechanisms to report on progress and remaining challenges.

Related technical sessions

During the two technical sessions focused on security of radioactive material, session participants expanded on the discussion of IAEA's radioactive material security programmes. In particular, they again emphasized the importance of providing the IAEA with predictable regular budget resources to support the programmes. The participants urged the IAEA to continue efforts to promote universal political commitment to the Code of Conduct and its Supplementary Guidance as well as to develop guidance providing support to Member States for assessing threats and responding to nuclear security events.

During one of the technical sessions, participants focused on gaps and challenges related to security of radioactive material. They observed that Member States remain focused on establishing and strengthening the regulatory framework for the security of radioactive material. In particular, they noted that regulatory bodies face challenges in implementing regulations (including limited human resources for conducting inspections), and further guidance in these areas is needed. Participants also noted the need for flexibility in the initial implementation of new security regulations, and by regulators in evaluating compliance, and shared the view that communication between regulatory bodies and licensees is important, making use of various methods of outreach to foster better cooperation. This could not only increase transparency but also give industry an opportunity to provide feedback on regulatory requirements.

During a session specifically focused on alternative technologies to the use of high activity radioactive sources, session participants focused on actions that the IAEA might consider to facilitate States' decision-making regarding alternative technologies. Notably, participants encouraged the IAEA to share comprehensive and reliable information on available alternative technologies as well as to consider how IAEA might facilitate a dialogue among Member States and varying stakeholders on this topic. Such a dialogue should be evaluated in relation to numerous factors — including their respective applications, safety, security, and end-of-life management — and will require coordination among multiple IAEA departments and should follow a balanced and neutral approach. Participants encouraged the IAEA to consider paths for providing additional support to Member States on implementation of alternative technologies to the use of high activity radioactive sources.

During the session focused on transport security, participants discussed the need for IAEA to provide additional support to Member States for the development of nuclear security regulations on the transport of nuclear and other radioactive material.

NUCLEAR AND OTHER RADIOACTIVE MATERIAL OUT OF REGULATORY CONTROL

High Level Session 5

During High Level Session 5, existing approaches, emerging trends and areas to be addressed in detection of, and response to, criminal and intentional unauthorized acts involving nuclear and other radioactive material out of regulatory control were discussed.

Participants encouraged the IAEA to continue to coordinate exercises, publish guidance and organize activities to strengthen Member States' capabilities on detection of nuclear and other radioactive materials out of regulatory control and response to nuclear security events. Participants also noted the importance of continued dialogue on these issues and the value of international conferences where national experiences in these areas could be shared and discussed.

Participants highlighted the importance of mechanisms that foster interagency cooperation at the national level, such as working groups, and joint training and exercise programmes. Participants encouraged the IAEA to continue to carry out and coordinate CRPs on detection technologies for nuclear and other radioactive material out of regulatory control and to support the establishment of nuclear security programmes for detection and response in Member States.

Participants also indicated that States are more likely to design an effective national response framework if they clearly identify and define roles and responsibilities, and ensure that the framework includes the full spectrum of response actions to be taken, beginning with the initial response to a nuclear security event, crime scene management, investigations and eventual prosecution of perpetrators.

Related technical sessions

Participants in the session on threat assessment for material out of regulatory control called for efforts to focus on:

- Providing guidance to States on the effective use of information indicators to detect criminal or intentional unauthorized acts involving material out of regulatory control and on effective incorporation of both instrument- and information-based methods when developing detection operations;
- Coordinating the efforts of international and regional organizations to develop a harmonized and consistent approach to sharing nuclear security threat and risk information; and
- Facilitating regional nuclear security exercises to build relationships and trust and to develop information exchange protocols and procedures.

Participants in two technical sessions on detection technology stressed that the nuclear security detection architecture needs to be continuously reviewed, and improved as necessary, to address evolving threats. Exercises were recognized as crucial in developing effective national detection architecture. Participants shared the view that new approaches and methodologies are needed to address the technical and organizational challenges in achieving this. Several paths were suggested for the IAEA in addressing Member States' needs in relation to detection technology. Participants encouraged IAEA to continue the development of guidance on sustaining nuclear security systems and measures for the

detection of nuclear and other radioactive material out of regulatory control. Participants also proposed that the IAEA expand the scope of CRPs on detection technology to address the needs of Member States, and encouraged Member States to participate in these projects. They also called on the IAEA to expand its efforts to provide opportunities for information sharing on detection technology and its application, particularly to address the needs and capabilities of Member States with limited resources, and to provide technical guidance and raise awareness of new and improved detection technologies and processes, including better methods of application of these technologies.

Three technical sessions addressed different aspects of nuclear forensics, focusing on the need to build confidence in nuclear forensics, the science and interpretation of nuclear forensics signatures, and the role of nuclear forensics in a national nuclear security infrastructure. Participants in the first session stressed the need for consistency of practice in nuclear forensics and shared the view that conclusions resulting from the conduct of nuclear forensics examination or analysis of physical objects contaminated by radionuclides should be handled in such a way as to maximize the possibility that the results may be admitted as evidence as part of a legal proceeding. In this regard, strong links between nuclear forensic laboratories and law enforcement organisations are vital to address requirements that may exist in different national legal systems in relation to the admission of evidence of this type.

During the second session, participants stressed that the scientific methods supporting the examination need to be fully validated and defensible and emphasized the role of subject matter experts and clearly defined information flows in comprehensive nuclear forensic interpretation. Participants also discussed the issue of statistical confidence in nuclear forensics conclusions and its effect on the weight that such evidence carries in legal proceedings, including the possibility of guidelines to seek greater uniformity in making such determinations. During the third session, participants noted that nuclear forensics needs to be integrated within a national response plan for nuclear security events and stressed that nuclear forensics is predicated on the process of conducting an examination rather than on sophisticated instrumentation or a single measurement.

Participants in the technical session on major public events noted that nuclear security systems and measures for such events have become a major topic for nuclear security internationally. States hosting such events are increasingly requesting international assistance to complement their existing national nuclear security resources and capabilities, and the IAEA's support in this regard has been particularly welcome. Effective coordination and cooperation at all levels among the different competent authorities that need to be involved was identified as a key challenge in implementing the nuclear security measures for major public events.

Participants in the technical session on response to nuclear security events recognized the State responsibility for nuclear security but stressed that threats no longer respect borders or boundaries. In light of the evolving threat environment, participants suggested that further IAEA support for multilateral nuclear security event response exercises is an excellent means to strengthen and sustain nuclear security. The session pointed out the need for increased transparency amongst fellow Member States on nuclear security event response, including consideration of possible regional and bilateral sharing of information on threats. Further development and promotion of technical guidance on response to nuclear security events, increased dialogue and fora focused on response to nuclear security events is the recommended path forward for the IAEA activities in this field.

NATIONAL NUCLEAR SECURITY REGIME, INCLUDING NUCLEAR SECURITY CULTURE

High Level Session 6

During High Level Session 6, nuclear security regimes were discussed, with a focus on steps Member States could take to improve their national nuclear security regimes. The importance of nuclear security culture as a central part of sustaining national nuclear security regimes was particularly stressed.

Session participants encouraged Member States to continually assess threat and risk, taking into account the evolving threat and new technologies, and adapt their nuclear security regime; provide assistance and guidance to national operators on implementing a sustainable nuclear security culture; continue developing their human resources; and continually evaluate and test their security systems and measures. In addition, participants encouraged Member States to: subscribe to the IAEA Nuclear Security Fundamentals; to meet the intent of the IAEA Nuclear Security Recommendations; to continue to improve the effectiveness of their nuclear security regimes and operators' systems; and to ensure that managers and personnel with accountability for nuclear security are demonstrably competent. The Integrated Nuclear Security Support Plan (INSSP) was recognized as a way to assist Member States in systematically developing and sustaining their national nuclear security regimes.

With respect to IAEA's provision of guidance, participants urged the IAEA to complete the Nuclear Security Series and, at an appropriate time, to consider consolidating the guidance as well as provide more guidance on addressing the safety–security interface. In addition, participants urged the IAEA to consider ways to ensure that its Nuclear Security Recommendations are seen to be of comparable importance to its Safety Requirements within the Safety Standards Series.

Related technical sessions

Participants in the technical session on national nuclear security regimes focused on the IAEA's support for national nuclear security regimes. Participants urged the IAEA to work with Member States to incorporate lessons learned, approaches adopted and tested by Member States in developing and sustaining their national nuclear security regimes and address the trends and issues relevant to global nuclear security through assistance activities and guidance. Participants suggested that the IAEA could provide a platform for advanced nuclear power countries to support States embarking on nuclear power programmes in establishing a sustainable national nuclear security regime. It was also suggested that the IAEA could provide guidance on approaches to nuclear security specific to States with no nuclear power and limited applications using radioactive material. Participants also encouraged the IAEA to develop additional guidance on managing safety–security interfaces, establishing legislative and regulatory frameworks for nuclear and other radioactive material out of regulatory control, including model legislative provisions, and conducting peer reviews focusing on the sustainability of nuclear security regimes.

Other technical sessions addressed aspects of the sustainability of nuclear security regimes.

Participants in the technical session on nuclear security culture noted that achieving sustainable nuclear security depends on the people involved and that security culture is the vehicle for achieving this goal, emphasizing that efforts to promote and sustain a strong

nuclear security culture should be an integral part of national strategy for nuclear security. Competent authorities have important roles in promoting a strong nuclear security culture at a national level and in encouraging licensees to take actions to continuously improve their organizational nuclear security culture. Participants urged the IAEA to continue to take a leading role in a coordinated approach to promote strong and sustainable nuclear security cultures in Member States by developing further practical guidance, promoting the understanding of nuclear security culture, supporting its application in practice, through workshops, conducting expert missions on nuclear security culture assessment, and facilitating and coordinating international experience-sharing opportunities.

Participants in the technical session on nuclear security education noted that the International Nuclear Security Education Network (INSEN) has made great contributions to education and training in nuclear security, and encouraged Member State institutions to join and actively participate in the Network. Member States were encouraged to support their academics and academic institutions, that wish to establish nuclear security educational programme and courses, with professional development and INSEN participation. Participants noted that a collegial approach involving institutional collaborations through INSEN has been extremely beneficial for nuclear security education, and the IAEA, Member States and other partners were encouraged to continue this approach.

Participants of the technical session on nuclear security training highlighted that high quality and effective training in the area of nuclear security should be recognized as one of the most important prerequisites for achieving sustainable nuclear security regimes and that management commitment to high quality training is important. Participants encouraged States to develop national human resource development plans, to employ a systematic approach to training, applying existing methods and tools for training needs analysis and evaluation of training effectiveness, and to ensure the competence of instructors. It was specifically mentioned that to increase the effectiveness of nuclear security training, especially in the international environment, it is important to establish more explicit requirements for trainees and to meet these requirements. Participants also urged Member States to ensure that nuclear security training programmes should address the interface between safety and nuclear security. Regarding the IAEA's programmes on human resource development and training, participants encouraged the IAEA to continue to assist States, upon request, in establishing training programmes for competent authorities. They encouraged the IAEA to tailor nuclear security training programmes to specific needs of States and use e-learning as a prerequisite for instructor-led training. Good practices in nuclear security training should also be collected, analysed and disseminated.

During the technical session on Nuclear Security Training and Support Centres (NSSCs) and sustainability of human resource development, participants encouraged the NSSC Network to coordinate and facilitate regional and international cooperation in human resource development, technical support, and scientific support for nuclear security. Participants encouraged NSSC Network Members and the IAEA to continue to share best practices and lessons learned on establishing and operating NSSCs, including through development of further guidance for States, and on steps that States can take to ensure sustainability of centres over the long term. It was noted that the IAEA and the NSSC Network can help States to identify further needs or gaps in establishing and operating an NSSC.

A number of technical sessions also addressed specific topics that relate to parts of a nuclear security regime.

Participants in the panel on information management discussed processes, challenges and tools for information management for nuclear security, with a particular focus on information management by the IAEA and how to use the information to improve nuclear security. With regard to the Incident and Trafficking Database (ITDB), the participants encouraged the IAEA and the Member States to focus on acting on the findings of ITDB analytical reports in the near future, and urged Member States to ensure that their reporting provides needed information. Participants were interested in better understanding the IAEA's security measures for handling such information, and encouraged the IAEA to provide a description of its methods for information security and to consider establishing agreements with Member States on information classification and management, as appropriate. In addition, several new IAEA initiatives relevant to information management and use of information provided to the IAEA were suggested by participants, including encouraging the IAEA to consider establishing a combined information exchange and reporting interface for nuclear security. Finally, appropriate uses of open source information as well as the use of advanced information tools were addressed.

Participants in the technical session on threat and risk assessment methodologies recommended greater focus on research and development (for example, through a CRP) to develop new approaches and methodologies to address identified challenges in conducting accurate and practical nuclear risk assessment. Such research and development should include consideration of the wide range of possible scenarios and measures (and the limited evidence and experience available), the diversity of actors involved, and common analytical pitfalls such as failure to account for an adversary's adaptation to security measures encountered. Participants also called for more harmonized guidance for nuclear security threat and risk assessment to enable consistent application across the nuclear security regime.

Participants in the technical session addressing the emerging issue of unmanned aerial vehicles, or drones, observed that legislation and regulations are slow to reflect changing technological environments. The participants shared the view that the threat and potential security uses of unmanned aerial vehicles are emerging issues, and should remain topics of discussion, including potential computer security dimensions.

Participants in the technical session on communicating with the public on nuclear security shared the view that public engagement on nuclear security should be a national priority, but noted that a balance needs to be struck between transparency and confidentiality during such engagement. Participants also observed that States need to be prepared to communicate on a spectrum of scenarios, to balance the different demands of communicating about safety and security, and to work with designated communications and subject matter experts to ensure that messaging is both technically accurate and understandable to the public.

The above commentary provides a summary record of the International Conference on Nuclear Security: Commitments and Actions, held in Vienna, Austria, 5–9 December 2016.

SUMMARY OF THE MINISTERIAL SEGMENT

The conference began with a ministerial segment in which Ministers and other Heads of Delegation made national statements, and a Ministerial Declaration was adopted by consensus.

The segment was chaired by the Conference President, His Excellency Mr Yun Byung-se, Minister of Foreign Affairs of Republic of Korea. Minister Yun Byung-se's opening remarks and the opening statement to the conference by the Director General of the IAEA, Mr Yukiya Amano, are reproduced in full in Appendix I.

A total of 90 ministers and other heads of delegation made statements. All acknowledged the importance of national commitment to strengthen nuclear security globally, and the need for international cooperation and assistance to complement and support national action. Many expressed appreciation for the IAEA's central role in coordinating such international efforts and providing such assistance when requested. The national statements reflected the different circumstances and priorities of the various States, but a number of recurring themes can be identified; for example:

— States welcomed the entry into force of the Amendment to the Convention on the Physical Protection of Nuclear Material, noting this event as an important milestone in nuclear security.
— Many States referred to the central role of the Agency in coordinating international cooperation and assistance in order to strengthen nuclear security, globally.
— Several States referred to the changing and evolving nature of technology that brings both opportunities and challenges.
— Many States referred to the continued need to acknowledge that the threat of nuclear terrorism is real and must be responded to, globally, as nuclear security is only as strong as its weakest link.
— A number of States reported on the actions that they had taken nationally to strengthen nuclear security.
— Several States noted their expanding use of nuclear energy and nuclear applications and the importance of nuclear security in ensuring that the peaceful uses of nuclear energy continued to be a positive opportunity for States and their communities.
— Several States emphasized the importance of ensuring that the IAEA has sufficient resources to fulfil its role. Some highlighted their own voluntary contributions, both monetary and in-kind, and a few announced their intentions to provide continuing or new contributions.

The text of the ministerial declaration is reproduced below.

MINISTERIAL DECLARATION

Adopted by the International Conference on Nuclear Security: Commitments and Actions
Vienna, 5 December 2016

1. We, the Ministers of the Member States of the International Atomic Energy Agency (IAEA), gathered at the International Conference on Nuclear Security: *Commitments and Actions*, remain concerned about threats to nuclear security and therefore committed to continuously maintaining and further strengthening nuclear security through national actions, which may involve international cooperation, primarily through the IAEA, as well as through other relevant international organisations and initiatives, in accordance with their respective mandates and memberships.

2. We reaffirm the common goals of nuclear non-proliferation, nuclear disarmament and peaceful uses of nuclear energy, recognize that nuclear security contributes to international peace and security, and stress that progress in nuclear disarmament is critically needed and will continue to be addressed in all relevant fora, consistent with the relevant obligations and commitments of Member States.

3. In the spirit of the 2013 Ministerial Declaration of the International Conference on Nuclear Security: *Enhancing Global Efforts*, we welcome the advances made by IAEA Member States in developing and enhancing their national nuclear security regimes. We also welcome the positive impact of the Agency's increasing nuclear security efforts, while noting that much more work needs to be done.

4. We underline the importance of keeping pace with evolving challenges and threats to nuclear security. We affirm the important role of science, technology and engineering in understanding and addressing such challenges and threats, and commit ourselves to stay vigilant and continue to take steps to confront, reduce and eliminate them.

5. We reassert that the responsibility for nuclear security within a State rests entirely with that State, in accordance with its respective national and international obligations, to maintain at all times effective and comprehensive nuclear security of all nuclear and other radioactive material under its control.

6. We call upon all States to ensure that measures to strengthen nuclear security do not hamper international cooperation in the field of peaceful nuclear activities.

7. We recognize that bilateral, regional and international cooperation can serve to strengthen nuclear security, and support, in this context, the central role of the IAEA in facilitating and coordinating international cooperation and in organizing Information Exchange Meetings with other organizations and initiatives on nuclear security.

8. We acknowledge and support the IAEA's core nuclear security activities that assist States, upon request, in their efforts to establish effective and sustainable national nuclear security regimes, including guidance development, advisory services, and capacity building.

Moreover, we encourage Member States to contribute to the Agency's nuclear security assistance by sharing national expertise, best practices and lessons learned.

9. We recognize physical protection as a key element in nuclear security, and support the further development of the IAEA's assistance in areas of importance to Member States such as nuclear forensics, nuclear security detection architecture and response, information security, transport security, and insider threat mitigation, recognizing the need for appropriate measures to protect sensitive information in achieving this objective. In particular, we support the IAEA's efforts to assist Member States to strengthen computer security, recognizing the threat of cyber attacks against nuclear installations.

10. We welcome the entry into force of the Amendment to the Convention on the Physical Protection on Nuclear Material (CPPNM), look forward to its full implementation, and encourage IAEA's continued efforts to promote universalization. We encourage all Member States that have not yet done so to become parties to the Amended CPPNM and also in other international nuclear security instruments such as the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT).

11. We will continue providing the necessary technical, human and financial resources, including through the Nuclear Security Fund, in line with our respective capacities and commitments, as required for the Agency to implement its nuclear security activities and to provide, upon request, the support needed by Member States.

12. We recognize that highly enriched uranium (HEU) and separated plutonium in all their applications require special precautions to ensure their nuclear security and that it is of great importance that they be appropriately secured and accounted for, by and in the relevant State. We encourage the Member States concerned, on a voluntary basis, to further minimize HEU in civilian stocks and use LEU where technically and economically feasible.

13. We commit to maintain effective security of radioactive sources throughout their life cycle, consistent with the Code of Conduct on the Safety and Security of Radioactive Sources. Moreover, we encourage the IAEA to promote and facilitate technical exchanges of knowledge, experiences and good practices on the use and security of high activity radioactive sources.

14. We commit to continue taking active steps to combat illicit trafficking of nuclear and other radioactive material, to protect and secure all such material to ensure that it cannot be used by non-State actors in criminal or terrorist acts, and to continue efforts on our territories to prepare for recovering such material in case it has fallen out of regulatory control, taking into account relevant international instruments. We emphasize the importance of strong national legislative and regulatory frameworks for nuclear security.

15. We support the IAEA's and Member States' efforts to strengthen nuclear security culture and provide education and training opportunities in nuclear security, including by using national and regional Centres of Excellence and Nuclear Security Training and Support Centres, to ensure that the current and future generations of nuclear security professionals are well equipped to meet the challenge of ensuring effective and responsive national nuclear security regimes.

16. We welcome the consensus reached on the 60th GC Nuclear Security Resolution, and remain determined to build upon it. This Declaration and the 2016 International Conference on Nuclear Security will be taken into account in the consultation process between the Secretariat and the Member States on the IAEA's 2018–2021 Nuclear Security Plan. We call upon the IAEA to continue to organize international conferences on Nuclear Security every three years and encourage all Member States to participate at a Ministerial level.

Appendix I:

OPENING AND CLOSING STATEMENTS

OPENING STATEMENT

YUKIYA AMANO
Director General, IAEA

Good morning, Excellencies, Ladies and Gentlemen.

I am very pleased to welcome you to Vienna and to this IAEA International Conference on Nuclear Security. Let me begin by thanking His Excellency, Mr Yun Byung-se, Minister for Foreign Affairs of the Republic of Korea, for agreeing to act as President of the Conference. I am also grateful to the co-Chairs, the distinguished Ambassadors of the Republic of Korea and of Nigeria, for their hard work in preparing this event.

Ladies and Gentlemen,

2016 has been an important year for the IAEA. We began celebrating our 60th anniversary in September. We are proud of our achievements in implementing our Atoms for Peace and Development mandate in the past six decades. The Agency has made peaceful nuclear science and technology available to improve human wellbeing and prosperity, and helped to prevent the spread of nuclear weapons. Nuclear security has been an important area of our work for decades.

Nuclear security is the responsibility of individual countries, but the IAEA provides practical assistance, supplying expert advice, equipment and training. We also provide the global platform through which countries cooperate to minimize the risk of nuclear and other radioactive material being used in a malicious way. This is the second time that a conference on this very important subject has been held at ministerial level, open to all 168 IAEA Member States. I am grateful for the participation of so many Ministers, senior policy-makers and technical experts. This demonstrates that your governments are serious about enhancing global efforts to protect material and facilities from malicious acts and to put appropriate detection and response capabilities in place.

Ladies and Gentlemen,

As far as the IAEA is concerned, nuclear safety and security are priority areas in our budget, alongside technical cooperation. At the request of Member States, the Agency has continued to expand the services which we offer in nuclear security. In the last six years, we have trained more than 10 000 police, border guards and other officials in detecting and preventing the smuggling of nuclear and other radioactive materials. We have given countries over 3 000 instruments for detecting such material. This year, we provided radiation detection equipment and other assistance to Brazil during the Olympic and Paralympic Games in Rio de Janeiro.

Computer security is an important and growing aspect of nuclear security as reliance on digital systems grows. In June last year, we hosted an International Conference on Computer Security in a Nuclear World. It brought together experts from government, industry and law enforcement agencies to discuss how best to strengthen nuclear facilities against both random and targeted cyber attacks. The IAEA's work to strengthen computer security includes activities to build awareness and resilience. We also develop practical

guidance. Countries all over the world have stepped up their investments in nuclear security, with support from the IAEA, and have been working to build their human resources.

In my travel as Director General, I have seen many positive developments in the nuclear security area. I visited a very impressive centre in Pakistan, where training is offered in every aspect of nuclear security. I saw the groundwork being laid for China's Centre of Excellence on Nuclear Security, a large facility near Beijing, which opened this year. I visited Disaster City in Texas, where every conceivable type of crisis and disaster – including nuclear – can be simulated on a grand scale. Last month, I visited Cuba, where I saw a major new port facility at which cargo being unloaded from ships passes through giant radiation detection portals. The IAEA assisted Cuba with this project.

Ladies and Gentlemen,

The subtitle of this conference is Commitments and Actions. At our first ministerial conference in 2013, I identified three key areas in which I called for urgent action to improve global nuclear security. I am pleased to report that good progress has been made in all three. The first of my three items was the need for the Amendment to the Convention on the Physical Protection of Nuclear Material to enter into force. This finally happened on May 8th this year, nearly 11 years after the Amendment was adopted. The original Convention covers the physical protection of nuclear material in international transport. The Amendment expands its coverage to include the protection of nuclear material in domestic use, storage and transport, and the protection of nuclear facilities against acts of sabotage. Under the Amendment, countries are required to establish appropriate physical protection regimes. They also take on new obligations to exchange information on sabotage and credible threats of sabotage. Last week, we held a meeting for States Parties to the CPPNM and to meet those new obligations, and on the need to promote universal adherence to the Amendment.

Ladies and Gentlemen,

My second point in 2013 was an invitation to all countries to invite peer review of their nuclear security arrangements by international experts. The level of interest in the past three years has been encouraging. The IAEA International Physical Protection Advisory Service (IPPAS) marks its 20th anniversary this year. IPPAS missions provide expert advice on the physical protection of nuclear and other radioactive material and associated facilities, and on implementing international nuclear security commitments. We have now carried out 75 IPPAS missions in 47 countries. Six missions were conducted this year and ten more are in the pipeline. There is increasing recognition of the value of such services and I encourage all States to make use of them. I would welcome additional support to enable more countries to make use of IPPAS missions. Finally, I urged all countries in 2013 to use IAEA nuclear security guidance. In the past three years, we have published five new guidance documents on aspects of nuclear security. Nearly 30 more are being prepared.

The Nuclear Security Guidance Committee, which I established in 2012, has proven to be a valuable mechanism for promoting greater involvement by all Member States in ensuring that our guidance truly meets their needs. I encourage all Member States to take part in the Committee's work.

Ladies and Gentlemen,

Looking to the future, the IAEA will continue to work with all Member States, and other partners, to strengthen global nuclear security. Ensuring effective nuclear security is important for all countries, including those which possess little or no nuclear or other radioactive material. Terrorists and criminals will try to exploit any vulnerability in the global nuclear security system. Any country, in any part of the world, could find itself used as a

transit point. And any country could become the target of an attack. That is why effective international cooperation is vital. Much progress has been made in improving nuclear security throughout the world. But we can never relax our guard. Continued vigilance is essential as the threat evolves. The IAEA will continue to play its part in helping to ensure that all countries are able to make the best use of available technology and to ensure state-of-the-art nuclear security. More attention will be paid to repatriation and disposal of spent radioactive sources at the end of their operational life. Member States have made clear that they want increased assistance in strengthening computer security in the nuclear industry and related sectors.

We will continue to develop guidance on enhancing computer security and to provide focused training on cyber threats, helping to boost countries' capacity to respond to attacks.

A priority for me in the coming years will be to encourage all countries to adhere to the CPPNM and its Amendment. The IAEA will continue to assist all States in meeting their new obligations under the Amendment.

The next IAEA Nuclear Security Plan will be developed in close consultation with all Member States. The Ministerial Declaration, which you are expected to adopt today, and the findings and conclusions of the President's report, will help to define that Plan. The IAEA will work with all of you to ensure that the commitments made at this Conference are translated into practical actions that will make the world safer for everyone.

I am now honoured to give the floor to the President of the 2016 IAEA International Conference on Nuclear Security, His Excellency, Mr Yun Byung-se, Minister for Foreign Affairs of the Republic of Korea. I invite him to open the Conference officially. Thank you.

OPENING REMARKS[2]

YUN BYUNG-SE
Minister for Foreign Affairs, Republic of Korea
Conference President

At the outset, may I welcome you all to the IAEA International Conference on Nuclear Security. I am particularly honoured to serve as President of this Conference at this critical juncture in nuclear security, which coincides with the 60th anniversary of the establishment of this great organization.

Let me also express my gratitude to the Co-Chairs of the Open-ended Working Group on the Ministerial Declaration, Ambassador Song Young-wan of the Republic of Korea and Ambassador Abel Ayoko of the Federal Republic of Nigeria, for their dedicated work.

This Conference marks a new beginning following four Nuclear Security Summits in three capitals — Washington D.C., Seoul and the Hague — which brought the issue into the limelight. Through concerted efforts and commitments at the highest level, the Nuclear Security Summits brought significant progress in strengthening nuclear security. Now it is up to us, IAEA Member States, to lead the way. Entrusted with a mission to "accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world," the IAEA should take the helm of global nuclear security efforts based on its decades of experience.

Certainly, the challenges before us are daunting. Starting from Al Qaeda's plans to attack nuclear power plants in the U.S. to the arrest of smugglers attempting to sell caesium to ISIS last year in Moldova, to the latest attempt by ISIS to breach a nuclear facility in Brussels this March, the threat of nuclear terrorism is more palpable than ever before. That is not all. In Korea two years ago, we experienced intense cyber attacks on our nuclear facilities from North Korea. Under these circumstances, this Conference could not have come at a better moment. I hope we will seize this opportunity to contribute to nuclear security in three different ways.

First, we must come together to forge a global partnership on nuclear security among all IAEA Member States. This may be a challenge in view of the differences among Member States in terms of the amount of nuclear material as well as relevant capacities each possesses. Yet this Conference is well poised to provide an inclusive venue for bringing on board diverse experiences and perspectives. For example, the consultation process on the Ministerial Declaration over the past year gave Member States an excellent opportunity for sustained interactions with each other. As such, this triennial Conference should serve as the highest platform for strengthening nuclear security in keeping with the spirit of Vienna: the sense of innovation, creativity and consensus.

---

[2] The opinions expressed in these opening remarks — and any recommendations made — are those of the participants and do not necessarily represent the views of the IAEA, its Member States or the other cooperating organizations.

Second, we should make every effort to deliver timely and concrete outcomes. Given the many daunting challenges facing us, this is no time for complacency. We are fortunate to be living in a world that has not yet known the nightmare of nuclear terrorism. But it would be ill-advised for us to wait until such an incident occurs. We must take proactive steps today to avoid a catastrophe tomorrow. In this regard, the title of this year's Conference — "Commitments and Actions" — could not be more appropriate. I believe our shared commitments to strengthen nuclear security, as expressed in the Ministerial Declaration to be formally adopted later this afternoon, will be translated into actions. For one, our discussions here at this Conference will provide a good reference for the IAEA's 2018–2021 Nuclear Security Plan. We could also build upon the many achievements of various international organizations and initiatives, such as the UN, INTERPOL, GICNT, the Global Partnership and, among others, the Nuclear Security Summit process. In this connection, in supporting the IAEA, I believe relevant Member States may wish to introduce "gift baskets" that were announced at the Nuclear Security Summits and invite others to join them.

Third, this Conference should lay the groundwork for an enduring nuclear security architecture based on international norms. The Amended CPPNM which entered into force this May, along with ICSANT, are key building blocks. UN Security Council Resolution 1540 is another milestone in nuclear security. At its tenth anniversary in 2014, I presided over the Security Council open debate which emphasized the importance of better implementation of the resolution. Such high level conferences, including this IAEA Conference, are important venues to promote universal adherence to and implementation of these instruments. I would call on all Member States to consider joining the Amended CPPNM and ICSANT at an early date and to fully implement Resolution 1540. The IAEA, for its part, could support relevant capacity building for Member States.

Distinguished delegates, since 9/11, a possible nexus between terrorism and WMD has been viewed as one of the most serious threats to international peace and security. In recent years, the threat has become all the more pressing with the rise of a new breed of terrorists like ISIS. Imagine terrorist groups and violent extremists joining hands with proliferators. It could annul decades of efforts to strengthen global nuclear security. Determined terrorists will stop at nothing to acquire nuclear materials and technology. And from my standpoint as the head of the delegation of the Republic of Korea, I imagine that a desperate, cash-strapped country like North Korea could well be a willing supplier. Given its track record in illicit arms trade and smuggling, the possibility of illicit transfer of nuclear materials or technology cannot be ignored.

Furthermore, while countries around the world are working to confront, reduce and eliminate nuclear material, North Korea has adamantly insisted on taking the opposite course. Worse still, as North Korea has refused all IAEA safeguards and inspection since 2009, the quantity and state of management of its nuclear materials remain in obscurity. As such, North Korea's nuclear program is a source of grave concern not only in terms of non-proliferation but also nuclear security. The denuclearization of North Korea is therefore a quintessential task for enhancing nuclear security on the Korean Peninsula and beyond.

Unfortunately, decades of global efforts to build a peaceful nuclear governance based on the NPT, CTBT, UN Security Council resolutions and international norms have been shattered repeatedly by North Korea. It is with this sense of urgency and gravity that the UN Security Council unanimously adopted another milestone Resolution 2321 just last Wednesday in addition to Resolution 2270 adopted in March. This reflects the international community's unwavering resolve that it will not tolerate North Korea's reckless pursuit of

nuclear program. In this regard, I welcome the strongest ever IAEA resolution on North Korea that was adopted at this year's General Conference, condemning North Korea's nuclear tests "in the strongest terms."

Distinguished delegates, Finally, I would like to emphasize that we must sustain efforts and ambition to build a more robust and comprehensive nuclear security architecture. The vast potential of nuclear technology to enhance human life will not be realized unless we work tirelessly to stop its malicious use. Fortunately, we do not have to start from scratch. The IAEA is uniquely situated to assist States in their efforts to establish effective and sustainable national nuclear security frameworks, including through the development of guidelines, advisory services and capacity building.

The Republic of Korea will remain steadfast in its support of the IAEA and its core activities through the Nuclear Security Fund and other contributions. I hope that other Member States will join these efforts as well. As the saying goes, "a chain is only as strong as its weakest link." International cooperation is therefore key to strengthening nuclear security. This is why your insight and input into today's discussion will be instrumental. I count on your vision and wisdom.

Thank you very much. With these remarks, I now open the IAEA's International Conference on Nuclear Security.

INTRODUCTORY STATEMENT

YUKIYA AMANO
Director General, IAEA

Good afternoon, Ladies and Gentlemen.

I am pleased to welcome you all to the Scientific and Technical Programme of this second IAEA International Conference on Nuclear Security.

Ministers from more than 45 countries had very productive exchanges yesterday and this morning. I am very pleased that they agreed an important Ministerial Declaration. This confirms high level government support for the work which you, in your individual countries, and we, at the IAEA, are doing to prevent nuclear and other radioactive materials from being used for malicious purposes.

The work which you, the practitioners on the ground, are doing to protect us all is absolutely vital.

I visit around 30 IAEA Member States every year and, wherever possible, I try to see some nuclear security activities. I am always impressed by the commitment and dedication of the many thousands of men and women who are working in many different institutions – including police, customs, border agencies and intelligence services – to prevent misuse of nuclear and other radioactive materials.

This Scientific and Technical session will cover a broad range of very practical issues, including detection equipment, nuclear forensics, international legal instruments and identifying gaps in measures to protect nuclear and other radioactive material – to name but a few.

I am confident that everyone will leave with an improved understanding of the challenge which we all face, of the latest technological developments in nuclear security, and of best practices in meeting this global threat.

The people in this room are the world leaders in the nuclear security field. You have much to learn from each other and the world will be a safer place as a result of the work you do here.

I wish you a very productive session. Thank you.

INTRODUCTORY STATEMENT[3]

KIM WON-SOO
United Nations High Representative for Disarmament Affairs

Distinguished delegates, Excellencies, Ladies and Gentlemen

At the outset I would like to extend my thanks and congratulations to Director General Amano and the International Atomic Energy Agency for arranging this conference and for inviting me to represent the United Nations. Preventing nuclear material from being used by terrorist groups must remain one of the international community's highest priorities. Since the last conference in 2013, the international community has taken great strides in forestalling this nightmare scenario. Much of this success is thanks to the leadership and diligence shown by the IAEA.

However, the risks and threats have not abated. We know that since 2010, INTERPOL has reported forty-four incidents of nuclear smuggling, including for Highly Enriched Uranium.

As the Secretary-General has argued, if we are to stop this menace we need sustained political momentum at the highest level. The number of ministers present at this conference indicates many countries feel the same way. A top-down push from the ministerial level is vital.

Closing the gaps in our defences will require an inclusive approach and the active engagement of all States. The United Nations is committed to playing its part in raising awareness of the urgency of these risks and threats at the highest level.

Excellencies, Ladies and Gentlemen

The risks and threats of a WMD terror attack are being exacerbated by the scientific and technological trends that are revolutionising global communications, transportation, healthcare and manufacturing. The same technologies that drive innovation and development could, if used for malicious purposes, have devastating results.

I want to outline three such challenges.

The first relates to cyber security. In an "internet of things", actions in cyber space will have physical global consequences. Facilities housing nuclear materials are becoming reliant on digital and automated industrial control systems. This leaves them vulnerable to hacking for theft or, in the worst case scenario, the dangerous and uncontrolled release of ionizing radiation.

Second, 3-D printing and intangible technology transfers through the internet will make acquisition of nuclear materials and technology designs easier and cheaper. 3-D

[3] The opinions expressed in these opening remarks — and any recommendations made — are those of the participants and do not necessarily represent the views of the IAEA, its Member States or the other cooperating organizations.

printing facilitates the evasion of export controls. This is a dangerous prospect when we consider that some machines have the ability to print material such as maraging steel for centrifuges. Likewise, the proliferation via the internet of so-called "turnkey" 3-D design files that require little knowhow cannot be stopped at borders.

Third, unmanned vehicles, aerial or ground, provide readily available delivery vehicles for attacks, including from distances and against hardened targets. As this technology becomes increasingly automated, so too will the sophistication of these attacks. At the least, terrorists didn't have to deploy suicide bombers and it will make tracing almost impossible.

Excellencies, Ladies and Gentlemen

We cannot allow ourselves to lag behind the technological curve. There is a normative gap in addressing these potential weapons. The international community needs to work together to develop the required norms and instruments, and encourage responsible behaviour, especially in cyber space.

Much good work has been achieved through the UN's two primary instruments for preventing terrorists from acquiring nuclear and other weapons of mass destruction: UN Security Council Resolution 1540 and the International Convention for the Suppression of Acts of Nuclear Terrorism, or ICSANT.

Since the last International Conference on Nuclear Security in 2013, significant advances have been made. Resolution 1540 is now a tent pole of the international security architecture at all levels – national, regional and multilateral. Its impact is felt across all sectors: governments, the private sector, academia and civil society. Since 2013, initial reporting to Resolution 1540 has risen to 91 per cent of all Member States. Since 2013, 87 outreach activities have been held. These have been directed at national officials, international and regional organization, as well as civil society and industry. Training for points of contact has taken place in Russia, China and Chile. The industry focused Wiesbaden process held its first ever regional event in the Republic of Korea. A regional assistance conference co-organized with the African Union in Ethiopia brought together, for the first time, those States requesting assistance with prospective assistance providers. Likewise, during the same period, ICSANT has also grown in support — from 86 State parties in 2013 to 107 today.

But much work remains to be done. Both Resolution 1540 and ICSANT must be universally and fully implemented through robust domestic legislation and capability. The UN and Member States must cooperate for the universalisation of these two instruments. Two good examples of such partnership are the UN Group of Friends of Security Council Resolution 1540, led by Spain, and the UN Group of Friends on chemical, biological, radiological and nuclear Risk Mitigation and Security Governance, led by Georgia, Morocco and the Philippines. These groups work hand in hand with the UN system to better integrate prevention of CBRN risks and threats into national policy and to enhance coordination. ICSANT has a solid membership base, but it is not on the same level as other WMD instruments. Some States may simply lack the capability – if not the will – to accede to the Convention. A State-led universalisation drive coupled with capacity building outreach could help overcome this deficit. Disparity is growing between the needs of Resolution 1540 implementation and financing. Needs are growing fast while financing remains stagnant, so the gap is widening. There is a need for Member States to step into this breach. A Comprehensive Review of Resolution 1540 is due to be completed later this month under the

leadership of the Spanish Presidency of the United Nations Security Council. It is my genuine hope that States use the opportunity presented by the Review to ensure Resolution 1540 remains fit for purpose.

We need to treat WMD risks and threats holistically. Lessons learned in one area can be emulated in another. The IAEA has learned valuable lessons through its own emergency management work and partnership with other UN agencies, including through the UN Counter-Terrorism Implementation Task Force. These lessons could be beneficial in developing response mechanisms for biological incidents.

Unlike nuclear and radiological risks and threats, there is no institutionalised response mechanism for biological incidents. This is a very serious gap in the international architecture. Imagine how devastating a virus deliberately released to cause infection could be.

Excellencies, Ladies and Gentlemen

Before closing, I would like to remind this eminent group that the eventual way to totally eliminate the risks and threats posed by WMD is to eliminate the weapons themselves. I hope that all States will come together through inclusive engagement to work collaboratively towards this shared goal. As Secretary-General Ban said, “Together, let us continue until we reach our destination: a world free of nuclear weapons, a world free of all weapons of mass destruction or massive disruption, and a world that is safer, more secure and better for all the people.”

I thank you so much.

INTRODUCTORY STATEMENT[4]

JACEK BYLICA
European Union

Mr. Director General, Mr. Under Secretary-General, Excellencies, Ladies and Gentlemen,

It is an honour for a representative of the European Union to be invited to speak at this opening panel. I am convinced that this privilege stems from the various contributions that the European Union has been providing to the global nuclear security agenda, both by activities on its own territory, and capacity building beyond it.

We must assume that the threat of nuclear and radiological terrorism is real. It is a sovereign decision of any nation whether to develop nuclear power for peaceful applications. Once this decision is taken, however, this should be done under the best safety, security, and non-proliferation conditions.

The European Union is firmly committed to strengthening nuclear safety, security, safeguards and non-proliferation, within its competences, through a global and comprehensive approach, within its regional dimension and through international cooperation. Responsibility for ensuring nuclear security lies with national Governments, also inside the EU, but international cooperation in this domain is and will remain crucial. The EU considers the IAEA to be playing a key role in this respect.

EU policy framework supporting internal and global security is enshrined in a number of strategic documents. Already in 2003 the European Security Strategy listed terrorism and WMD proliferation among key threats, with a combination of the two as a particularly dangerous scenario. Also in 2003 the EU adopted a Strategy against proliferation of weapons of mass destruction.

The main premise of both these documents was the concept of effective multilateralism understood, inter alia, as EU's support for the universalisation and effective implementation of international treaties and agreements in this domain. The EU also extended its support to the organisations implementing those legal instruments, such as the International Atomic Energy Agency.

Over the years, the EU provided tens of millions of euros worth of support to the IAEA, together with our Member States becoming one of the largest donors to the Agency's Nuclear Security Fund with over 45% of all funds provided. We are currently finalizing another contribution close to 9 million euros which would benefit States all over the world. It is going to provide support to the strengthening of States' nuclear security support infrastructure, legislative and regulatory framework, capabilities to deal with nuclear and radioactive material out of States' regulatory control, resilience to cyber crime and mitigating of its impact on national and nuclear security.

---

[4] The opinions expressed in these opening remarks — and any recommendations made — are those of the participants and do not necessarily represent the views of the IAEA, its Member States or the other cooperating organizations.

Separately, earlier this year the EU adopted a Council Decision which authorizes ca 4.3 million euro over the period of five years for the security of the LEU Fuel Bank being set up by the IAEA in Kazakhstan. In this way, not only the nuclear fuel itself will be purchased by the Agency with an earlier 20 million euro contribution from the EU, but it will be protected in transit and storage thanks to new EU funding.

In June 2016, a new EU document was unveiled: Global Strategy for the European Union's Foreign and Security Policy entitled "Shared Vision, Common Action". It tackles the challenges to security today such as energy security, climate change, terrorism and hybrid warfare that need a response which combines aspects of internal and external policies. In dealing with global challenges the EU supports effective multilateralism with the United Nations at its core.

In our domain the crucial role is played by the UNSC Resolution 1540, also strongly supported by the EU both politically and financially. The Comprehensive Review of UNSCR 1540 is currently being finalized in New York under the very able and energetic leadership of EU Member State Spain.

Turning now to internal security, in March 2010 the EU adopted an Internal Security Strategy for the years 2010–14. It was designed to prevent crimes and increase the capacity to provide a timely and appropriate response to natural and man-made disasters. The European Agenda on Security 2015–20 adopted in April 2015 put the focus for the EU and its Member States on three main priorities: [1] tackling terrorism and preventing radicalisation; [2] disrupting organized crime; [3] fighting cyber crime. Effective implementation of these priorities is ensured through three pillars of EU's action: [1] better information exchange; [2] increased operational cooperation; [3] supporting actions, such as training, research and innovation.

The Euratom Treaty continues to be the basis of EU's activity on nuclear issues. Through Euratom, the EU operates an effective regional safeguards system, encompassing nuclear material accountancy, verifications through on-site inspections, regular reporting, and technical and scientific support to EU Member States, in close cooperation with the IAEA. Moreover, in 2015 Euratom acceded to the amended Convention on the Physical Protection of Nuclear Material (aCPPNM), following its ratification by all 28 EU Member States.

With specific regard to nuclear and radiological security, significant progress has been made in the last decade in the EU through the implementation of an EU internal plan on chemical, biological, radiological and nuclear security. In 2009 the EU adopted a CBRN Action Plan to strengthen CBRN security throughout the EU. Based on an "all hazard" approach, the Action Plan's overall goal was to reduce the threat and consequences of CBRN incidents of accidental, natural, and intentional origin, including terrorist acts.

This all hazards approach also has a global component: through the CBRN Centres of Excellence initiative the EU contributes to capacity building in other countries with eight regional secretariats already covering over 55 States, with some 25 more looking to join. I believe that EU CoEs were mentioned in a number of national statements yesterday.

The EU has also developed through the European Commission's Joint Research Centre (JRC) particular expertise in the field of nuclear detection and forensic analysis of nuclear and radiological materials. This expertise is now complemented by a comprehensive training programme for frontline responders and national experts on detection, forensics and response at EU's own nuclear facility.

Just recently, on 23 November 2016 in the same nuclear facility JRC organized a regional scenario-based nuclear security exercise for EU Member States and relevant EU

Institutions named APEX-Europa. It was not unlike the facilitated discussions conducted during the Nuclear Security Summit process and yesterday, here at the IAEA. The exercise scenario was, however, adjusted to particular EU conditions, such as the lack of internal border controls in the Schengen area.

Excellencies, Dear Colleagues,

These are just some examples of EU practical actions, and some of the topics which are going to be further discussed at many panels of this important Conference. As the EU continues to support the key role of the IAEA in nuclear security cooperation worldwide, I can only wish you very fruitful deliberations.

Thank you for your attention.

INTRODUCTORY STATEMENT[5]

ABEL ADELAKUM AYOKO
Republic of Nigeria

It gives me great pleasure to welcome you to the Scientific and technical programme of this 2nd International Conference on Nuclear Security. On your behalf, I wish to warmly commend the DG and the Secretariat for delivering what is clearly already a successful Conference. Similarly, may I also congratulate Member States for the commitments and actions which they have agreed on at the political level.

This afternoon, as we gather to open the technical and scientific component of this Conference, to which am told, over 1 500 scientists, experts and technicians would be participating, I am already certain that the outcomes would richly further the course of Nuclear Security worldwide.

In addition, I hope that the exchange of views and scientific ideas at this Forum would establish and sustain new findings which would make our world safer. The goal of Nuclear Security requires a combination of both political will and technical knowhow; one depends on the other for mutual reinforcement and validation. The importance of this Forum can therefore not be over emphasized.

In the run up to this Conference, Member States had participated in an informal open ended consultation to negotiate and adopt a declaration which Ministers adopted yesterday. I was honoured to have co-chaired the consultation process alongside Ambassador Young Song of the Republic of Korea.

While the declaration focused mostly of political issues, there are elements in it which speak to technical and scientific issues. In other words, our Ministers have already committed to pursue Nuclear Security in an ambitious manner, it is my hope that your work in the next few days will build on this commitment and further strengthen the scientific backbone in Nuclear Security.

I thank you.

[5] The opinions expressed in these opening remarks — and any recommendations made — are those of the participants and do not necessarily represent the views of the IAEA, its Member States or the other cooperating organizations.

INTRODUCTORY STATEMENT[6]

LAERCIO ANTONIO VINHAS
Brazil

Excellencies, Director General Amano, Ladies and Gentlemen,

I am very pleased to have been invited to address you at the opening of the Scientific and Technical Programme of the International Conference on Nuclear Security: Commitments and Actions.

I congratulate you all on the successful conclusion of the Ministerial Segment of the Programme, which had over 45 ministerial representatives and national statements made on behalf of 90 States

I have been most privileged to serve as Chairman of the Programme Committee for the International Conference in 2013 as well as this Conference. Each time the response to the Conference Announcement has served to underscore how seriously States take the challenge of building and sustaining effective national nuclear security infrastructure. In addition it serves to remind us that it is important to continue to keep the awareness of nuclear security as an important national issue and one that is of concern to the international community as well.

This conference is also a key reminder of the central role of the IAEA to provide assistance in nuclear security upon the request of its Member States.

At the outset, I would like to sincerely thank those representatives from 20 Member States who comprised our Programme Committee as well as the representatives from our 17 cooperating organisations and initiatives. Together they worked tirelessly and effectively from our first meeting in April 2015 until our last in June 2016 to put together this comprehensive programme of nuclear security topics.

The role of a Programme Committee is never easy. The Technical Session programme was built around 577 contributed abstracts on areas as diverse as international legal instruments ; security of nuclear material in transport; detection and response; nuclear forensic techniques; insider threat and computer security.

In addition, at its first meeting, the Programme Committee identified six key thematic areas that comprise the “High Level Sessions”. It is important in the area of nuclear security to discuss big themes as well as technical details.

As a Committee we also were very conscious of the need to ensure both geographic diversity and gender balance when constructing our programme.

---

[6] The opinions expressed in these opening remarks — and any recommendations made — are those of the participants and do not necessarily represent the views of the IAEA, its Member States or the other cooperating organizations.

The first time the Committee met in April 2015 the then Director of Nuclear Security, Mr Khammar Mrabit told us that: “Our challenge is to ensure that the past, present and future issues of nuclear security are suitably reflected at the strategic, policy and technical level through the Scientific and Technical Programme that will be developed for this Conference.”

He went on to say that: “We should ensure that the outcomes from that Programme will take us into the future and prepare us for the work that will need to be done by all of us to ensure nuclear security for everyone, everywhere.”

This was an ambitious task but one I believe that my colleagues and I carried out with sincerity and dedication.

I am also advised that this is the largest gathering of experts in nuclear security at the IAEA. I understand that in excess of 1 800 participants are registered from around 140 Member States of the Agency.

That indicates to me that my colleagues on the Programme Committee and I did a very good job in attracting you to this conference with the strength of our programme and the breadth and depth of the subjects covered therein.

The Scientific and Technical Programme represents the importance that we all place on our national nuclear security. It represents our collective commitment to nuclear security as a serious subject that is worth our dedicated attention over the next four days.

I believe that each of us will leave this conference with a greater understanding of this very important subject, strengthened commitment to our efforts and a revitalised interest in our actions to support our national nuclear security systems and thereby contribute to strengthened nuclear security, globally.

I wish you all a very successful and productive conference.

CLOSING REMARKS

JUAN CARLOS LENTIJO
Deputy Director General, Head of the Department of Nuclear Safety and Security, IAEA

I would like to thank the Minister of Foreign Affairs of the Republic of Korea HE Mr Yun Byung-se for presiding over this conference and Ambassador Song for assuming the role of acting President in the Minister's absence.

I congratulate the Republic of Korea and the Federal Republic of Nigeria for their roles as Co-Chairs of the open ended consultation process that lead to the adoption of the Ministerial Declaration by consensus on Monday during the ministerial session.

The goals of the Conference were many. It was designed to:

— Provide an inclusive forum for all Member States of the IAEA to discuss nuclear security;
— Raise awareness of nuclear security;
— Review the current status of nuclear security efforts and existing approaches, emerging trends and areas that may still need to be addressed;
— Consider the medium and long term objectives and priorities for nuclear security and how current approaches may evolve to address these and to meet future challenges.

I am confident that we achieved each and every one of these goals:

— 90 Ministers and other heads of delegation made national statements and 47 government ministers attended the ministerial segment, and there have been some 2 100 participants from 137 IAEA Member States took part in the conference;
— Ministers of the IAEA's 168 Member States agreed, by consensus, a Ministerial Declaration that sets out their collective commitment to improve nuclear security and demonstrates the high level of support for the IAEA's work in this area;
— Every high level and technical session resulted in the identification of key issues, emerging trends and areas to be addressed.

There are three points further that I would like to stress.

First, the Ministerial Declaration made clear that States remain concerned about threats to nuclear security and stressed the importance of keeping pace with evolving challenges and threats.

Second, the inclusive nature of the Conference, open to all Member States, underscores the commitment of the international community as a whole to nuclear security and the unique platform the IAEA offers to assist in further strengthening a global response to a global threat.

And third, for the IAEA to continue this important work, we will continue to depend on Member States for their support.

The conference's work and the ministerial declaration will contribute to and inform the IAEA's Nuclear Security Plan for 2018–2021. The IAEA will strive to ensure that the commitments made at this conference are translated into practice actions that will make the world more secure for everyone.

As the conference comes to a close, I would like to thank all involved, especially the Division of Nuclear Security and Conference Services for their hard work in putting this together, and particular mention should be made of the Scientific Secretary Rhonda Evans and other members of the conference team, Tom Gray, In Young Suh and Nicole Herndlbauer.

Thank you all again for participating so actively in the conference and we look forward to seeing you in three years.

Appendix II:

OUTLINE CONFERENCE PROGRAMME

CONFERENCE PROGRAMME

Sunday, 4 December 2016

15:00–18:30	Registration	
17:00–19:00	Welcome Reception hosted by the IAEA Division of Nuclear Security	

Monday, 5 December 2016

08:00	Registration	
10:00–12:30	Ministerial Segment	(Board Room B/M1)
12:30–13:30	Lunch for ministers and other heads of delegation	
13:30–15:00	Interactive session for ministers and other heads of delegation	(Board Room C)
15:00–17:00	Ministerial Segment (continued)	(Board Room B/M1)
17:00–17:30	Adoption of Ministerial Declaration	(Board Room B/M1)
17:30–21:00	Ministerial Segment	(Board Room B/M1)

Tuesday, 6 December 2016

09:00–12:00	Ministerial Segment (continued)	(Board Room B/M1)
12:00–13:00	Opening of the Scientific and Technical Programme	(Board Room B/M1)
13:00–14:00	Lunch Break	
14:00–15:40	High Level Session 1: International Legal Instruments for Nuclear Security: Universalization and Implementation of Binding International Legal Instruments	((Board Room B/M1))
	Technical Session 2C-A: Detection Technology	(Boardroom A)
	Technical Session 2C-1: Threat and Risk Assessment and its Broad Application to Nuclear Security	(Press Room)
	Technical Session 2C-2: Public Engagement on Nuclear Security	(Conference Room M2)
	Technical Session 2C-3: Radioactive Material: Regulatory and Operator Perspectives	(Conference Room M3)
15:40–16:20	Hosted Coffee Break, Interactive Content Presentations and Poster Viewing	
16:20–18:00	High Level Session 1: International Legal Instruments for Nuclear Security: Universalization and Implementation of Binding International Legal Instruments	(Board Room B/M1)
	Technical Session 2D-A: Detection Technology	(Conference Room M2)
	Technical Session 2D-1: Design Basis Threat (DBT) and Threat Assessment for Nuclear Material and Nuclear Facilities	(Conference Room M2)

16:20–18:00	Technical Session 2D-2: The Application of Threat and Risk Assessment for Design and Implementation of Systems and Measures for MORC	(Conference Room M2)
	Technical Session 2D-3: Radioactive Material: Regulator and Operator Perspectives	(Conference Room M2)
18:00–20:00	Reception	

Wednesday, 7 December 2016

09:00–10:30	High Level Session 2: International Bodies and Initiatives for Nuclear Security: Role of IAEA in Coordinating International Efforts	(Board Room B/M1)
	Technical Session 3A-A: Radioactive Material: Identifying Gaps and Strategies for Addressing those Gaps	(Boardroom A)
	Technical Session 3A-1: Perspectives on Implementing Obligations under International Instruments for Nuclear Security	(Press Room)
	Technical Session 3A-2: Nuclear Forensics: Building Confidence in Nuclear Forensics Conclusions	(Conference Room M2)
	Technical Session 3A-3: Systems and Measures for Detection of MORC: Design and Implementation	(Conference Room M3)
	Technical Session 3A-4: Panel: Processes, Tools and Challenges in Information Management	(Conference Room M4)
	Technical Session 3A-5: Nuclear Material Accounting and Control	(Conference Room M5)
10:30–11:10	Hosted Coffee Break, Interactive Content Presentations and Poster Viewing	
11:10–12:30	High Level Session 2: International Bodies and Initiatives for Nuclear Security: Role of IAEA in Coordinating International Efforts	(Board Room B/M1)
	Technical Session 3B-A: Radioactive Material: Identifying Gaps and Strategies for Addressing These Gaps	(Boardroom A)
	Technical Session 3B-1: Perspectives on Implementing Obligations under International Instruments for Nuclear Security	(Press Room)
	Technical Session 3B-2: Nuclear Forensics: Building Confidence in Nuclear Forensics Conclusions	(Conference Room M2)

	Technical Session 3B-3: Systems and Measures for Detection of MORC: Design and Implementation	(Conference Room M3)
	Technical Session 3B-4: Panel: Processes, Tools and Challenges in Information Management	(Conference Room M4)
12:30–14:00	Lunch break	
14:00–15:40	High Level Session 3: Nuclear Material and Nuclear Facilities: National Approaches, Emerging Trends and Areas to be Addressed	(Board Room B/M1)
	Technical Session 3C-A: National Nuclear Security Regimes	(Boardroom A)
	Technical Session 3C-1: Human Resource Development: Nuclear Security Education	(Press Room)
	Technical Session 3C-2: Nuclear Forensics: The Science and Interpretation of Nuclear Forensics Signatures	(Conference Room M2)
	Technical Session 3C-3: Computer Security for Industrial Control Systems at Nuclear Facilities	(Conference Room M3)
	Technical Session 3C-4: Panel: Systems and Measures for the Detection of MORC: Design and Implementation	(Conference Room M4)
	Technical Session 3C-5: Panel: Perspectives on Implementing Obligations under International Instruments for Nuclear Security	(Conference Room M5)
15:40–16:20	Hosted Coffee Break, Interactive Content Presentations and Poster Viewing	
16:20–18:00	High Level Session 3: Nuclear Material and Nuclear Facilities: National Approaches, Emerging Trends and Areas to be Addressed	(Board Room B/M1)
	Technical Session 3D-A: National Nuclear Security Regimes	(Board Room A)
	Technical Session 3D-1: Human Resource Development: Nuclear Security Education	(Press Room)
	Technical Session 3D-2: Nuclear Forensics: The Science and Interpretation of Nuclear Forensics Signatures	(Conference Room M2)
	Technical Session 3D-3: Computer Security for Industrial Control Systems in Nuclear Facilities	(Conference Room M3)
	Technical Session 3D-4: Panel: Systems and Measures for the Detection of MORC: Design and Implementation	(Conference Room M4)

	Technical Session 3D-5: Panel: Perspectives on Implementing Obligations under International Instruments for Nuclear Security	(Conference Room M5)

Thursday, 8 December 2016

09:00–10:30	High Level Session 4: Radioactive Materials and Associated Facilities, including Radioactive Sources: National Approaches, Emerging Trends and Areas to be Addressed	(Board Room B/M1)
	Technical Session 4A-A: Major Public Events	(Boardroom A)
	Technical Session 4A-1: Human Resources Development: Training	(Press Room)
	Technical Session 4A-2: Physical Protection: Through the Fuel Cycle	(Conference Room M2)
	Technical Session 4A-3: Nuclear Forensics: Nuclear Forensics Serving a Nuclear Security Infrastructure	(Conference Room M3)
	Technical Session 4A-4: Panel: Preventive and Protective Measures Against Insider Threat	(Conference Room M4)
10:30–11.10	Coffee Break & Poster Viewing	
11:10–12:30	High Level Session 4: Radioactive Materials and Associated Facilities, including Radioactive Sources: National Approaches, Emerging Trends and Areas to be Addressed	(Board Room B/M1)
	Technical Session 4B-A: Unmanned Aerial Vehicles: Good Drone or Bad?	(Board Room A)
	Technical Session 4B-1: Human Resources Development: Training	(Press Room)
	Technical Session 4A-2: Physical Protection: Through the Fuel Cycle	(Conference Room M2)
	Technical Session 4A-3: Nuclear Forensics: Nuclear Forensics Serving a Nuclear Security Infrastructure	(Conference Room M3)
	Technical Session 4A-4: Panel: Preventive and Protective Measures Against Insider Threat	(Conference Room M4)
12:30–14:00	Lunch Break	
14:00–15:40	High Level Session 5: Nuclear and Other Radioactive Material Out of Regulatory Control: Existing Approaches, Emerging Trends and Areas to be Addressed	(Board Room B/M1)

	Technical Session 4C-A: Nuclear Security Culture	(Boardroom A)
	Technical Session 4C-1: Security of Nuclear and Other Radioactive Material in Transport	(Press Room)
14:00–15:40	Technical Session 4C-2: Physical Protection: Approaches and Evaluation Tools	(Conference Room M2)
	Technical Session 4C-3: Computer Security: Regulation and Policies in Nuclear Security Regimes	(Conference Room M3)
	Technical Session 4C-4: Panel: Human Resources Development: Training	(Conference Room M4)
	Technical Session 4C-5: Panel: Exchanging Experience, Knowledge and Good Practices on the Use and Security of High Activity Radioactive Sources and the Exploration of Nuclear and Radioactive Alternative Technologies	(Conference Room M5)
15:40–16:20	Hosted Coffee Break & Poster Viewing	
16:20–18:00	High Level Session 5: Nuclear and Other Radioactive Material Out of Regulatory Control: Existing Approaches, Emerging Trends and Areas to be Addressed	(Board Room B/M1)
	Technical Session 4D-A: Nuclear Security Culture	(Boardroom A)
	Technical Session 4D-1: Security of Nuclear and Other Radioactive Material in Transport	(Press Room)
	Technical Session 4D-2: Physical Protection: Approaches and Evaluation Tools	(Conference Room M2)
	Technical Session 4D-3: Computer Security: Regulation and Policies in Nuclear Security Regimes	(Conference Room M3)
	Technical Session 4D-4: Panel: Human Resources Development: Training	(Conference Room M4)
	Technical Session 4D-5: Nuclear Material Minimization	(Conference Room M5)

Friday, 9 December 2016

09:00–10:30	High Level Session 6: National Nuclear Security Regime, Including Nuclear Security Culture: Existing Approaches, Emerging Trends and Areas to be Addressed	(Board Room B/M1)
	Technical Session 5A-A: Computer Security for Industrial Control Systems and Nuclear Facilities	(Board Room A)

	Technical Session 5A-1: Human Resource Development: Nuclear Security Support Centres and Sustainability	(Press Room)
09:00–10:30	Technical Session 5A-2: Physical Protection: Regulatory Aspects	(Conference Room M2)
	Technical Session 5A-3: National Approaches and Challenges in Preparedness for and Response to Nuclear Security Events	(Conference Room M3)
10:30–11:10	Hosted Coffee Break	
11:10–12:30	High Level Session 6: National Nuclear Security Regime, Including Nuclear Security Culture: Existing Approaches, Emerging Trends and Areas to be Addressed	(Board Room B/M1)
	Technical Session 5B-A: Computer Security for Industrial Control Systems and Nuclear Facilities	(Board Room A)
	Technical Session 5B-1: Human Resource Development: Nuclear Security Support Centres and Sustainability	(Press Room)
	Technical Session 5B-2: Physical Protection: Regulatory Aspects	(Conference Room M2)
	Technical Session 5B-3: National Approaches and Challenges in Preparedness for and Response to Nuclear Security Events	(Conference Room M3)
12:30–14:00	Lunch	
14:00–15:00	Closing Plenary	(Board Room B/M1)

Appendix III:

INVITED CONTRIBUTIONS

INVITED CONTRIBUTIONS

HIGH LEVEL SESSION 1: INTERNATIONAL LEGAL INSTRUMENTS FOR NUCLEAR SECURITY: UNIVERSALIZATION AND IMPLEMENTATION OF BINDING INTERNATIONAL LEGAL INSTRUMENTS

Co-Chairs: C. Dominguez (Argentina) and K. Nederlof (Netherlands)

Invited papers

International legal instruments for nuclear security – State of play, current trends and basic principles that should guide future developments

M. Ulyanov (Russian Federation)

The importance of the Convention on Physical Protection of Nuclear Material and Nuclear Facilities

T. Countryman (United States of America)

Innovations in global nuclear security governance: building a preventive and sustainable system

B. Jun (Republic of Korea)

International legal framework against nuclear terrorism

M. Miedico (United Nations Office of Drugs and Crime)

United Nations Security Council Resolution 1540

J. Morro Villician (Spain)

Universalization and implementation of nuclear security binding instruments

T. Olikule (Botswana)

Achieving effective implementation: Key provisions of the amended Convention on the Physical Protection of Nuclear Material and IAEA Guidance

J. Herbach (Netherlands)

Panel discussion topic

Achieving Universalisation and implementation of international legal instruments for nuclear security

Additional panel member: P. Johnson (IAEA)

HIGH LEVEL SESSION 2: INTERNATIONAL BODIES AND INITIATIVES FOR NUCLEAR SECURITY: ROLE OF THE IAEA IN COORDINATING INTERNATIONAL EFFORTS

Co-Chairs: K. Heppell-Masys (Canada) and N. Akiyama (Japan)

Invited papers

The International Nuclear Security Architecture and the Nuclear Security Summits

L. Holgate (United States of America)

IAEA and Other Mechanisms of International Cooperation in the Area of Nuclear Security: Central Role of the Agency

V. Smirnov (Russian Federation)

EU Nuclear Security: activities in Europe, outside Europe and in support of the IAEA

M. Betti (European Commission)

The IAEA's role in a changing risk environment

R. Floyd (Australia)

International bodies and initiatives for nuclear security: role of the IAEA in coordinating international efforts

A. Singh Gill (India)

International bodies and initiatives for nuclear security: Kenya's Progress in Support of Global Initiative.

E. Gatebe (Kenya)

Role of the IAEA in coordinating the activities related to the essential elements to strengthen the nuclear security globally

L. Vinhas (Brazil)

Panel discussion topic

Strengthening the role of the IAEA in nuclear security post 2016

Additional panel member: R. Raja Adnan (IAEA)

HIGH LEVEL SESSION 3: NUCLEAR MATERIAL AND NUCLEAR FACILITIES: NATIONAL APPROACHES, EMERGING TRENDS AND AREAS TO BE ADDRESSED

Co-Chairs: M. Ziakova (Slovakia) and A. Habib (Pakistan)

Invited papers

Sustaining high levels of nuclear security during decommissioning and beyond

W. Cloosters (Germany)

Nuclear materials and facilities: science and technology – contributions from a US laboratory

J. Hruby (United States of America)

Security at a nuclear facility – a holistic approach from design to decommissioning

G. Dandrieux (France)

Republic of Korea's best practice and challenge for nuclear security

B. Min (Republic of Korea)

Security of nuclear material and nuclear facilities: national approaches

D. Ge (China)

Actual challenges in the field of nuclear security

T. Sarbukova (Russian Federation)

Panel discussion topic

Achieving high levels of nuclear security for nuclear material and nuclear facilities during each stage of the life of a facility – siting to post-decommissioning including legacy issues

HIGH LEVEL SESSION 4 RADIOACTIVE MATERIAL AND ASSOCIATED FACILITIES: NATIONAL APPROACHES, EMERGING TRENDS AND AREAS TO BE ADDRESSED

Co-Chairs: A. Harrington (United States of America) and J. Istiyanto (Indonesia)

Invited papers

Experience of the Russian Federation in the field of regulating physical protection of radioactive material an associated facilities and areas of improvement

V. Kuzin (Russian Federation)

IPPAS – the New Zealand experience

S. Lilley (New Zealand)

Security of high activity radioactive sources throughout their lifecycle

G. Dandrieux (France)

Strengthening the security of radioactive sources by effective implementation of the Code of Conduct on the Safety and Security of Radioactive Sources

R. Czarwinski (Germany)

A can do approach: Canada's approach to enhance radiological security

N. Semblat (Canada)

Ghana's approach and strategies in managing radioactive materials and associated facilities including radioactive sources

B. Nyarko (Ghana)

National approach for security of radioactive material and associated facilities

R. Corcho Gomez (Cuba)

Panel discussion topic

Ensuring the security of radioactive material throughout its lifecycle

HIGH LEVEL SESSION 5 NUCLEAR MATERIAL AND OTHER RADIOACTIVE MATERIAL OUT OF REGULATORY CONTROL: NATIONAL APPROACHES, EMERGING TRENDS AND AREAS TO BE ADDRESSED

Co-Chairs: G. de Salazar Serantes (Spain) and J. Esteves Santos (Brazil)

Invited papers

Current status, ongoing action and challenges in MORC control in Chile

L. Villanueva (Chile)

Global Initiative to Combat Nuclear Terrorism: The contribution of the response and mitigation working group to enhance global capacity to respond to nuclear security events

I. Soufi (Morocco)

Global Initiative to Combat Nuclear Terrorism and Nuclear Security, Finland

K. Perajarvi (Finland)

EU Activities to support nuclear and other radioactive material out of regulatory control

S. Abousahl (European Commission)

Institutionalizing nuclear security detection capabilities within national nuclear security matters: Experience in Malaysia

I. Isa (Malaysia)

Cyclamen – The UK's radiological and nuclear detection capability and MORC

V. Evans (United Kingdom)

Nuclear and other radioactive material out of regulatory control: Existing approaches, emerging trends and areas to be address: Homeland security

W. Brasure (United States of America)

Panel discussion topic

Regaining control of nuclear and other radioactive material out of regulatory control

HIGH LEVEL SESSION 6 NATIONAL NUCLEAR SECURITY REGIME, INCLUDING NUCLEAR SECURITY CULTURE: NATIONAL APPROACHES, EMERGING TRENDS AND AREAS TO BE ADDRESSED

Co-Chairs: F. Rayment (United Kingdom) and F. Osaisai (Nigeria)

Invited papers

A Nuclear Security Regime in Japan: Enhancement Efforts and Global Contributions

S. Tanaka (Japan)

IAEA Guidance and its use by Member States.

B. Dal (Netherlands)

Developing Nuclear Security Culture in Indonesia

D. Wisnubroto (Indonesia)

U.S. NRC Perspectives on the Security of Nuclear Installations and Radiological Materials

S. Burns (United States of America)

Nuclear Security Infrastructure in Egypt: Special Emphasis on Nuclear Security Culture

M. Ezz El-Din (Egypt)

Moroccan nuclear security and safety regulatory regime: Sustainability at the design and establishment phases

K. Mrabit (Morocco)

A new nuclear security paradigm: global solutions to global problems

J. Gadano (Argentina)

Panel discussion topic

Sustaining a national nuclear security regime

Appendix IV:

ESSAY COMPETITION WINNING ESSAYS

ESSAY COMPETITION WINNING ESSAYS

The IAEA opened an essay competition for students and early career professionals, aged 35 years and under, to submit an innovative and original essay on the future of Nuclear Security: Commitments and Actions as part of the IAEA's 2016 International Conference on Nuclear Security.

The essay competition attracted 353 submissions from 79 countries. 3 winners were selected through a blind evaluation process and were invited to participate in the International Conference. IAEA Director General Yukiya Amano presented prizes to the winners at a side event, where they also provided summaries of their essays.

The essays contained recommendations for strengthening nuclear security through stronger border controls, closer international cooperation and public education. The competition was sponsored by the Permanent Mission of the United Kingdom of Great Britain and Northern Ireland to the IAEA. The full essays are included in the proceedings document here.

The opinions expressed in these essays are those of the authors and do not necessarily represent the views of the IAEA, its Member States or the other cooperating organizations.

ENCOURAGING COMMUNITY ENGAGEMENT AS A STRATEGY TO STRENGTHEN NUCLEAR SECURITY IN OUR BORDERS

Ms Abeer Mohamad (Sudan)

Introduction

We are witnessing and harnessing the growing use of nuclear technology for power production and other applications from both developed and developing countries [1]. Regrettably, according to International Atomic Energy Agency (IAEA), more than 100 Member States who use radioactive materials that can be used to make dirty bombs are characterized by unsatisfactory control and management system [2]. It is clear that global security challenges like illicit cross-border trafficking in arms, illegal immigrants, drugs, radiological, chemical and biological weapons — which are global threats to international peace and security posed by armed conflict, terrorism, weapons proliferation and transnational organized crime groups — cannot be managed by a single country [3, 4]. This is why nuclear and other radioactive materials are required by the IAEA for Member States to have a tough alternative protection with effective capabilities to spot and capture their illegal movement both at borders and within their States [5]. Regardless of these international requirements, the porous borders and limited security resources pose critical challenges in developing countries which may have nuclear and other radioactive materials out of regulatory control [6].

The community engagement in security has been emphasized in fight against local and global crimes; for instance communities have been engaged in the fight against extremist groups, illegal immigration, drug abuse, and other community security challenges [7–9]. The community is one of the stakeholders for a nuclear power program that should be fully involved in each step, as suggested by the International Nuclear Safety Group (INSAG) from their report on stakeholders involvement, in order to improve nuclear security [10]. Proper community engagement in radioactive material security across borders and within States with porous borders and limited security resources can help to improve the response of enforcement agents to illicit and other cross border crimes.

Therefore, in this essay I will highlight the threats and challenges in developing countries with porous borders and limited security control resources, and come up with the suggestion on how these countries should engage border community which includes public, civil societies and private sectors to improve nuclear security and other radioactive materials out of regulatory control in their borders and within the States as one of the pledges and acts of improving future global nuclear security.

The threat and risk of nuclear and other radioactive materials

The threat for nuclear and other radioactive materials within our countries, across international borders, and through the global maritime shipping system to fall into the hands of non-State actors through means such as black market, illicit trafficking, and dual use, and cause devastation is real and no country is exempted in this threat [11]. Even with this global threat, still every single country, intentionally or unintentionally, is involved in assisting this illegal business in one way or another; a country can be involved as a source, or transit of illegal products or technology [12]. A country can be involved as a transaction venue, technology transfer venue, or destination for an operation. As a consequence of the nature of this crime the United Nations under the Security Council resolution 1540 (2004) took a global measure against this global crime, where all Member States were obliged to first,

refrain from supporting by any means non-State actors from developing, acquiring, manufacturing, possessing, transporting, transferring or using nuclear, chemical or biological weapons and their delivery systems; adopt legislation to prevent the proliferation of nuclear, chemical and biological weapons, and their means of delivery; and to take and enforce effective measures to establish domestic controls over biological, chemicals and radiological weapons of mass destruction materials to prevent their illicit trafficking and other illegal acts [13].

Moreover globalization, privatization and the development of information communication technologies have aided criminal groups and give them access to technology, freedom to move illegal products, and skills to produce weapons of mass destructions. Some of developing countries in sub-Sahara Africa seem to have low to moderate risk for nuclear weapons of mass destruction [6]. However the availability of radiological devices and low enriched uranium which are used for medical, industrial and research purposes can be used in a dirty bomb. This global criminal activity can be possible in the presence of information technology such as, E-procurement, E-commerce, E-learning system and others which can be used to acquire illicit products, finance the illicit groups, and access and share knowledge which can enable non-State actors to fulfil their mission.

The instability and increased number of fragile and failed States in developed and developing countries is creating a large number of extremist groups. The fact that these groups can use nuclear technology for malicious purposes has put States with porous borders, weak enforcement and low resources at greater risk [14].

The efforts to secure radiological materials has been facilitated by competent international organizations; for example, the IAEA, UN Security Council, Comprehensive Test Ban Treaty Organization (CTBTO) are all working to control nuclear and other radioactive materials through cooperation aimed at countering illicit trafficking, improving physical security at nuclear facilities, strengthening relevant international institutions to ensure security of nuclear technology throughout the World. Other organizations, like the World Customs Organization (WCO) are coordinating and cooperating with partners and donors in establishing different programs aimed at countering weapon of mass destruction (WMD), like WCO framework of standards and Operation Cosmo [15]. The International Criminal Police Organization (INTERPOL) is also working with other States and international organizations to prevent the spread of radiological and nuclear weapons. These International Organizations' efforts and others, has assisted many countries develop domestic controls to prevent the proliferation of nuclear materials and their acquisition by non-State actors from their entire life cycle. However there are number of challenges which slow this tremendous effort, including the serious challenges related to border control and limited security resources available for the countries with porous borders [16].

In apprehending this, States in the Millennium Declaration resolution agreed that, they should strengthen the efforts to fight transnational crimes in all dimensions, including crimes involving drugs, terrorism, illicit trafficking among others [17]. To intensify this, the need for effective coordination and cooperation at local, regional and international level is essential [4].

Challenges in border control

The first challenge lies on low government budgets and the country economies, which embrace very few detection instruments and low trained enforcement agents, border control, customs agencies to deter, detect and interdict illicit trafficking of nuclear and other radioactive materials inside their country and across their borders. For instance, Sudan has

experienced a more volatile economic period in the past, and now priorities are given mostly to agriculture and manufacturing to boost the economy. The country has long porous border with Ethiopia and Eritrea, which facilitate the illegal movement of good and people, including the Eritrea Islamist Jihad that operated out of Sudan [18]. According to UN Humanitarian Chief Jan Egeland, the ongoing unstable situations in regions like Darfur have weakened the border security between Sudan, Chad and northern Central African Republic [19]. This is worsened by the emergence of extremism, illicit trafficking, rebels and terrorist groups like Al-Shabaab, Al-Qaida, ISIS and Janjaweed. These groups have different motivations; some like Janjaweed are motivated by economic reasons, where they move goods and people from Chad to Sudan and vice versa. In such situation, the country needs a number of mobile and fixed monitors, such, DetectivEX which are easy to use but very expensive due to current economic situation.

The economic position for most States and priorities for the country are not corresponding with rapidly changing scientific, technological, and commercial environment in which crimes are taking place. For example, growth of cyber crimes, cyber terrorism and new techniques used by non-State actors require well trained staff and modern technology to fight the crimes.

The second challenge is the absence of harmonized security laws within and between countries where one country may interpret the requirement different from another country [20]. Also the absence of clear classification of nuclear materials, which are dual-use and often can be useful for health and development purpose as well as for creating weapons of mass destruction [21]. Example nuclear technologies, used for health, agriculture, industries and research purposes at the same time this technology can be used by non-State actors for malicious activities. High enriched uranium which is used in research reactor or in production of medical isotopes from South Africa, Egypt, or any other part of the world, can be smuggled across Sudan's porous borders and used for malicious activities.

The third challenge is the political will, where most of the countries regard nuclear security as a problem for nuclear energy producing countries, and therefore they have less responsibility on its security. Unfortunately, this perception is proved to be wrong due to porous borders. The terrorist attack in 2013, where at least at least 67 people were killed and hundreds of others were injured in the attack by members of al-Shabab, was perpetrated by a Somali group with links to al-Qaeda that entered Kenya from Somalia in a car in June 2013 through porous border with insufficient surveillance technology [22].

The fourth challenge is the priority of the country; developing countries are facing many challenges with more public attention than nuclear security, including problems like malaria, Ebola and civil war.

The fifth challenge is corruption, where enforcement agents, border control, customs agencies at borders are involved in drug trafficking, illegal migration, terrorism, money laundering, piracy, arms smuggling, and other crimes. Despite the great efforts of International Organization like UNODC and the governments, the criminals still take advantage of corrupt system and weak enforcement in the borders to meet their goals.

The sixth challenge is the close relationship which exists between illicit trafficking, terrorism, drugs, and poaching, which makes the fight against the nuclear security more difficult given the availability of technology and our porous borders. It was reported by the Elephant Action League that terrorism has very close links with poaching where a close linked terrorist group Al-Shabaab has generated average of US $40 000 annually [23].

There are twelve research reactors within African countries that give access to research students and others for isotopes production [24]. Some of these countries like Egypt with regional fragile stability and porous borders have raised concerns over security of nuclear material and other crimes.

The challenges above can be mitigated through engagement of the community in securing the borders from black market, illicit trafficking, terrorism, and hence improve global nuclear security.

Border community engagement in nuclear security

When people are allowed to participate directly or indirectly on different decision that affects their community, like policies, security programs, development programs and services to communities, it makes it easier for the government to tap into the diverse perspectives and potential solutions to improve the quality of its undertakings [25]. The IAEA nuclear power program milestone encourages stakeholder engagement to align them and support the program because of their direct link with safety and security, among the key stake holders are community around the nuclear power plant.

The first step in community engagement is educating the community across the border; a well informed community can address the Government budget, the country's economic priorities, and political will. The notion that a nuclear security threat can't be compared with malaria is not true; nuclear technology in developing countries is used in health, agriculture and industries and therefore the threat associated with nuclear security should be given required priority.

The second step is to engage them in a process of establishing domestic policies, security programs and services to fight illicit cross-border trafficking for nuclear security and associated crimes. The more the community decision is valued the easier it becomes to implement the program, policy or service in the community.

The third stage is establishing the communication channels between the community and the enforcement agents and auditing mechanism. Properly engaged community will address the challenge of corruption where enforcement agents, border control, customs agencies at our borders are involved in drug trafficking, illegal migration, terrorism, money laundering, piracy, arms smuggling, and other crimes.

The implementation of this system requires trust and legitimacy [26]. Legitimacy and fair procedures practised by the regulatory and enforcement authorities' shapes cooperation between them and their communities [27].

Conclusion

Developing countries with limited resources and porous borders challenges can engage communities living along the borders in nuclear security within their States. Therefore, I propose that the next nuclear security plan 2018–2021 include this component of community engagement as future strategy for countries with problems of porous borders and limited security resources to combat and strengthen nuclear security within and across their States.

References

[1] INTERNATIONAL ATOMIC ENERGY AGENCY, Stakeholder Involvement Throughout the Life Cycle of Nuclear Facilities, IAEA Nuclear Energy Series No. NG-T-1.4, IAEA, Vienna (2011).

[2] NATIONAL RESEARCH COUNCIL, U.S.–Russian Collaboration in Combating Radiological Terrorism, The National Academies Press, Washington, D.C. (2007).

[3] UNITED NATIONS SECURITY COUNCIL, "Threats to international peace and security caused by terrorist acts", In Repertoire of the Practice of the Security Council, 16th Supplement (2008–2009), Part I, New York (2010).

http://www.un.org/en/sc/repertoire/2008-2009/Part%20I/Thematic/08-09_Terrorist%20acts.pdf

[4] GENEVA CENTRE FOR SECURITY POLICY AND INSTITUTE FOR FOREIGN POLICY ANALYSIS, A Comprehensive Approach to Combating Illicit Trafficking, IFPA, Cambridge, MA (2010).

https://www.sipri.org/sites/default/files/United-States-4-IFPA-GCSPTraffickingReport.pdf

[5] INTERNATIONAL ATOMIC ENERGY AGENCY, Combating Illicit Trafficking in Nuclear and other Radioactive Material, IAEA Nuclear Security Series No. 6, IAEA, Vienna (2007).

[6] GROSSMAN-VERMAAS, R., HUBER, K. AND KAPITANSKAYA, A., Minimizing Threat Convergence Risks in East Africa and the Horn of Africa: Prospects for Achieving Security and Stability, Center for the Study of Threat Convergence, The Fund for Peace, Washington, D.C. (2010).

[7] VAN GINKEL, B., Engaging Civil Society in Countering Violent Extremism, The International Centre for Counter-Terrorism – The Hague 3, no. 8 (2012).

https://icct.nl/publication/engaging-civil-society-in-countering-violent-extremism/

[8] U.S. IMMIGRATION AND CUSTOMS ENFORCEMENT, "ICE initiative to increase community engagement", News Release 3 October 2016, ICE, Washington, D.C. (2016).

https://www.ice.gov/news/releases/ice-initiative-increase-community-engagement

[9] CRAWFORD, T., "Increasing the Peace: How community engagement improves security sector reform", Peacebuilding News Article, 10 January 2014 Alliance for Peacebuilding, Washington, D.C. (2014).

http://www.allianceforpeacebuilding.org/2014/01/increasing-the-peace-how-community-engagement-improves-security-sector-reform/

[10] INTERNATIONAL NUCLEAR SAFETY GROUP, Stakeholder Involvement in Nuclear Issues, INSAG-20, IAEA, Vienna (2006).

[11] APIKYAN, S. AND DIAMOND, D. (EDS), Nuclear Threats and Security Challenges, NATO Science for Peace and Security Series B, Springer, Dordrecht (2015).

[12] WARDEN, H., "Overcoming challenges to the proliferation security initiative", Thesis for Naval Postgraduate School, Monterey, CA (2004).

http://calhoun.nps.edu/handle/10945/1334

[13] United Nations Security Council Resolution 1540, S/RES/1540, United Nations, New York (2004).

[14] BUNN, M., MALIN, M., ROTH, N., AND TOBEY, W., Preventing Nuclear Terrorism: Continuous Improvement or Dangerous Decline?, Belfer Center for Science and International Affairs Project on Managing the Atom, Harvard Kennedy School, Cambridge, MA (2016).

http://www.belfercenter.org/sites/default/files/legacy/files/PreventingNuclearTerrorism-Web%202.pdf

[15] WORLD CUSTOMS ORGANIZATION, "Nuclear Security Summit (NSS) in Washington D.C.", News Release 4 April 2016, WCO, Brussels (2016).

http://www.wcoomd.org/en/media/newsroom/2016/april/nuclear-security-summit-nss-in-washington-d-c.aspx

[16] U.S. DEPARTMENT OF STATE, Country Reports on Terrorism 2015, U.S. Department of State Publication, Washington, D.C. (2016).

[17] UNITED NATIONS OFFICE ON DRUGS AND CRIME, "About UNODC", Web page, UNODC, Vienna (2016).

https://www.unodc.org/unodc/about-unodc/index.html?ref=menutop

[18] DAVIS, J. (ED.), Terrorism in Africa: The Evolving Front in the War on Terror, Lexington Books, Lanham, MD (2010).

[19] HANSON, S., Sudan, Chad, and the Central African Republic. Backgrounder 2 January 2007, Council on Foreign Relations, New York (2007).

http://www.cfr.org/sudan/sudan-chad-central-african-republic/p12309

[20] DIXON, T., "Security in the Transport of Radioactive Materials", In: International Symposium on Nuclear Security, 30 March–3 April 2009, Vienna, Austria, Book of Extended Synopses, IAEA, Vienna (2009).

http://www.iaea.org/inis/collection/NCLCollectionStore/_Public/41/011/41011636.pdf?r=1. 2009 Conf paper

[21] VESTERGAARD, C., Governing Uranium Globally, Danish Institute for International Studies Report 2015:09, DIIS, Copenhagen (2015).

http://stimson.org/sites/default/files/file-attachments/DIIS_RP_2015_09_web.pdf

[22] KABERIA, J., "Kenya's Porous Borders Under Scrutiny", News Article 15 January 2014, ACR Issue 376, Institute for War & Peace Reporting, London (2014).

https://iwpr.net/global-voices/kenyas-porous-borders-under-scrutiny

[23] POE, T., "How poaching fuels terrorism funding", Opinion Article 22 October 2014, CNN International Edition, Atlanta, GA (2014).

http://edition.cnn.com/2014/10/22/opinion/poe-poaching-terrorism-funding/

[24] INTERNATIONAL ATOMIC ENERGY AGENCY, Research Reactors in Africa, IAEA Brochure, IAEA, Vienna (2011).

https://www.iaea.org/OurWork/ST/NE/NEFW/Technical-Areas/RRS/documents/RR_in_Africa.pdf

[25] QUEENSLAND GOVERNMENT, "Community engagement", Web page, policy, guidelines and factsheets, Queensland Government, Brisbane (2016).

http://www.qld.gov.au/web/community-engagement/guides-factsheets/introduction/what.html

[26] GORDON, E., "Security Sector Reform, Local Ownership and Community Engagement", In: Stability: International Journal of Security and Development. 3(1), p.Art. 25, Ubiquity Press Ltd, London (2014).

http://doi.org/10.5334/sta.dx

[27] TYLER. T. AND FAGAN. J., "Legitimacy and Cooperation: Why Do People Help Police Fight Crime in Their Communities?", In: 6 Ohio State Journal of Criminal Law, 231–275, Michael E. Moritz College of Law, Columbus, OH (2008).

THE FUTURE OF NUCLEAR SECURITY: COMMITMENTS AND ACTIONS: A MEDICAL PHYSICIST'S PERSPECTIVE

Katharine Thomson (United Kingdom)

On the 5th April 2009, Barack Obama addressed a huge crowd in Hradčanske Square, Prague, in one of the first major foreign policy speeches of his presidency. He spoke of a post-Cold War world in which the threat of global nuclear war had receded, but the risk of nuclear attack had not. He described the Cold War's legacy of thousands nuclear weapons, and warned of the menace of nuclear terrorism, and the ultimate threat "to our global safety, our security, our society, our economy, to our ultimate survival." [1]

The future of nuclear security is not addressed easily. International, multi-professional conferences are vital precisely because of the scale of the challenges and the diversity of expertise required. As a medical physicist, I am no expert in international diplomacy or nuclear smuggling. Instead, as someone who oversees all aspects of small-scale radiation use, I hope to draw some parallels between medical and nuclear uses of radiation, and make some suggestions for both their futures.

The challenges both communities face are the same: controlling access to dangerous material, creating a strong security culture, cooperating with the wider world and engaging the public.

I would like to focus on three challenges for the future of nuclear security: public engagement, nuclear terrorism and cyber security. The medical sector has benefited greatly from the nuclear community's expertise; perhaps we can contribute some suggestions in return.

The current situation

In the seven years since President Obama spoke of "dangers that recognize no borders", much has happened globally. We have experienced the Fukushima disaster and a series of North Korean weapons tests. Syria has descended into bloody civil war, the government has collapsed in Libya, and ISIS, or Da'esh, have taken control of vast swathes of territory. We have endured terrorist attacks in Pakistan, Kenya, France, and throughout the Middle East. Diplomatic tensions have been heightened and populist movements have grown in popularity [2–4].

There has also been tremendous progress. The USA and Russia signed the New START arms treaty, a historic nuclear deal was struck with Iran, the Amendment to the Convention on the Physical Protection of Nuclear Materials (CPPNM) came into force, and four Nuclear Security Summits have been held, the latest this year.

These Summits have been hugely valuable in reducing nuclear material worldwide and improving security practices. As they finish in their current form, it would be easy to fall into either despondency, as a period of great progress ends, or complacency, congratulating ourselves on a job well done.

Our responsibility is to do neither. We find ourselves in a critical period in global affairs and in nuclear security in particular. As the Nuclear Security Summit process ends, we must reflect on its achievements, consolidate its successes and plan our next steps.

Public engagement

2016 has been an interesting year to be British. I have followed the events of the past few months with near obsession and occasional alarm. From the renewal of the Trident nuclear deterrent to strained relations with China over delays to the Hinkley Point C nuclear power station, nuclear issues have been in the public eye to an unusual degree.

However, the story dominating the headlines is not obviously nuclear-related: the referendum on membership of the European Union, and the shock decision to leave: Brexit.

Analysis of the motivations which led to the leave vote will continue for years. It seems clear, however, that one key factor was the feeling, justified or not, that ordinary people were being left behind by a "political elite" [5] who neither understood nor cared about their concerns. Appeals by the government fell on deaf ears. The International Monetary Fund, the Bank of England, security experts, business leaders, ten Nobel-prize winning economists, 5 000 scientists and 1 000 academics collectively extolled the virtues of the EU and warned of the consequences of leaving; to no avail. As the then Justice Secretary, Michael Gove, said, "People in this country have had enough of experts" [6].

This poses a problem to we who fall into that much-maligned category, "so-called experts". As discontent with traditional politics increases, evidenced by the rise of populist movements across Europe and the USA [2], we need to make sure that reasoned and coherent messages are getting through.

Public engagement is sometimes viewed as an optional extra after the technical matters are arranged. Whatever our nationality or political persuasion, recent events should have taught us the danger of this way of thinking. This is particularly true in nuclear security and medical physics, where the focus of our expertise is primarily on advising and supporting governments, hospital boards and industries. These groups become the prism through which the public are kept informed, and sometimes messages are lost in translation.

There is a discrepancy between reality and public perception that is not challenged enough. In 2011, the BBC reported that support for nuclear power had dropped considerably worldwide, with only around 22% of respondents in countries with nuclear programs confident of its benefit and safety [7]. In a 2013 report from the UK Energy Research Centre, only 33% of Britons thought their government adequately regulated nuclear power [8]. An acquaintance of mine, a veterinarian with years of education and professional training, is convinced that the nuclear powered submarines docking in our nearest port give most of the inhabitants leukemia.

In my work as a medical physicist, I often speak to patients who are anxious about their exposure to radiation from X rays or nuclear medicine procedures. Their level of understanding of the risks is often low, and the fear for themselves or their families correspondingly high. A proper discussion, where they are not only told the facts but given a chance to express their concerns and ask questions, usually allays most fears and puts the risks and benefits in perspective. This does not normally alter whether or not a procedure goes ahead, but it makes things go much more smoothly, relieves unnecessary worries and gives the patient a better picture of the hospital's work. These patients, and the wider public, are not only capable of understanding the facts; they have a right to, and it is the fault of we "so-called experts" when they do not.

There are many ways of tackling public engagement. In the UK, professionals in a range of industries are encouraged to sign up to the Science, Technology, Engineering and Math (STEM) Ambassadors scheme, running workshops in schools and talking about careers

in science. The UK Institute of Physics and Engineering in Medicine recently launched a "Science for Patient Benefit" campaign, displaying posters and leaflets in hospital waiting rooms describing the uses of radiation in medicine. Professional bodies and learned societies have a key role in influencing school syllabuses and engaging teachers.

An emphasis on education will not only pay dividends in public support and democratic mandate. It will also produce the next generation of scientists, engineers and policy makers. The medical profession has already seen the benefits of better public education and engagement; the nuclear industry might gain in the same way.

Who, then, should be involved in nuclear security? The answer, surely, is everyone, even only by understanding what is done in their name. From a brutally financial perspective, it is contributions from Member States that form the budgets of the IAEA, INTERPOL and other key bodies. Our taxes fund our nuclear security, and our security is on the line.

Of course, this is not just about money. Our governments represent us and act on our behalf. We must not lose sight at large international meetings of who it is we are protecting: first and foremost, nuclear security is there to defend the world's 7.4 billion ordinary citizens.

Nuclear terrorism

Since the IAEA's creation in 1957, the global nuclear security situation has changed radically. As the Institute on Global Conflict and Cooperation note [9], "International security in the 21st century has been transformed from a starkly bipolar confrontation of States and their surrogates, characteristic of the Cold War, to interactions among a wide variety of actors and institutions."

Huge progress has been made at a State level, but the threat from non-State actors such as terrorist groups has been increasing. The prospect of ISIS obtaining nuclear weapons would keep even the most hardened security expert awake at night; in President Obama's words, it presents "the most immediate and extreme threat to global security." It is hard to disagree: ISIS has shown no scruples over causing large-scale loss of life, and there are reports of them using chemical weapons against military and civilian targets.

It would be naïve to expect ISIS not to aim for the ultimate symbol of power: a nuclear weapon. Their forebears Al Qaeda claimed that "acquiring weapons of mass destruction for the defense of Muslims is a religious duty" [10]. It would be just as naïve to assume they would not use it if acquired. The traditional deterrence strategy of Mutually Assured Destruction holds no sway; they "lack the minimum degree of risk-adversity to be capable of being deterred; religious fanaticism has made them immune from fear of death" [11].

ISIS could either steal a complete weapon or aim to produce one themselves, requiring accurate blueprints, scientific expertise and fissile material [12]. We need to ensure all sources are under control, reduce reliance on highly enriched uranium, and support schemes such as INTERPOL's "Fail Safe" and "Conduit" operations and the IAEA's Incident and Trafficking Database. Poor national nuclear security, as well as proliferation, increases the chance of material falling into the wrong hands. We must also counter the false but effective propaganda that brings ISIS recruits, some with scientific expertise.

Instead of acquiring or producing nuclear capabilities, acquiring non-fissile radioactive material for use in dirty bombs or large scale contamination would be relatively easy, and must be a tempting choice for terrorists. Although the threat to the public is lower in terms of casualties, the psychological impact on a population from a dirty bomb incident would be huge. This is, of course, one of the key aims of terrorism.

Medical and nuclear uses of radioactive material overlap in this area. Hospitals have relatively weak security, particularly for radioactive materials in transit, and use highly radioactive objects such as molybdenum generators or iridium brachytherapy seeds. Guidance such as the IAEA's "Security of Radioactive Sources" provides a valuable resource for keeping sources safe, but this must be implemented within a strong security culture.

However, attitudes are changing. UK hospitals now include in their departmental rules contingency plans for theft or loss of radioactive sources. This has been valuable, not only in planning for the worst, but in creating a security conscious mindset in staff not used to seeing themselves as a target. Many medical physicists now train as responders under the "National Arrangements for Incidents involving Radioactivity" scheme, which provides assistance to the police after a radioactive incident. On the nuclear side, the Berlin workshop in September on the security of sealed sources provides a valuable opportunity to focus on implementing and improving the IAEA's Code of Conduct on the Safety and Security of Radioactive Sources. I suggest that the Code should cover unsealed sources as well as sealed, as they often have weaker security, particularly in medicine.

We should not neglect the personal side of nuclear security. A poorly paid, overworked employee, or one who is vulnerable to radicalization, is the weakest link in a nuclear facility's security; a well trained one might be its strongest. Similarly, a hospital physicist competent to restrict access and control disposal of radioactive waste might be the difference between a failed theft and a dirty bomb.

Cyber security

Cyber security must be urgently developed. The best physical security is useless if it is not matched by equally strong cyber security, in any type of facility. As global infrastructure becomes inseparable from the computer systems that govern it, the importance of cyber security grows.

This is an area of particular weakness in hospitals. Radiology staff are traditionally drawn from academia and medicine and are not natural computer scientists. I suspect this is mirrored in the nuclear world. We need to focus on recruiting not only brilliant engineers, scientists and policy makers, but computer scientists and cyber security experts. The US government agencies including the FBI and NSA hire so-called "white hat hackers" to spot weaknesses in security systems [13, 14]. Despite the challenges involved, including background checks and competing with the private sector, this is a strategy that could be replicated in the nuclear industry, creating the balanced workforce required.

As this balance tips ever more towards computerization, the nuclear industry is well ahead of medicine. Our staff are scientific professionals and computer literate, but they are not capable of building or maintaining a cyber security system. We outsource this task to computer experts and then misuse, or fail to understand, the results. An acquaintance of mine worked in a facility handling sensitive radioactive sources. The computer security system required all staff to change their passwords daily. The result was that workers would write each new password on a sticky note fixed to the computer monitor.

Just as a physical security system is let down by a careless employee, the weakest point of a cyber security system is the members of staff using it, and seniority is no guarantee of compliance. Cyber security systems need to be comprehensive, usable and respected. The Stuxnet attacks are an indication of the damage that can be wrought on nuclear facilities. Cyber security is the weakest point of hospital systems; the same must not be true of nuclear facilities.

Conclusion

As the Nuclear Security Summit process ends, we must ensure its strengths are harnessed for the future: the focus on tangible outcomes, the attention of national leaders and the emphasis on building relationships. Action Plans must be followed and the Amendment to the CPPNM universalized. We must address the current threats of nuclear terrorism and smuggling, and plan for the future by building strong cyber security systems and training upcoming experts.

We should also consider the consequences of failure. It will be ordinary, vulnerable people who suffer from nuclear security lapses: families in bombed out Syrian cities fleeing before ISIS's nuclear capabilities; tourists and commuters in Western cities contaminated by dirty bombs; populations living in fear of a threat they can't see and barely understand.

The global community needs to grasp this, and commit to working across borders, reaching out diplomatically to countries we have little in common with. If we can work with scientists and police forces, industrialists and diplomats, governments and international agencies, in dialogue with the public and remembering that our efforts are all for their safety – then, truly, we will have Atoms for Peace.

References

[1] Remarks of President Barack Obama, Prague, 5 April 2009.

https://www.armscontrol.org/ObamaPragueSpeech

[2] INGLEHART, R. AND NORRIS, P., Trump, Brexit, and the Rise of Populism: Economic Have-Nots and Cultural Backlash, HKS Working Paper No. RWP16-026, Harvard Kennedy School, Cambridge, MA (2016).

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2818659

[3] STAUFENBERG, J., "Rise of right-wing populist threat in Europe can only be tackled by greater EU co-operation, says German philosopher", The Independent 12 July 2016, London (2016).

http://www.independent.co.uk/news/world/europe/german-philosopher-jurgen-habermas-right-wing-populist-parties-grow-eu-integrates-brexit-a7132936.html

[4] OSBORN, A. AND DEVITT, P., "Germany urges Russia and Ukraine to ease tension over Crimea, keep talking", Reuters 15 August 2016, London (2016).

http://www.reuters.com/article/us-ukraine-crisis-russia-germany-idUSKCN10Q0H4

[5] JACK, I., "In this Brexit vote, the poor turned on an elite who ignored them", The Guardian. 25 June 2016, London (2016).

https://www.theguardian.com/commentisfree/2016/jun/25/brexit-vote-poor-elite

[6] MANCE, H., "Britain has had enough of experts, says Gove", The Financial Times 3 June 2016, London (2016).

[7] BLACK, R., "Nuclear power 'gets little public support worldwide'", BBC News 25 November 2011, London (2011).

http://www.bbc.co.uk/news/science-environment-15864806

[8] POORTINGA, W., PIDGEON, N., CAPSTICK, S., AND AOYAGI, M., Public Attitudes to Nuclear Power and Climate Change in Britain Two Years after the Fukushima Accident: Synthesis Report, UK Energy Research Centre, London (2014).

http://www.ukerc.ac.uk/publications/public-attitudes-to-nuclear-power-and-climate-change-in-britain-two-years-after-the-fukushima-accident.html

[9] INSTITUTE ON GLOBAL CONFLICT AND COOPERATION, "International Security", Web page, University of California, San Diego (2016).

https://igcc.ucsd.edu/research-and-programs/research/international-security/index.html

[10] Mowatt-Larssen, R., "Al Qaeda Weapons of Mass Destruction Threat: Hype or Reality?", Paper, Belfer Center for Science and International Affairs, Harvard Kennedy School, Cambridge, MA (2010).

http://www.belfercenter.org/publication/al-qaeda-weapons-mass-destruction-threat-hype-or-reality

[11] VERDIRAME, G., "The 'Sinews of Peace': International Law, Strategy and the Prevention of War", 78 British Yearbook of International Law 83–62, London (2006).

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2297766

[12] EWEISS, N., "Non-state actors & WMD: Does ISIS have a pathway to a nuclear weapon?", Briefing Report, British American Security Information Council, London (2016).

http://www.basicint.org/publications/nada-eweiss/2016/non-state-actors-wmd-does-isis-have-pathway-nuclear-weapon

[13] FEDERAL BUREAU OF INVESTIGATION, "Most Wanted Talent: Seeking Tech Experts to Become Cyber Special Agents", News Story 29 December 2014, Washington, D.C. (2014).

https://www.fbi.gov/news/stories/fbi-seeking-tech-experts-to-become-cyber-special-agents

[14] SAMUELSOHN, D., "Inside the NSA's hunt for hackers", Politico 9 December 2015, Arlington, VA (2015).

http://www.politico.com/agenda/story/2015/12/federal-government-cyber-security-technology-worker-recruiting-000330

THE FUTURE OF NUCLEAR SECURITY IN SOUTHEAST ASIA: COMMITMENTS AND ACTIONS

Noor Azura Zuhairah Binte Adbul Aziz (Singapore)

As is clearly stated in the International Atomic Energy Agency (IAEA) Nuclear Security Fundamentals, nuclear security is focused on the prevention and detection of, and response to, theft, sabotage, unauthorized access and other such criminal or intentional malicious acts involving nuclear material, radioactive material, and associated facilities or activities [1]. Even though each State carries full responsibility for nuclear security within its borders, nuclear security in a State might depend on the effectiveness of the nuclear security regime in other States [1], particularly neighbouring States and States in the same geographical region. In the current global situation where nuclear security issues could potentially cross several borders, it is increasingly important that States continue to enhance national frameworks and cooperate and engage in collective commitments and action to strengthen nuclear security worldwide [1].

Within Southeast Asia, nuclear energy currently has a limited role, with many States still in early stages of developing a nuclear power programme. Demand for electricity is increasing as the States in this region continue to develop and industrialize. Thus, the need for more electricity generating capacity could potentially drive the development of nuclear power programmes in some States. Sixteen nuclear energy reactors are planned for construction within the region; although plans and timelines may have changed following the 2011 accident at Fukushima [2]. Industrialization may also create increased demand for non-energy radiological materials including radioisotopes in medicine, agriculture and environmental protection. Indonesia and Viet Nam are two countries in the region with radioisotope production industries [2].

Southeast Asia faces existing cross-border challenges as a region in the areas of terrorism, maritime piracy, insufficient border and export controls, and insufficient capacity building [2]. These concerns may be further exacerbated after the launch of nuclear power due to increased movement of nuclear and radiological materials in the region that may present opportunities to malicious parties [2]. It is therefore important to ensure that nuclear security capabilities in Southeast Asia are robust and strengthened.

Viet Nam is the most active country in the region in expanding its nuclear power capabilities and is undertaking site preparation, work force training and the creation of a legal framework [3]. Furthermore, Viet Nam has signed a cooperative agreement with Russia as its vendor to build its first nuclear power plant, including financing of the nuclear plant [3]. An intergovernmental agreement with Japan was also signed for construction of a second nuclear power plant, including financing [4]. Taking the most recent delays into account, construction of the nuclear plant is due to start in 2019 and introduction of nuclear to Viet Nam's energy mix is forecast to take place in 2028 [4]. Other Southeast Asian countries including Indonesia, Thailand, Malaysia and the Philippines are similarly exploring the potential for developing nuclear power programmes as part of their energy mix. As such, the variation in nuclear and non-nuclear producing countries in different stages of nuclear development in Southeast Asia in the near future will bring about important implications for nuclear security in the region in any global effort to manage risks in nuclear security [2].

A sound nuclear security infrastructure is particularly important in a region that is just beginning to generate nuclear power capacity because there is a possibility for malicious parties to take advantage of any loopholes in a less established nuclear security infrastructure system and quickly smuggle nuclear material across a border to a non-nuclear country that may not possess a similarly high level of nuclear trained work force or nuclear security regime. The operation of seven nuclear research reactors in four countries in the region [2] has ensured that some nuclear security infrastructure is already in place; however, it is imperative that each country bordering any potential nuclear country in Southeast Asia has in place a strong nuclear security regime before the first nuclear power plant in the region is in operation. This can be facilitated by close collaborations and working relationships with the nuclear vendor country, other nuclear countries, the IAEA and within the Association of Southeast Asian Nations (ASEAN). ASEAN currently comprises Viet Nam, Malaysia, the Philippines, Indonesia, Singapore, Brunei Darussalam, Cambodia, Laos, Myanmar, and Thailand. It should also be noted that although each State is wholly responsible for nuclear security within its borders, these recommendations on commitments and actions to strengthen nuclear security on a regional level are in no way binding, and the onus to implement any of these recommendations lies solely on each individual State.

Sustained capacity building and training in nuclear capabilities

In the initial stages of launching nuclear power in a new country and region, capacity building and training of the work force in nuclear engineering, nuclear safety and nuclear security must be prioritized. Technical skills and best practices can be learned from nuclear vendor countries to ensure that there are sufficient capabilities to respond to any nuclear security threats to the newcomer nuclear country and within the region. Cooperation and collaboration with other countries that have established nuclear security infrastructure may also be a route to gain nuclear security expertise. A recommended action to secure the future of nuclear security in a geographical region that is newly launching nuclear power is sustained capacity building and training in nuclear for all States within the region, regardless of whether the State itself is a nuclear country.

Although Singapore is currently not planning to build nuclear power plants in the near future, the country has begun preparing for the launch of nuclear power in the Southeast Asian region by “developing its own pool of local nuclear experts” within the next decade [5]. A key area of expertise that Singapore is keen to develop related to nuclear security is nuclear forensics, which is defined as the detection and tracing of radioactive materials to determine the material’s origin and history [6]. Thus, if nuclear security issues in an ASEAN country were to cross borders, Singapore could potentially have the nuclear knowledge and capabilities to assist in responding to the issue. However, Singapore is facing challenges in building capacity in nuclear expertise. The difficulty in attracting local talent to nuclear is likely due to the absence of nuclear facilities and nuclear industry in the country [5]. Singapore may form new partnerships and collaborations with nuclear institutes to stay firm to its commitment to develop expertise in nuclear safety and security.

Capacity building and training in investigative and response capabilities

In addition to nuclear capabilities, investigative and response capabilities including traditional law enforcement and local authorities need to be developed in the region, and officials need to be trained on nuclear security culture and issues [7]. Increased capacity building and training are key areas for cooperation with regional and international partners

such as ASEAN and the IAEA. With sufficient resources, officials would be better placed to detect, prevent and respond to nuclear security threats including terrorism and trafficking.

The Philippines has conducted radiological security incidence response training for the Philippine National Police in 2015 to "train the trainers" and sustainably build capacity in law enforcement towards nuclear security [8]. In order to enhance nuclear security culture, Viet Nam has organized seminars on nuclear security culture specifically for local authorities, radiation facilities and research facilities in 2015 and early 2016 [9]. Such seminars and training can also be held on a regional basis or in bilateral cooperation to ensure that all countries in the region are knowledgeable on nuclear security culture. Regional, bilateral and international collaborations may also be helpful in fostering cooperation and sharing of information among countries to address terrorist or trafficking threats and increase nuclear security in the region.

Benefiting from regional and international conferences

As explained by the IAEA Deputy Director General Mr. Mikhail Chudakov, the decision to embark on a nuclear power programme should be based upon "a well-informed national position, comprehensive analysis of the current and required national infrastructure, energy planning and commitment to safe, secure, peaceful use of nuclear power" [10]. Representatives of ASEAN Member States would be able to evaluate their options and learn from best practices in nuclear security through attending, organizing or hosting international or regional conferences that are focused on establishing nuclear infrastructure or discussing nuclear security strategies. Gaps and knowledge gaps in nuclear security of a State, especially a new nuclear power State, can be identified and filled on a national, regional and global level. One such recent regional conference is the Prospects for Nuclear Power in the Asia Pacific Region that was organized by the IAEA in collaboration with the International Framework for Nuclear Energy Cooperation, and hosted by the Philippines Department of Energy [10].

Regional nuclear security summits may also be proposed in order to discuss unique nuclear security concerns within the ASEAN region. Alternatively, nuclear security can be included as a usual item on the agenda of semi-annual ASEAN Summits or Ministerial Meetings. Regional seminars on export controls and non-proliferation of nuclear and radioactive materials are also already present [11] but opportunities to expand the scope of these seminars and conferences should not be overlooked when nuclear is high on the agenda of some countries in ASEAN.

The participation of country representatives highlights their commitments to nuclear security objectives, thus contributing to global nuclear security infrastructure. The actions to strengthen the security of nuclear and radioactive materials can be carried out with the assistance of other States with nuclear power, the cooperation of regional partners, and/or the IAEA.

Enforcing border and export controls

ASEAN countries have made progress in enforcing border and export controls for nuclear security implementation. To counter smuggling, Malaysia and Thailand have conducted joint exercises to detect nuclear materials at their shared borders, with the cooperation of the IAEA and have also shared those experiences with other ASEAN countries [12]. More such joint exercises are encouraged at other shared borders, particularly

along the shared borders around Viet Nam, where a nuclear power programme is probably the closest to launching in the region.

To prevent illicit nuclear trafficking, ASEAN countries have taken steps to share information on missing radioactive sources on the IAEA Incident and Trafficking Database and to establish mobile expert support teams (MEST). Radiological Portal Monitors have also been installed in greater numbers to monitor and detect movement of nuclear materials in the ports of Indonesia, Singapore, Malaysia and the Philippines, among others [8, 11–13]. National and regional emergency preparedness and response capability measures with regard to nuclear and radiological materials can also be carried out to ensure nuclear security. Importantly, corruption in the region must be tackled for an effective nuclear security framework and culture. As nuclear smuggling may potentially cross borders, the risk of regulatory agencies and customs officials allowing nuclear material to be illegally exported must be minimized.

Establishing cybersecurity initiatives

On top of physical nuclear security, it is clear that cyber security risks and threats are emerging as we continue to be further reliant on advanced technology infrastructure. It is possible that nuclear power plants may be targets of cyber attacks or cyber/physical attacks. Thus capacity building in nuclear cybersecurity is recommended to protect national systems. For example, Indonesia is establishing a nuclear cyber security doctoral programme [13] and Singapore has set up a Cyber Security Agency [11]. Given the trans boundary nature of nuclear cyber security, extensive cooperation with other countries and international partners on cyber security initiatives is also highly encouraged for data sharing and joint training exercises. Other ASEAN countries may benefit from considering such initiatives in their national computer security systems.

ASEAN regulatory framework

A future option for nuclear energy in Southeast Asia is regional collaboration, similar to nuclear energy generation and distribution in Europe [14]. Resources could be pooled among ASEAN States, sharing expertise, costs and benefits to build a nuclear power plant in the region and supply electricity to member countries through an electrical grid [5]. To achieve this, ASEAN requires a regulatory framework to address trans boundary issues including nuclear fuel management, nuclear waste and risk management [14]. Nuclear security concerns would also have to be addressed under this framework.

Conclusions

The IAEA supports Member States' efforts to establish and improve nuclear security, and has provided assistance to States upon request. The role of the IAEA in organizing international conferences on nuclear security every three years is vital in bringing States together to participate in high level policy discussions and serves as a focal point for enhancing international cooperation [15]. Several countries in Southeast Asia have plans to develop nuclear power programmes in the near future, which will require strengthening of nuclear security regimes throughout the Southeast Asian region.

These commitments and actions include enhancing capacity building and training in nuclear, law enforcement, and nuclear cyber security for all countries in Southeast Asia, even those with no plans to develop nuclear power, because nuclear security in a State might depend on the effectiveness of the nuclear security regime in other States. Many ASEAN

countries have taken steps to address border and export controls, but further work is needed to ensure nuclear security of the region. Cooperation and collaboration between ASEAN Member States as well as international partners, and high level participation in nuclear security conferences, seminars and workshops are highly encouraged to build towards global nuclear security infrastructure and a safer, more secure region when nuclear power is then established.

References

[1] INTERNATIONAL ATOMIC ENERGY AGENCY, Objective and Essential Elements of a State's Nuclear Security Regime, Nuclear Security Fundamentals, IAEA Nuclear Security Series No. 20, IAEA, Vienna (2013).

[2] JAMES MARTIN CENTER FOR NONPROLIFERATION STUDIES, CENTER FOR ENERGY AND SECURITY STUDIES AND VIENNA CENTER FOR DISARMAMENT AND NON-PROLIFERATION, Prospects for Nuclear Security Partnership in Southeast Asia, Monterey/Moscow/Vienna (2012).

https://www.ciaonet.org/attachments/20675/uploads

[3] WORLD NUCLEAR ASSOCIATION, "Asia's Nuclear Energy Growth" (Updated January 2016), Country Profiles, WNA, London (2016).

http://www.world-nuclear.org/information-library/country-profiles/others/asias-nuclear-energy-growth.aspx

[4] WORLD NUCLEAR ASSOCIATION, Nuclear Power in Vietnam, Country Profiles, WNA, London (2016).

http://www.world-nuclear.org/information-library/country-profiles/countries-t-z/vietnam.aspx

[5] LEONG W.K., "Singapore plans to develop local pool of nuclear experts: National Research Foundation", Channel News Asia 26 March 2016, Singapore (2016).

http://www.channelnewsasia.com/news/singapore/singapore-plans-to/2636864.html

[6] INTERNATIONAL ATOMIC ENERGY AGENCY, "Nuclear Forensics: Key to Ensuring Nuclear Security", IAEA News 13 April 2012, IAEA, Vienna (2012).

https://www.iaea.org/newscenter/news/nuclear-forensics-key-ensuring-nuclear-security

[7] Philippine statement by Honorable Mario G. Montejo, Secretary of Science and Technology, Republic of the Philippines On the Occasion of the High Level Meeting on Nuclear Safety and Security, 22 September 2011, United Nations, New York (2011).

[8] National Progress Report: Philippines, Report to Nuclear Security Summit, 31 March 2016, Washington D.C. (2016).

http://www.nss2016.org/document-center-docs/2016/3/31/national-progress-report-philippines

[9] National Progress Report: Vietnam, Report to Nuclear Security Summit, 31 March 2016, Washington D.C. (2016).

http://www.nss2016.org/document-center-docs/2016/3/31/national-progress-report-vietnam

[10] INTERNATIONAL ATOMIC ENERGY AGENCY, "Asia's Prospects for Nuclear Power Highlighted at Regional Conference", IAEA News 2 September 2016, IAEA, Vienna (2016).

https://www.iaea.org/newscenter/news/asias-prospects-for-nuclear-power-highlighted-at-regional-conference

[11] National Progress Report: Singapore, Report to Nuclear Security Summit, 31 March 2016, Washington D.C. (2016).

http://www.nss2016.org/document-center-docs/2016/3/31/national-progress-report-singapore

[12] National Progress Report: Malaysia, Report to Nuclear Security Summit, 31 March 2016, Washington D.C. (2016).

http://www.nss2016.org/document-center-docs/2016/3/31/national-progress-report-malaysia

[13] National Progress Report: Indonesia, Report to Nuclear Security Summit, 31 March 2016, Washington D.C. (2016).

http://www.nss2016.org/document-center-docs/2016/3/31/national-progress-report-indonesia

[14] Kotwani, M., "Singapore must be prepared to handle nuclear developments: Experts", Channel News Asia 27 September 2015, Singapore (2015).

http://www.channelnewsasia.com/news/singapore/singapore-must-be/2154300.html

[15] INTERNATIONAL ATOMIC ENERGY AGENCY, International Conference on Nuclear Security: Commitments and Actions, Vienna, 5–9 December 2016.

http://www-pub.iaea.org/iaeameetings/50809/International-Conference-on-Nuclear-Security-Commitments-and-Actions

Annex

CONTENTS OF CD-ROM

Full conference programme

List of conference participants

Contributed papers and presentations

IAEA
International Atomic Energy Agency

No. 25

ORDERING LOCALLY

In the following countries, IAEA priced publications may be purchased from the sources listed below or from major local booksellers.

Orders for unpriced publications should be made directly to the IAEA. The contact details are given at the end of this list.

CANADA

Renouf Publishing Co. Ltd

22-1010 Polytek Street, Ottawa, ON K1J 9J1, CANADA
Telephone: +1 613 745 2665 • Fax: +1 643 745 7660
Email: order@renoufbooks.com • Web site: www.renoufbooks.com

Bernan / Rowman & Littlefield

15200 NBN Way, Blue Ridge Summit, PA 17214, USA
Tel: +1 800 462 6420 • Fax: +1 800 338 4550
Email: orders@rowman.com Web site: www.rowman.com/bernan

CZECH REPUBLIC

Suweco CZ, s.r.o.

Sestupná 153/11, 162 00 Prague 6, CZECH REPUBLIC
Telephone: +420 242 459 205 • Fax: +420 284 821 646
Email: nakup@suweco.cz • Web site: www.suweco.cz

FRANCE

Form-Edit

5 rue Janssen, PO Box 25, 75921 Paris CEDEX, FRANCE
Telephone: +33 1 42 01 49 49 • Fax: +33 1 42 01 90 90
Email: formedit@formedit.fr • Web site: www.form-edit.com

GERMANY

Goethe Buchhandlung Teubig GmbH

Schweitzer Fachinformationen
Willstätterstrasse 15, 40549 Düsseldorf, GERMANY
Telephone: +49 (0) 211 49 874 015 • Fax: +49 (0) 211 49 874 28
Email: kundenbetreuung.goethe@schweitzer-online.de • Web site: www.goethebuch.de

INDIA

Allied Publishers

1st Floor, Dubash House, 15, J.N. Heredi Marg, Ballard Estate, Mumbai 400001, INDIA
Telephone: +91 22 4212 6930/31/69 • Fax: +91 22 2261 7928
Email: alliedpl@vsnl.com • Web site: www.alliedpublishers.com

Bookwell

3/79 Nirankari, Delhi 110009, INDIA
Telephone: +91 11 2760 1283/4536
Email: bkwell@nde.vsnl.net.in • Web site: www.bookwellindia.com

ITALY

Libreria Scientifica "AEIOU"

Via Vincenzo Maria Coronelli 6, 20146 Milan, ITALY
Telephone: +39 02 48 95 45 52 • Fax: +39 02 48 95 45 48
Email: info@libreriaaeiou.eu • Web site: www.libreriaaeiou.eu

JAPAN

Maruzen-Yushodo Co., Ltd

10-10 Yotsuyasakamachi, Shinjuku-ku, Tokyo 160-0002, JAPAN
Telephone: +81 3 4335 9312 • Fax: +81 3 4335 9364
Email: bookimport@maruzen.co.jp • Web site: www.maruzen.co.jp

RUSSIAN FEDERATION

Scientific and Engineering Centre for Nuclear and Radiation Safety

107140, Moscow, Malaya Krasnoselskaya st. 2/8, bld. 5, RUSSIAN FEDERATION
Telephone: +7 499 264 00 03 • Fax: +7 499 264 28 59
Email: secnrs@secnrs.ru • Web site: www.secnrs.ru

UNITED STATES OF AMERICA

Bernan / Rowman & Littlefield

15200 NBN Way, Blue Ridge Summit, PA 17214, USA
Tel: +1 800 462 6420 • Fax: +1 800 338 4550
Email: orders@rowman.com • Web site: www.rowman.com/bernan

Renouf Publishing Co. Ltd

812 Proctor Avenue, Ogdensburg, NY 13669-2205, USA
Telephone: +1 888 551 7470 • Fax: +1 888 551 7471
Email: orders@renoufbooks.com • Web site: www.renoufbooks.com

Orders for both priced and unpriced publications may be addressed directly to:

Marketing and Sales Unit
International Atomic Energy Agency
Vienna International Centre, PO Box 100, 1400 Vienna, Austria
Telephone: +43 1 2600 22529 or 22530 • Fax: +43 1 2600 29302 or +43 1 26007 22529
Email: sales.publications@iaea.org • Web site: www.iaea.org/books

17-34581

INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA
ISBN 978–92–0–107017–3
ISSN 0074–1884

17-34581