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(GC(64)/1, Add.1 and Add.2)

**INTERNATIONAL CONFERENCE ON
NUCLEAR SECURITY: SUSTAINING
AND STRENGTHENING EFFORTS**

10-14 February 2020

Report by the Director General

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Item 15 of the Conference's provisional agenda
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International Conference on Nuclear Security: Sustaining and Strengthening Efforts

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Report by the Director General

Summary

- The International Conference on Nuclear Security: Sustaining and Strengthening Efforts was held at the Agency's Headquarters in Vienna, Austria, from 10 to 14 February 2020. The conference attracted more than 1900 registered participants from 141 Member States, 53 of which were represented at the ministerial level, and 25 intergovernmental and non-governmental organizations. The conference provided a forum at which experiences and lessons learned could be discussed and ideas exchanged to identify emerging trends and to consider the medium and long term objectives for nuclear security.

International Conference on Nuclear Security: Sustaining and Strengthening Efforts

10-14 February 2020

Report by the Director General

A. Introduction

1. The International Conference on Nuclear Security: Sustaining and Strengthening Efforts (ICONS 2020) was held at the Agency's Headquarters in Vienna from 10 to 14 February 2020. This was the third conference of this type convened by the Agency, following those held in July 2013 and December 2016. It was attended by government ministers; senior officials and policymakers responsible for nuclear security; experts and representatives from a wide range of specialized organizations that contribute to nuclear security; representatives of international, intergovernmental and non-governmental organizations (NGOs) with relevant competencies; regulatory bodies and other national competent authorities, including national security and crisis management agencies; law enforcement and border control agencies; and industry and other entities engaged in activities relevant to nuclear security.

2. The conference was attended by a record number of 54 ministers and over 1900 participants from 141 Member States, 4 non-Member States and 25 international organizations. As the largest scientific conference hosted by the Agency, ICONS 2020 reflects the continuing high level of importance attached to nuclear security worldwide and the value that States and organizations place on the inclusive forum provided by the conference. It also confirms the widespread recognition that, while activities relating to nuclear security are the responsibility of individual States, regional and global nuclear security can be greatly enhanced through collective commitments supported by national actions and international cooperation.

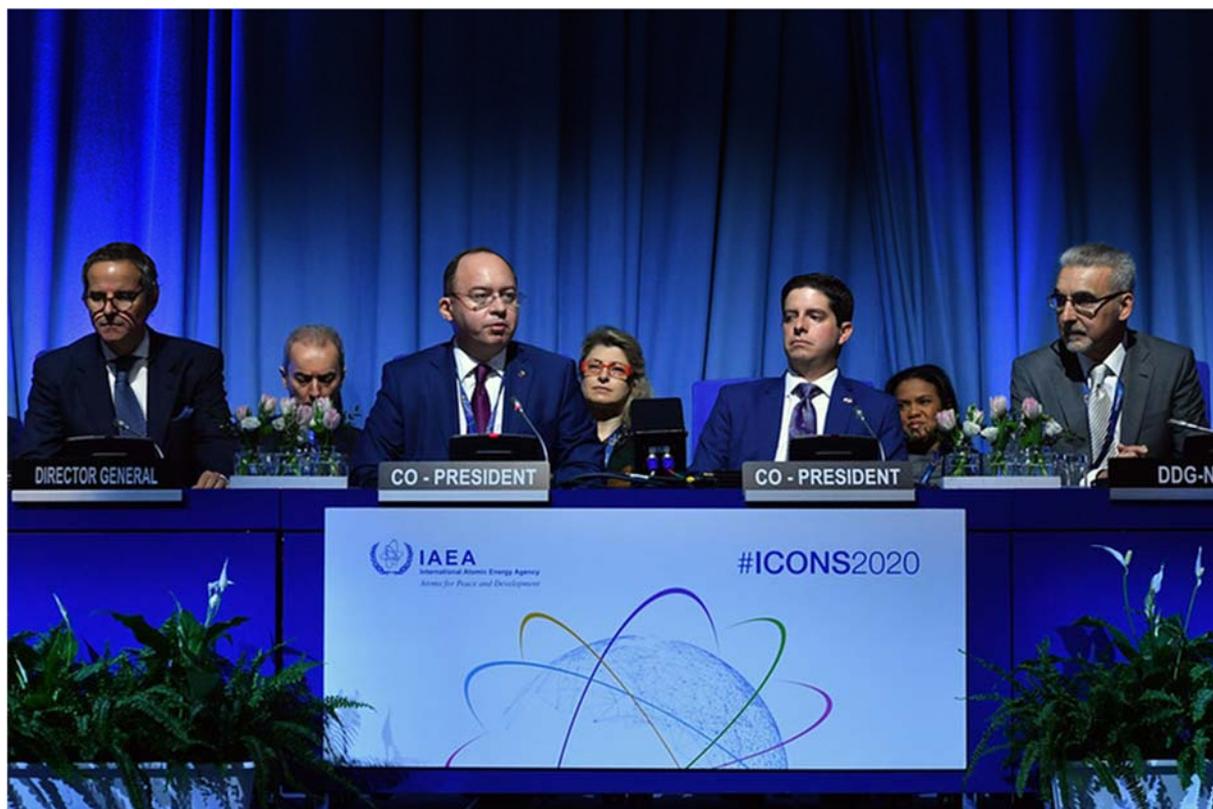
3. The conference was convened to discuss the experiences and achievements to date of individual States and of the international community as a whole in strengthening nuclear security; to enhance understanding of current approaches to nuclear security worldwide; to identify emerging trends; and to provide an inclusive forum at which ministers, policymakers, senior officials and nuclear security experts could look forward by formulating and exchanging views on future objectives for nuclear security globally.

4. The conference was composed of a ministerial session, high level sessions and parallel technical sessions.¹

¹ The full programme of the conference is available on the Agency's website at:

<https://www.iaea.org/events/nuclear-security-conference-2020>

B. Ministerial Session



The opening of the Ministerial Session of the International Conference on Nuclear Security ICONS 2020: Sustaining and Strengthening Efforts held at the Agency headquarters in Vienna, Austria. 10 February 2020

5. The Minister of Foreign Affairs of Romania, HE Mr Bogdan Lucian Aurescu, and Vice-Minister of Foreign Affairs of Panama, HE Mr Federico Alfaro Boyd, assumed the role of Co-Presidents of the conference. The Resident Representatives of Romania and Panama, HE Mr Cristian Istrate and HE Ms Anabella Guardia de Rubinoff², acted as coordinators of the preparatory process for the conference and co-chaired the informal open-ended consultations among Member States on the draft Ministerial Declaration.

6. The conference opened with addresses by the Director General, Mr Rafael Grossi, and by the Co-Presidents of the conference. The Resident Representative of the Republic of Korea to the IAEA, HE Mr Shin Chae-Hyun, also delivered a statement on behalf of HE Ms Kang Kyung-wha, Minister of Foreign Affairs, and the President of ICONS 2016 to reflect on developments since the last ICONS in 2016.

7. An important achievement of the conference was the adoption by consensus of the Ministerial Declaration, which is attached as Annex 2. The Declaration demonstrates Member States' strong commitment to strengthening nuclear security to counter the threat of nuclear terrorism and other malicious acts. Strengthened nuclear security helps to ensure that all countries can enjoy the huge benefits of nuclear science and technology in improving the prosperity and well-being of their people.

² Following Ms Guardia de Rubinoff's departure during the summer of 2019, Panama was represented in this task by its Chargé d'Affaires, Mr Luis Eduardo Pabón Chevalier, who was in turn replaced in November 2019 by Ms Anayansi Rodríguez Vega as the new Chargé d'Affaires.

8. In the Ministerial Session, 109 ministers and other heads of delegation delivered national 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 actions. Many expressed appreciation for the Agency's central role in coordinating such international efforts and providing such assistance when requested.

C. High Level and Technical Sessions

9. The Ministerial Segment was followed by a scientific and technical programme comprising five high level discussions on broad themes central to nuclear security and 54 parallel technical sessions on specialized scientific, technical, legal and regulatory issues concerning nuclear security. The scientific and technical programme was complemented by a series of 32 side events hosted by Member States, NGOs and the Agency.

10. A short introductory session for the scientific and technical programme included remarks by the Director General, and precautionary medical guidance on COVID-19 by Dr Matthias Lademann, Medical Director of the VIC Medical Services.

11. The introductory session was followed by five high level sessions focusing on key broad areas of nuclear security. Each of these sessions comprised a series of presentations, followed by a panel discussion and questions and comments from the floor. The high level panel sessions focused on:

- The role of the Agency in nuclear security;
- Emerging technologies and the digital age;
- International legally and non-legally binding instruments for nuclear security;
- National nuclear security regimes; and
- International cooperation in information exchange, sharing of good practices and broader experience to enhance nuclear security.

12. In parallel, 54 technical sessions covered specific topics, including computer and information security, nuclear forensics, preventing illicit trafficking of nuclear and radioactive material, national nuclear security regulations, innovative technologies to reduce nuclear security risks and improve cost effectiveness where feasible, implementation of national legislative and regulatory frameworks and international instruments, transport security, nuclear security culture, and the interface between nuclear safety and security.

13. The Co-Presidents' Report, attached as Annex 1, highlights the key issues and main conclusions from the conference.

D. Way Forward

14. The proceedings of the conference will be published in the course of 2020.

15. Where appropriate, the outcomes of the conference, including the Ministerial Declaration, will be taken into account by the Agency in defining priorities for activity areas in the Nuclear Security Plan 2022–2025.

ANNEX 1

2020 International Conference on Nuclear Security: *Sustaining and Strengthening Efforts*

ICONS 2020

Vienna, Austria, 10-14 February 2020

Co-Presidents' Report

14 February 2020

Introduction

The 2020 International Conference on Nuclear Security: *Sustaining and Strengthening Efforts* (ICONS 2020) was convened by the IAEA at its Headquarters in Vienna from 10 to 14 February 2020.

The purpose of the conference was to provide a forum for ministers, policymakers, senior officials and nuclear security experts to formulate and exchange views on experiences and achievements, current approaches, future directions and priorities for nuclear security. The conference succeeded in:

- Adopting the ICONS 2020 Ministerial Declaration by consensus (Annex 1);
- Raising awareness to maintain and further strengthen national nuclear security regimes as well as international cooperation in strengthening nuclear security globally;
- Reviewing the current status of nuclear security efforts, existing approaches and trends, and highlighting areas that may need more focused attention including technological dimensions;
- Encouraging the universalization and full implementation of the Convention on the Physical Protection of Nuclear Material (CPPNM) and its Amendment;
- Promoting IAEA nuclear security guidance and other international guidelines, and their use by States;
- Encouraging the sharing of information and good practices in nuclear security whilst protecting sensitive information;
- Reaffirming and supporting the central role of the IAEA in strengthening the nuclear security framework globally and in leading the coordination of international activities in the field of nuclear security, whilst avoiding duplication and overlap;
- Highlighting and promoting the IAEA's activities and programmes with respect to the international instruments in the area of nuclear security;
- Discussing further enhancements of IAEA nuclear security activities and their sustainability;
- Recognizing the Nuclear Security Fund as an important instrument for the Agency's activities in the field of nuclear security; and
- Highlighting the interfaces between nuclear safety and nuclear security.

The conference did not discuss any sensitive nuclear security information.

The conference was attended by a record number of 54 ministers and over 1900 participants from 141 Member States, 4 Non-Member States and 25 international organizations.

In their opening remarks, the IAEA Director General Mr Rafael Grossi and the Conference Co-Presidents, Mr Bogdan Lucian Aurescu (Minister of Foreign Affairs, Romania) and Mr Federico Alfaro Boyd (Vice-Minister of Foreign Affairs, Panama), underlined the importance of adopting the Ministerial Declaration that will inform the work of the IAEA and its Member States in sustaining and strengthening nuclear security worldwide in the coming years. They also underscored the importance of the central role of the IAEA in nuclear security globally.

After recognizing and thanking both the Co-Presidents for working together to lead the Conference, and the co-chairs for their efforts in assuring consensus on the Ministerial Declaration, the Director General highlighted how the record participation of ministers at the conference reflects the great importance attached to nuclear security by the Member States. He highlighted the sustained growth of nuclear activities and noted how they are a magnet for groups harboring malicious intent. He observed, while emphasizing that nuclear security is a national responsibility, that there is universal recognition of the need for international cooperation to guard against nuclear terrorism and of the role of the IAEA as the inclusive global platform for that cooperation. He emphasized that maintaining the highest levels of nuclear security should not be seen as an obstacle to using nuclear technology, but rather as an enabler. Listing a variety of examples, he highlighted the constantly increasing demands for IAEA assistance in nuclear security. On the Convention on the Physical Protection of Nuclear Material and its Amendment, the Director General highlighted the importance of the Convention as the only legally binding treaty on the protection of nuclear material. He also noted that, since ICONS 2016, five further countries have adhered to the Convention, while 10 CPPNM States have adhered to the Amendment. He expressed the desire to, in time, see the IAEA nuclear security guidance share the same status as IAEA safety standards. Emphasizing the need for sustained efforts in nuclear security, the Director General stressed that even countries with little or no nuclear or radioactive material on their territory must remain vigilant. He concluded by thanking all for their presence and high-level political support.

Following the Director General's remarks, Minister Aurescu took the floor, noting the concise and forward looking Ministerial Declaration and pointing out the thorough and scrupulous process of negotiating the Declaration that lasted for almost a year under the co-chairmanship of Romania and Panama. He underlined that the Co-Chairs have served as facilitators and honest brokers and have carefully considered the valuable inputs and priorities put forward by Member States. He considered the Ministerial Declaration to reflect the political will of Member States, adding value to the process of strengthening nuclear security worldwide by guiding and channeling the efforts of Member States, as well as the work of the IAEA, in the coming years. He then recognized the importance of the IAEA's work in nuclear security, underscoring Romania's support for the Agency in this area. He highlighted several efforts that Romania is undertaking in the nuclear area, in general, and in nuclear security, in particular.

As Romania's national contribution to the IAEA, Minister Aurescu mentioned, among other efforts: the expertise of Ambassador Cornel Feruță, including through serving as the Agency's Acting Director General; serving as Co-President of ICONS 2020, together with Panama; the recent designation of the Nuclear Research Institute in Pitești (RATEN ICN) as an International Center based on Research Reactor (ICERR) in two areas of activity: "Education and Training" and "Joint Research and Development Projects"; the activities undertaken by "Horia Hulubei" National Institute for Research and Development in Physics and Nuclear Engineering (IFIN-HH) in training in nuclear safety and security; acting as a regional leader in the decommissioning of research reactors and developing the first national nuclear forensics laboratory, in close collaboration with the IAEA; the work of the National Commission for Nuclear Activities Control (CNCAN) and of the Romanian Nuclear Agency and Radioactive Waste (ANDR); and organizing in April 2019, in Vienna, under the aegis of the first

Romanian Presidency of the Council of the European Union, the workshop “Nuclear Security: From Political Commitment to Practical Implementation.” Finally, he underscored Romania’s support for the IAEA’s Technical Cooperation Programme.

Vice-Minister Alfaro then took the floor, addressing the audience in Spanish to promote multilingualism and its potential to allow Member States to better understand the work of the IAEA, especially in nuclear security. He highlighted the spirit of consensus and flexibility shown by Member States throughout the process of negotiating the Ministerial Declaration. He then expressed his confidence that all participants would benefit from the Conference in continuing to strengthen international cooperation and further supporting nuclear security efforts worldwide.

Vice-Minister Alfaro recognized that nuclear security contributes to international peace and security, particularly as global stocks of nuclear material are expected to grow in the coming years as a means to mitigating the consequences of climate change. He expressed support for the IAEA’s work to help Member States to establish sustainable nuclear security regimes by helping to share good practices and lessons learned. Finally, he highlighted the assistance provided to Panama by the IAEA in implementing nuclear security measures before and during the 2019 World Youth Day, including through holding training events and supplying radiation detection equipment. He noted that this successful cooperation had enhanced Panama’s overall nuclear security architecture.

Following the remarks by the Co-Presidents of the Conference, the Resident Representative of the Republic of Korea to the IAEA, Ambassador Shin Chae-Hyun, was invited to deliver a statement on behalf of Ms Kang Kyung-wha, Minister for Foreign Affairs, and as the Chair of ICONS 2016, to reflect on developments since the last ICONS. After congratulating the Co-Presidents and the Director General for the successful organization of the conference, Ambassador Shin highlighted the importance of ICONS for supporting the collective efforts of the international community to place and maintain nuclear security on the global agenda.

Then, Vice-Minister Alfaro, along with Minister Aurescu, officially opened the conference. Afterwards, Minister Aurescu submitted the ICONS 2020 Ministerial Declaration for adoption. The Ministerial Declaration, adopted by consensus during the opening of the Ministerial Segment, is available on the conference web site.

The Conference continued with the Ministerial Segment, in which a total of 109 statements were delivered by Ministers and other Heads of Delegation on behalf of their States and the EU.

The Ministerial Segment was followed by a scientific and technical programme comprising five high level discussions on broad themes central to nuclear security and 54 parallel technical sessions on specialized scientific, technical, legal and regulatory issues concerning nuclear security. The programme also included an interactive scenario-based policy discussion involving Ministers and other Heads of Delegations which highlighted the benefits of becoming party to the amended CPPNM, over 70 interactive content presentations and over 80 poster sessions, 35 exhibitions and 32 side events.

This Co-Presidents’ Report draws on rapporteurs’ reports and highlights the main conclusions and key issues of the conference as a whole. Concluding remarks of the Co-Presidents were presented on the last day of the Conference. While every effort has been made to ensure that this Report is an accurate and balanced reflection of the conference, ultimately it is the Co-Presidents’ and not a consensus report.

High-level Panel Sessions

The five high-level panel sessions of the conference focused on:

- The role of the IAEA in nuclear security;
 - Emerging technologies and the digital age;
 - International legally and non-legally binding instruments for nuclear security;
 - National nuclear security regimes; and
 - International cooperation in information exchange, sharing of good practices and broader experience to enhance nuclear security.
- The main conclusions of these sessions are summarized in the following five sections.

The role of the IAEA in nuclear security

This session addressed the role of the IAEA in implementation of international instruments related to nuclear security as well as the central role of the IAEA in coordinating efforts and technical support provided to Member States, upon request, for strengthening nuclear security. Panellists described their perspectives on future focus areas and activities for the IAEA, and in particular, for the Nuclear Security Plan 2022 – 2025, which will begin to be developed in 2021. Further, some presenters touched upon how the activities of the IAEA and its Member States in nuclear security relate to the UN Sustainable Development Goals. Panellists also addressed opportunities for synergy and coordination between the IAEA's Division of Nuclear Security and other Departments and Divisions of the IAEA.

In conclusion, the panellists agreed that the IAEA's central role in nuclear security globally is crucial. They expressed appreciation for the IAEA's work with Member States to enhance their nuclear security regimes, calling for a strengthened role for the IAEA in nuclear security. Further, several panellists noted the need for enhanced synergies between safety and security, including related to IAEA guidance. Finally, while some panellists highlighted that safety and security are intrinsic to peaceful uses, others stressed that security should not be a constraint condition for provision of assistance related to peaceful uses.

Emerging technologies and the digital age

- In this session, panellists discussed the impact of emerging technologies, their applications in improving nuclear security and the additional security challenges that they present. Panellists also discussed the need to ensure adequate cyber security while dealing with challenges such as resource restraints and the speed of technological advancement.
- Panellists brought perspectives from both public and private sectors, but agreed that cooperation between the two is key to ensuring emerging technology is accounted for in nuclear security. Multiple panellists proposed strong public-private partnerships in order to keep up with the speed of technological advancement, as well as to ensure that emerging technology meets security requirements and falls within regulatory frameworks. Panellists also suggested strong partnerships with vendors in order to maintain the integrity of supply chains.
- Panellists concluded that emerging technologies are essential to improving operations and can be valuable for improving nuclear security. At the same time, they highlighted the additional potential security risks that accompany such technologies, especially those associated with information and computer security. Emerging technologies in areas such as artificial intelligence and big data have applications in detection, delay, and response to nuclear security events. Panellists expressed that the adoption of new technology to help ensure the safe and secure operation of activities involving nuclear

and other radioactive material is becoming an expectation. However, they noted that vigilance is needed to avoid potentially introducing new security vulnerabilities as the efficiency and effectiveness of such activities is improved by the adoption of such technology.

- Finally, panellists noted that the IAEA plays an important role in supporting investigations of new technologies for nuclear security applications, as well as in continuing to raise States' awareness of the need to protect against cyber-attacks on nuclear and other radioactive material facilities and activities. They emphasized that a strong regulatory foundation is critical to a State's ability to address how to handle technological advancements.

International legally and non-legally binding instruments for nuclear security

In this session, panellists discussed the range of international legally and non-legally binding instruments for nuclear security including United Nations Resolution 1540, the Convention on the Physical Protection of Nuclear Material (CPPNM) and its Amendment, the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT), and the IAEA Code of Conduct on the Safety and Security of Radioactive Sources. Some panellists elaborated on national experiences related to these instruments as well as with activities intended to support States in implementing them, such as International Physical Protection Advisory Service (IPPAS) missions. Others provided perspectives from international organizations such as UNOCT, UNODC and IAEA that seek to assist States in adhering to and implementing such instruments.

Much of the discussion following the panel briefings focused on the challenges, as well as the motivations, for Member States to join or adhere to these instruments. One panellist noted that crises such as the terrorist events in the United States on 11 September 2001 can motivate States to adhere to legal instruments, emphasizing that such crises can make it clear that the security of one country depends on the security of others. At the same time, several panellists stressed that the nuclear security community should be proactive and not only react to crises.

Multiple panellists encouraged States to adhere to international instruments related to nuclear security, particularly the CPPNM and its Amendment. They also expressed support for continuing efforts by international organizations, including IAEA legislative and technical assistance, to encourage further adherence.

In conclusion, it was noted that as nuclear security threats continue to change and emerge, the international nuclear security framework, comprised of both legally and non-legally binding instruments, needs to be able to adapt. Further, it was noted that legally binding instruments are good foundations for nuclear security but that there is also a need for agile non-binding instruments that reflect the good practices of Member States, such as the IAEA Nuclear Security Series.

National nuclear security regimes

In this session, panellists provided overviews of national nuclear security regimes in individual Member States. Under this broad topic, panellists addressed national legal and regulatory frameworks, physical protection measures, methods for managing the interface between safety and security, sustainability and integrated approaches to nuclear security. The importance of nuclear security culture and capacity building, including training and education, was stressed by the panel. Further, a particular focus of the discussions was States that are initiating new nuclear programmes and the steps they have taken to establish and strengthen their national nuclear security regimes.

Both prescriptive and risk-informed performance-based approaches to designing nuclear security systems were discussed by various panellists. National experiences were shared regarding the use of each of these approaches. In addition, the importance of the State assessing the appropriateness of a performance-based or prescriptive approach for a particular situation was underscored.

Panellists emphasized the importance of the IAEA's role in providing assistance to Member States, upon request, in establishing and strengthening their national nuclear security regimes, including assistance in training and education and by providing legislative and regulatory assistance.

While it was agreed that the IAEA is providing good support for States, they receive a large number of requests, not all of which can be quickly addressed. The panel concluded that given the importance of IAEA's coordination efforts, further investment of energy and resources in this area would be valuable.

- ***International cooperation in information exchange, sharing of good practices and broader experience to enhance nuclear security***

- In this session, panellists shared their national perspectives, experiences, and success stories in international cooperation related to nuclear and radiological security. Panellists underscored the importance of taking long-term capacity building and sustainability into consideration when engaging in international cooperation. In particular, they stressed that international cooperation needs to be driven by Member States' needs, and expressed appreciation for the role of organizations such as the IAEA, INTERPOL, the European Union as well as bilateral partners in offering assessments of States' nuclear security gaps and of opportunities to enhance States' national nuclear security regimes. Panellists further observed that the IAEA's Integrated Nuclear Security Support Plans and Nuclear Security Support Centres are serving effectively as focal points for international cooperation to develop national and regional capability.

- Panellists also observed that to make international cooperation more productive and effective, the international community should focus on the specific areas where States require support (in appropriate fora) in order to avoid duplication of efforts. They also emphasized that the international community should ensure the perspectives of industry and operators are taken into account, as these perspectives are valuable to the international exchange of information on nuclear security. Lastly, they noted that bilateral and multilateral information exchange as well as public communication can increase confidence in national nuclear security regimes, which in turn supports the peaceful uses of nuclear technologies.

Technical Sessions

Building on the discussions in the High Level Panels, 54 technical sessions addressed in more detail a wide range of specific scientific, technical, legal and regulatory issues relevant to nuclear security. The main conclusions of these sessions are summarized in the following sections.

International instruments and national regulations

National nuclear security regulations

During the first of these technical sessions, discussions addressed the integration of nuclear forensics into national legal systems, case studies of nuclear security regulations, and the role of law enforcement in a State's physical protection and nuclear security response regime. It was noted that the implementation of nuclear forensics at national level should be in accordance with a State's national penal legislation, and that there is a need for an information exchange channel between judicial

authorities or other investigative bodies. In addition, panellists agreed that international cooperation on issues related to nuclear forensics is essential, but at the same time, confidentiality concerns need to be addressed as part of national legislation and bilateral agreements in this area. Panellists also noted that there is a need to integrate nuclear security requirements into regulations in a way that optimizes regulatory activities and associated resources. They underscored as well that the regulatory body, with the help of industry, should maximize the use of resources for ensuring continued protection of public health and safety.

During the second technical session on national nuclear security regulations, the main focus was on national experiences in implementing nuclear security regulations, with an emphasis on physical protection and computer security regulations. One panellist highlighted steps taken to increase the nuclear security capacity at the nuclear regulator, while another panellist discussed physical protection and computer security aspects of licensing the operation of a recently constructed nuclear power plant. In computer security, topics included the evolution of international standards for instrumentation and control systems in nuclear power plants, the creation, implementation and ongoing evolution of national computer security regulations, and experiences of one State to incorporate computer security threat profiling and risk mitigation into its nuclear security programme.

Finally, during a third session addressing national nuclear security regulations, Member States provided national perspectives on the establishment of their national nuclear security regimes and how these regimes can be sustainable. Panellists addressed new national legislation for security of nuclear material and nuclear facilities in detail, as well as their approaches for the development of nuclear security regulations. The active role of IAEA in assisting Member States, upon request, in the development of such regulations was underscored. With respect to sustainability, guidance contained in the recently published IAEA Implementing Guide *Sustaining a Nuclear Security Regime* (IAEA Nuclear Security Series No. 30-G) was highlighted.

The Amended Convention on the Physical Protection of Nuclear Material review conference in 2021

This technical session included discussion of both the upcoming 2021 Conference of the Parties to the Amendment to the CPPNM as well as national experiences in adherence to and implementation of the CPPNM and its Amendment. One panellist provided an update on the preparations for the 2021 Conference, while another provided an argument for holding such conferences at regular intervals following the 2021 Conference, with the aim of keeping the Convention relevant. Panellists also suggested that a regional approach to reviewing the CPPNM as amended could be successful, particularly with respect to articles referring to information sharing and coordination. The session concluded that the CPPNM as amended is an important instrument to ensure a robust physical protection regime and panellists underscored the importance of all States adhering to the CPPNM and its Amendment, regardless of whether or not they have substantial nuclear programmes. Finally, during the discussion, panellists emphasized that IAEA IPPAS missions, bilateral agreements, and regional peer reviews could accomplish the same goals that verification measures serve in other treaties, while avoiding the challenges that accompany verification measures.

Implementation of national legislative and regulatory frameworks, and international instruments

The briefings presented during the first technical session on the implementation of national legislative and regulatory frameworks related to nuclear security addressed issues such as nuclear and other radioactive material; associated facilities; and intra- and international cooperation, and good practices to implement a comprehensive national legislative and regulatory framework for nuclear security. The panellists emphasized that international cooperation, including bilateral assistance to strengthen States' national nuclear security regimes, is important for the international legal framework and that well-

drafted regulations based on relevant international legal instruments as well as IAEA guidance documents and internationally accepted practices can enable better international cooperation in this area. The panellists also highlighted that legislative and regulatory frameworks may differ from State to State. Finally, they noted that national regulators have the primary responsibility to develop and enforce regulations, whereas nuclear operators have the responsibility to implement them, underscoring the importance of cooperation between the regulator and operators.

During the second technical session on the implementation of national legislative and regulatory frameworks and international instruments, several challenges were discussed, along with national experiences in addressing them. One panellist highlighted the challenges associated with assuring security of radioactive sources with limited resources, while another addressed challenges of exchanging information between various nuclear security stakeholders in the context of investigations and prosecutions related to nuclear security events. A third panellist focused on national experiences in implementing outcome-focused nuclear security regulations. Two other panellists addressed a national system for the electronic licencing of applications for facilities and activities using radioactive sources, and how a national internal compliance system is used by industries to comply with national and international export control policy.

National nuclear security regimes

Identification of national needs through the development of an Integrated Nuclear Security Support Plan

This technical session addressed national experiences in the development and implementation of Integrated Nuclear Security Support Plans (INSSPs). The panellists focused particularly on the benefits of developing and implementing an INSSP, including enhancing national coordination, applying a systematic and comprehensive approach to strengthening their national nuclear security regimes, coordinating assistance using the INSSP process and the use of self-assessment tools to enhance national nuclear security. The session concluded that an INSSP is a valuable tool to coordinate nuclear security activities in a State—in particular to increase coordination among relevant competent authorities—and to provide a systematic approach to strengthen national nuclear security regimes. In addition, they underscored that an INSSP can be a valuable tool in accessing IAEA assistance and coordinating other programmes of assistance and in ensuring that the assistance received addresses national needs.

Regional experiences in nuclear security

The Chair opened the session by stressing the importance of regional security and the variation across the world in nuclear security approaches. Following the Chair's introduction, the panellists highlighted their experiences with nuclear security cooperation in their respective regions. Notably, in some instances, work by organizations such as the Arab Atomic Energy Agency (AAEA) and the Association of Southeast Asian Nations Network of Regulatory Bodies on Atomic Energy (ASEANTOM) help members to build capacity and develop networks of experts in the region. Panellists stressed the importance of a national commitment to nuclear security. Such a commitment can provide authorities with needed political support enabling, for example, regulators to develop and implement memoranda of understanding (MOU) between regulatory bodies and other national and regional stakeholders with nuclear security responsibilities. Panellists also emphasized the importance of taking a “bottom-up” approach to nuclear security and of involving multiple stakeholders in processes such as developing national action plans as part of the European Union's Chemical, Biological, Radiological and Nuclear Risk Mitigation Centres of Excellence programme, and developing an Integrated Nuclear Security

Support Plan with the IAEA, as well as in other efforts in nuclear security. Broadly, panellists agreed that regional cooperation and coordination starts at the national level, with training of personnel and the creation of a network of experts to support regional efforts in nuclear security.

Security of nuclear and other radioactive material and facilities

Addressing security from the start: Security by design and newcomers

This technical session addressed two interrelated topics: security by design and newcomer States. During the briefings, panellists noted that many countries are beginning to explore the possibility of using nuclear energy to meet their energy needs, and in parallel, efforts continue to develop and deploy new types of nuclear reactors globally. Panellists emphasized that as systems and facilities are first designed, it is important to keep in mind that efficient and effective design is best achieved when measures to meet national requirements for safety, safeguards and security are balanced and incorporated into the facility design from the initial stages. Briefings addressed security by design approaches ranging from changing reactor designs to reduce consequences, through broadly influencing decisions on siting of a nuclear facility and its facility layout and construction, to detailed approaches on how to modify a commercial irradiator design to incorporate security by design into the irradiator itself. During the discussion following the briefings, panellists re-emphasized the importance of incorporating security by design features early in the design process. Further, panellists suggested that the IAEA intensify its efforts to encourage Member States to incorporate materials, particularly as part of new nuclear programmes.

Physical protection systems: Evaluation and assessment

The first technical session on this topic addressed experiences and lessons learned in the evaluation and assessment of physical protection systems. In particular, the session addressed the design and evaluation process for a physical protection system, including modeling and simulation tools, and the benefits of using performance testing to validate evaluation inputs when characterizing physical protection system effectiveness and performance. Further, the session addressed detection, delay, response, balanced protection and defence in depth measures as well as lessons learned for design and placement of security measures for facilities with high radiation areas. The session also discussed the importance of the human factor in nuclear security. IPPAS missions and the follow-up physical protection upgrades were also identified as helpful to Member States in identifying and resolving challenges related to physical protection systems.

The second technical session on this topic focused on evaluation and assessment of physical protection systems, with a focus on modelling and simulation and response training. During the session, a case study was presented of the design and evaluation process for a physical protection system at a hypothetical facility used as a demonstration for university students. In addition, another panellist described the application of a risk management performance-based approach in physical protection, information security, and nuclear material accounting and control. Another briefing provided an overview and history of the design and evaluation process for a physical protection system, with an emphasis on the challenges associated with ensuring the effectiveness of physical protection measures through modelling and simulation as well as performance testing. Finally, an overview of a training course for on-site and off-site coordinated response to nuclear security events, intended to increase confidence in response performance at nuclear facilities, was provided.

Research reactor security

The technical session focused on nuclear security at research reactors, including licensing, risk assessment and project management to implement and assess upgrades in response to identified risks. A digital tool to enhance nuclear safety and security at research reactors was also discussed. When discussing approaches for risk assessment at research reactors, panellists and audience members noted that explicit consideration of cyber and insider risks could be useful.

Nuclear security of nuclear fuel cycle facilities: Emerging technologies and associated challenges and complex threats

Briefings during this session focused on the challenges and complex threats to nuclear security of nuclear fuel cycle facilities from emerging technologies. Panellists highlighted their efforts to identify and evaluate new areas of threats and opportunities associated with such technologies, as well as their national regulatory experiences in this area. One panellist described a systematic methodology for analysing a range of emerging technologies and prioritizing them with respect to their potential impact on nuclear and radiological security. Approaches to strengthen national and international management of plutonium were also discussed. The panel discussion following the briefings highlighted that there is a lack of IAEA Nuclear Security Series guidance on activities such as disposal, decommissioning of facilities, spent fuel and waste generated from nuclear fuel cycle facilities. In conclusion, the panellists noted that technological advances and corresponding potential vulnerabilities may pose additional nuclear security challenges. Such challenges should be regularly and systematically analyzed in order to keep nuclear security frameworks adequate and relevant to address emerging threats.

National nuclear security inspections

In this session on national nuclear security inspections, panellists provided briefings on how their countries implement security inspection regimes. The main themes covered in the session included the need for international cooperation and sharing of best practices on nuclear inspections; sustainability of inspection regimes; and training of inspectors and the inspection process. During the discussions, the panellists shared experiences on how nuclear security inspection regimes are implemented and sustained in their respective countries, and highlighted some of the challenges faced in the process. One particular challenge that was highlighted was the difficulty in developing and sustaining human resources. To address this challenge, panellists discussed multiple potential solutions, including incorporating multiple individuals in an inspection, ensuring trainees are paired with experienced inspectors, and allowing outside organizations to provide peer feedback. Panellists and audience members further discussed the importance of developing not only technical competencies, but also “soft” skills, such as communication, negotiation and behavioural skills.

International Physical Protection Advisory Service: Good practices and lessons learned

The briefings provided in this technical session highlighted the benefits provided by IPPAS and other IAEA advisory or review missions. It was noted that through the IPPAS missions, the IAEA can provide support to newcomers and opportunities for Member States with more developed nuclear programmes to further improve their nuclear security regimes, and for both newcomers and Member States with developed programmes to take concrete action in this area. All panellists reinforced that IPPAS missions are neither inspections nor audits, but rather provide advice to Member States on how to enhance their national nuclear security regimes. Panellists also stressed that the host country has ownership over the outcomes of an IPPAS mission and ultimately decides on how the outcomes are acted upon and with what priority. They also provided suggestions for the further enhancement of IPPAS missions, notably

the development of self-assessment guidelines and sub-modules. Finally, it was underscored that early preparation for an IPPAS mission, involving all stakeholders, is key to a successful mission.

Risk-informed approach to the security of radioactive material in use and storage and application of the graded approach and defense in depth to nuclear security

During this technical session, briefings from panellists summarized risk informed approaches to the security of radioactive material in use and storage, with a focus on defense in depth, strengthening of security measures and developing and implementing regulations. Panellists generally encouraged more engagement between the regulator and the operator to promote a risk-informed approach and graded approach to nuclear security. With regard to reducing the security risk associated with radioactive materials and associated activities and facilities, it was noted that, where feasible, one approach is to eliminate the risk of misuse of radioactive material by, for example, replacing high activity radioactive sources used in medicine by X-ray machines. However, panellists agreed that when radioactive material is being used, risk informed approaches and defense in depth should be used to protect this material, and an associated regulatory framework should be established. The use of the newly revised IAEA Implementing Guide *Security of Radioactive Material in Use and Storage and of Associated Facilities* (IAEA Nuclear Security Series No. 11-G (Rev.1)) was recommended by panellists as guidance for Member States in applying a graded approach in this area.

Preventing, detecting and responding to material out of regulatory control

Preventing illicit trafficking of nuclear and radioactive material

In the first of these technical sessions, panellists discussed techniques employed in their respective countries to develop technical capabilities and to coordinate organizations in order to prevent illicit trafficking of nuclear and radioactive materials. Much of the discussion focused on improving radiation detection capabilities at ports of entry and commercial ports. Panellists shared experiences based on exercises and case studies on the successes and challenges to responding to potential illicit trafficking events. Additionally, panellists discussed how the coordinating bodies in their countries improve collaboration between multiple agencies while responding to potential incidents. The importance of international collaboration on developing radiation detection technologies, strategies on coordinating radiological and nuclear response, and sharing information on radiological and nuclear trafficking through mechanisms such as the IAEA's Incident and Trafficking Database (ITDB) was highlighted.

In the second technical session on this topic, panellists addressed illicit trafficking and the technologies and methodologies being employed by States to improve detection and risk assessment and to reduce cargo screening time. Some panellists shared stories regarding how countries that were made aware of incidents of illicit trafficking were able to cooperate. Following the briefings and discussion, it was concluded that it is important that States have a regulatory framework in place to address the issues of illicit trafficking, and that information exchange and cooperation between States, including in the area of risk assessment and management, is essential. Further, it was concluded that new developments in technology can improve detection systems.

Detection technology performance testing

This technical session addressed new technologies and approaches to detection technology and performance testing. It was noted that the landscape of detection technologies is constantly changing, and that there is a need for performance testing to ensure sustainability of equipment used for detection. Panellists identified a number of challenges with detection equipment, including human and

environmental factors, cost and aging of equipment. Panellists also highlighted activities developed by individual Member States or through support of existing IAEA Coordinated Research Projects to develop techniques to improve performance and usability of detection equipment. In addition, panellists addressed new techniques for nuclear detection, including the use of gamma imaging to improve accuracy for collecting samples and the use of artificial intelligence to identify complex radionuclides. Broadly, the panellists agreed on the need for performance testing and developing new detection techniques to ensure that detection equipment is accurately detecting illicit material under various conditions.

Building and maintaining a Nuclear Security Architecture

During this technical session, briefings addressed systems and measures for the detection of nuclear and radioactive materials, including training tools, a case study of technical reachback, and methods for detection of radioactive sources in scrap metal. With respect to training tools, one panellist addressed the use of desktop radiation portal monitors for addressing the challenges associated with hands-on training, such as limited time for training on equipment and likelihood of damage to the equipment. On reachback, it was stressed by panellists that there is a need for a national team of scientific experts who provide advisory or coordination assistance to front line officers, as well as to provide simulation tools and automated software to support timely and effective reachback. Finally, panellists emphasized that timely communication needs to be established between regulatory authorities regarding information on material out of regulatory control.

Coordinated response to a nuclear security event

In this technical session, panellists addressed challenges and opportunities related to developing and implementing a coordinated response to a nuclear security event. It was noted that substantial specialized resources are needed to respond effectively to a nuclear security event, and that an effective response involves coordination and cooperation on the part of all levels of the national government, as well as, often, international cooperation. Panellists specifically addressed an impact assessment of nuclear security events involving chemical explosives; challenges associated with a coordinated response to a nuclear security event; a model for nuclear security programme assessment and planning; and an airborne gamma mapping system developed for the response to nuclear security events.

Good practices in the development and execution of nuclear security exercises: National experiences

During this technical session, panellists discussed how nuclear security exercises can help strengthen the nuclear security regime, test and develop cooperation and coordination among various stakeholders, and evaluate procedures, personnel training and equipment. In addition, it was noted that exercises offer excellent opportunities for awareness raising, including for the public. Computer security was a particular focus of discussion, and it was noted that simulated exercises are very well adapted to be used in computer security. Panellists considered that due to the increasing threat of cyber-attacks, States should increasingly consider undertaking national exercises focused on computer security. They also noted that nuclear security events, including those involving cyber-attacks, can trigger a radiological emergency; thus, interactions between nuclear security and emergency response need to be taken into account in developing exercise scenarios.

Nuclear security for major public events

During the technical session focused on nuclear security for major public events, each panellist provided a case study of a major public event in his or her country that underscored the importance of preparation, the adoption of a ‘many agencies, one team with a shared goal’ approach and training for such events.

The panellists emphasized that the need for security, preparedness and operational capabilities for pre-event monitoring, detection, and response at major public events has steadily increased in recent years. Panellists noted that the intent of nuclear security measures at a major public event should be not only to protect the public, but also to deter adversaries by displaying a strong readiness capability. A common theme among the case studies was the understanding that in order to properly support a major public event, Member States need to develop a solid nuclear security framework that includes coordination among national agencies and strong collaboration among law enforcement agencies and nuclear experts. It was noted that this collaboration should be reinforced with strong joint training activities. The panellists also concluded that, due to the potential level of effort to execute nuclear security measures at large major public events, coordinating with the IAEA or partner States for additional planning, training, resources, technical support and exchange of information can be beneficial.

Nuclear forensics: Create and sustain

Briefings during this technical session were focused on initiating and sustaining a national nuclear forensics program. Several major themes emerged from the panellists' briefings, including: the value of using existing resources and applying them to national nuclear forensics programs; the need to establish national response plans; the value of detailed analytical plans and procedures; and the need for effective cooperation between nuclear forensics scientists and law enforcement. Panellists also highlighted the value for regional and international collaborations to initiate and sustain national nuclear forensics programs and the importance of training and exercises for establishing and maintaining nuclear forensics capabilities. Further, they underscored the need for national nuclear forensics programs to effectively collaborate and communicate with a diverse set of stakeholders both domestically and internationally, particularly nuclear forensics scientists and law enforcement.

Nuclear forensics: Collaborative efforts

This technical session reviewed recent technical forums, trainings, self-assessment tools and bilateral and regional cooperation promoting nuclear forensics. Panellists noted the growth of nuclear forensics over the past decade as a tool for preventing and responding to nuclear and other radioactive materials out of regulatory control, and raised the importance of a common and consistent approach to the conduct of a nuclear forensics examination. They also emphasized that nuclear forensics can be strengthened through the use of existing national tools and subject matter expertise, augmented by bilateral and regional partnerships and professional development assignments within leading nuclear forensics laboratories. Finally, it was stressed that the development and sustainability of nuclear forensics is contingent upon international collaboration in nuclear forensics and that the IAEA should consider organizing more frequent meetings similar to the Nuclear Forensics Technical Meeting convened in 2019.

Computer security for nuclear security

Identification, classification, and protection of digital assets in a nuclear security regime

This technical session discussed the identification, classification, and protection of digital assets in nuclear security regimes. It was noted that digital assets are an integral part of nuclear security regimes and the defense of these assets is important for protecting against theft and sabotage of nuclear and other radioactive materials. One panellist in particular noted information and computer security risk analysis and technical defense architectures need to be more broadly considered in the construction stage of nuclear power plants. Several panellists suggested specific possible methods for protecting these assets and highlighted the need for ongoing research efforts to continually assure protection. For example, it

was noted that a function-based approach allows measures to be directed based on the impact of compromise rather than just the protection of the digital asset itself.

Computer security risk management for nuclear security

During this technical session, panellists provided a range of methods used by States to manage computer security risk. During the briefings, it was stressed that safety needs to consider security and the protection against malicious acts in all computer systems relevant for safety. Further, it was noted that computer security capability maturity models, a method for evaluating the maturity of computer security programmes, can be developed and may be helpful to identify areas for improvement. Further, it was noted that simulations can help not only in training, but also for research related to computer security. There was also discussion of cyber security training and exercises, during which it was noted that the constantly changing nature of computer security and cyber threats makes effective personnel training challenging. Further, it was underscored that computer security exercises need to be undertaken to effectively determine the performance of a computer security programme.

Secure digital asset design techniques

This session heard from five Member States describing different aspects of the development and assessment of digital assets that are secure. The common challenge is how to achieve clarity and confidence about the correct design and performance of sensitive digital assets when faced with the intrinsic complexity of today's advanced digital technology and cyber-attacks. The examples, which ranged from complex software-based systems through to programmable hardware systems, illustrated the value but also the dangers attendant on the use of models, programming languages and simulations to provide a simplified abstraction of the complexity.

Assurance activities for computer security

During this technical session, a range of briefings were provided addressing assurance activities for computer security. In this context, the potential advantages and challenges of using artificial intelligence for cyber security were discussed. In addition, a performance-based cyber security self-assessment methodology was presented, as well as a risk management framework involving the use of continuous monitoring for information security. The session also included a briefing proposing a new application of a trust model lexicon for information and computer security assurance. The chair, panel and audience all agreed that each of these concepts has the potential to have a key impact on the treatment of computer security within nuclear security.

Threat assessment (including DBT) for computer security

During this technical session, briefings addressed the complexities associated with developing a threat assessment for computer security, as well as potential solutions. The briefings and the ensuing discussions illustrated how the dynamic nature of cyber-attacks can challenge the orthodox approach to creating and using a threat assessment or a Design Basis Threat. One panellist provided a briefing proposing a 2-step process for developing a threat assessment for computer security: first, characterizing the tactics, techniques and procedures, the events, the scenarios and the adversaries and, second, considering how the target of the attack will respond to that characterization. A second briefing addressed methods for modelling the activities of both cyber adversaries and defenders with the goal of identifying an optimum defense strategy against a range of attack methods. A third panellist provided an analysis of a particular type of cyber threats, involving hiding information within legitimate protocol communications. Finally, a fourth panellist described work to model cyber-attacks and to determine the most probable type of attack being made against a system.

National strategies for information and computer security

During this technical session, a number of computer security challenges and methods to address them were discussed. One panellist provided an overview of computer security for nuclear security from the proceedings of the IAEA's Technical Meeting in Berlin, from professional training to supply chain attacks. Following on this briefing, a national case study on effective and efficient development of computer security guidelines and inspections was provided, and a potential framework was described for regulatory bodies to rely on when developing computer security regulations for radioactive material and associated facilities. Further, another panelist proposed for future consideration in national strategies a cyber threat model developed through IAEA CRP J02008 that describes the capability sets and information prerequisites for different types of cyber-attacks that could lead to compromise of instrumentation and control systems at nuclear facilities. Finally, a panelist described the need for initiatives that encourage the sharing of good practices.

IAEA Coordinated Research Programmes for information and computer security

During this technical session, panellists discussed the findings from an ongoing IAEA Coordinated Research Project (CRP), Enhancing Computer Security Incident Analysis at Nuclear Facilities. As part of this CRP, a simulated nuclear environment was developed, the Asherah Nuclear Power Plant Simulator, to enable research on incident analysis to be performed. Briefings addressed research done as part of the CRP to develop this simulated environment: on the need for a simulator to understand the anatomy of an attack; to analyze network traffic on an instrumentation and control (I&C) system; on a development methodology and initial implementation process for blended threats; the different digital assets within a nuclear power plant and how virtualization can be used for security testing of the assets; and how cyber-attacks can disrupt critical functions in a nuclear facility.

Future trends and activities in computer security

During this session, briefings addressed the current state of computer security for the nuclear industry, emphasizing the evolving nature of computer security threats and the need for enhanced computer security to address these threats both now and in the future. Panellists noted that the cyber capabilities of threat groups and aggressors continue to develop at a faster pace than the capabilities of defensive technologies, and underscored the need for resilient nuclear process simulators capable of simulating and analyzing threat and exploitation scenarios in order to develop strategies to detect and defend against them. Further, it was highlighted that such simulators could contribute to effective, flexible, and efficient training in computer security. Finally, it was noted that new and emerging technologies used in defensive architectures—including software-defined networking—could provide an increased ability to deny attacks and to provide the types of rapid configuration changes needed to provide reliable communications resistant to cyber-attacks.

Human resource development, capacity building and sustainability

Capacity building: Education

Briefings during this technical session considered various approaches and practical experiences in designing and developing educational and training programmes in support of human resource development and capacity building in States for nuclear security. Panellists described their individual and collaborative programmes and indicated a number of lessons learned and good practices. They reiterated the importance of education as one of the instruments for capacity building in nuclear security. They also underscored that capacity building in nuclear security must include a comprehensive human

resource development programme, including education and training. Further, they noted that Member State support for IAEA activities in human resource development is critical as it assures availability of resources, expertise, teaching materials and facilities. The panellists also encouraged States to prioritize human resource development and emphasized the importance of early stakeholder engagement for the success of human resource development programme.

Capacity building, human resource development and job-specific training in nuclear security

During this session, capacity building, human resource development and job-specific training in nuclear security were discussed. This included topics such as the establishment of training organizations for nuclear security, gender equality and career advancement, providing nuclear security training to non-technical personnel, and training programme sustainability. Panellists noted the fruitful and productive cooperation of Rosatom Technical Academy with the IAEA in nuclear security training; training programmes that can be implemented on the protection of radioactive materials located at soft civilian targets; and the need for practical measures to effectively involve women in nuclear security activities. They also noted that employing a systematic approach to training and adult learning principles is important for further increasing the effectiveness of training. It was recognized that training in threat assessment and, in particular, addressing extremists' groups among the various threats assessed, should receive attention. Retaining competent staff is important to decrease the risk of terrorist groups exploiting their knowledge. Participation in IAEA Coordinated Research Projects (CRPs) is particularly effective for capacity building in Member States. It was emphasized that one of the most critical prerequisites for establishing sustainable nuclear security regimes is the availability of competent and motivated staff, and the involvement of stakeholders (particularly management staff) in evaluating and increasing the quality and effectiveness of nuclear security training is recognized as an essential element of leadership development.

Capacity building: Non-governmental organizations

During this technical session, panellists described the role of non-governmental organizations (NGOs) in nuclear security, identifying the missions of various NGOs and challenges they have observed in the nuclear security field. Panellists emphasized that NGOs can support research, keep governments accountable and help with implementation of nuclear security initiatives. They further noted that some organizations work to raise awareness of challenges in nuclear security as well as convene meetings and seminars to help build capacity and information sharing for the international community; others develop partnerships with national governments or industry to support projects related to nuclear security. Finally, panellists agreed that there is a need for greater inclusion and gender parity in the nuclear security workforce, noting that many NGOs are currently sponsoring activities to address this challenge.

Role of Nuclear Security Support Centres (NSSC)

During this technical session, the role of an NSSC in sustaining a State's national nuclear security regime was discussed. Participants also highlighted the NSSC network and its mission to foster international cooperation on the systematic and sustainable approach to NSSC development. Several conclusions were reached by the panel. First, NSSCs can play an important role in sustaining a State's nuclear security regime, and should be developed and customized according to the needs of each State. Second, the NSSC network and regional frameworks for cooperation provide effective platforms for sharing information, resources, and building capacity in centres around the world. Third, emphasis should be placed in the future on further implementing and supporting instructor training and train-the-trainer activities among NSSCs. Finally, there is interest in NSSCs and the IAEA should continue to organize sessions at future conferences to further explore this subject.

Minimization of highly enriched uranium

Minimization, on a voluntary basis, of high enriched uranium within civilian stocks and where technically and economically feasible

The panellists discussed the challenges associated with minimizing the use of civilian high enriched uranium (HEU), including technical, political and economic obstacles to conversion, minimization and consolidation of HEU. One panellist highlighted the role it played in addressing the global supply and use of HEU and the evolving security risks associated with these stockpiles; and how this influenced their country to choose to reverse course and minimize these dangerous materials. Another panellist focused on the significant technical achievements their country has made in converting HEU research reactors and critical assemblies on its territory, noting that, in many aging facilities, the re-establishment of lost technical processes is needed to enable conversion. Two other panellists noted the need for broad international cooperation and transparency to address all the technical challenges and necessary achievements to enable successful conversion of such complex facilities from using HEU to using low enriched uranium.

Nuclear material accounting and control and insider threat

Nuclear material accounting and control and national accounting and control measures for radioactive material

This technical session addressed the importance of nuclear material accounting and control (NMAC) for both nuclear material and other radioactive materials. In particular, new technical measures for accounting and control were discussed, such as blockchain technology and automated cross-checking of separate databases to improve transparency and limit errors. Panellists also discussed the difference between physical protection regulations and NMAC regulations, and how these should complement each other for the protection of nuclear material. Additionally, one panellist provided information on a new IAEA course on NMAC for Practitioners, which will be held for the first time in April 2020. Panellists also discussed good practices for regulating the accounting and control of other radioactive materials. The session concluded that the IAEA should seek to help Member States understand the difference between NMAC for nuclear security and safeguards and that more time and attention should be devoted to assisting Member States with developing their capacity in accounting and control of other radioactive materials.

Insider threat

During the briefings presented to this technical session, a range of national methods were discussed for analysing and managing the risk of insider threats at facilities containing nuclear or other radioactive material. In particular, panellists addressed strategies to prevent and detect insider threats and respond to them in the case where an insider intentionally or unintentionally causes harm to the critical assets. A number of States' insider mitigation programmes were also discussed, as well as the systems used to organize insider mitigation programmes. It was underscored that insider mitigation programmes need to be adjusted to the culture of the State to be effective. Such programmes should utilize a planned and structured approach to maximize efficiency and cost effectiveness. The session concluded that an increased focus by States on trustworthiness and assessing and evaluating the characteristics of an insider could be valuable.

Insider threat: Computer and information security

The briefings in this technical session addressed insider threats to computer and information security, with a particular focus on the characteristics of these insider threats, possible countermeasures, potential vulnerabilities at facilities and national regulations in this area. Panellists also discussed topics including the relationship between insider threats and outsider threats, computer security culture, and national good practices against insider threats. The panellists particularly emphasized that, in their view, an insider with cyber capabilities is the most dangerous threat to facilities where nuclear or other radioactive material is in use or storage.

Emerging technologies and research and development in nuclear security***Risks and benefits to nuclear security from innovations in other fields, including artificial intelligence and big data***

Briefings in this technical session addressed a range of topics, from reconceptualising nuclear security as a business enabler through the impact of emerging technologies on nuclear security. During the discussions, it was stressed that the development and implementation of nuclear security culture programmes need commitment from senior level management. In addition, it was noted that rapid development of technologies—particularly in detection—can strengthen nuclear security capabilities at the national level. With respect to computer security, it was noted that new approaches have been undertaken to address computer security for nuclear security, and that States, international organizations and other stakeholders will need to work together to address and mitigate cyber risk. The session concluded that innovation in other fields, including in artificial intelligence and big data, are essential to enhancing national nuclear security regimes, and that such innovation should be supported.

Innovative technologies to reduce nuclear security risks and improve cost effectiveness, where feasible

During the first of these technical sessions, the panellists discussed innovative technologies to reduce nuclear security risks. Alternative technologies to radioisotopic irradiators were discussed by several panellists, while another addressed the use of low enriched uranium targets to replace highly enriched uranium targets for Molybdenum 99 production. Specifically, some States are working to reduce nuclear security risks by using linear accelerator or X-ray based irradiators in place of Cobalt 60 or Cesium 137. International cooperation in this area is ongoing, as some States are providing assistance to others in transitioning to alternative technologies. The integrity of security systems themselves was also discussed, particularly the safekeeping of biometric data and the secure use of blockchain technology. The panellists agreed that innovative technologies such as blockchain have some prospect to strengthen nuclear security and could be used as a part of nuclear security for insider threat, transportation security and NMAC. The panel concluded that it would be helpful to Member States for the IAEA to provide guidance on threat reduction and strengthening nuclear security by using innovative technologies.

During the second of these technical sessions, panellists focused on further innovative technologies to reduce nuclear security risks. During the briefings, panellists noted that systems and measures for enhancing nuclear security need to be modified using advances in science and technology to effectively manage evolving threats. Further, they underscored that digital innovations must be part of nuclear security, for example, integrating secure smartphone networks with radiation detection systems can be used to enhance detection and response capabilities. Further, they noted that technical, economic and political factors can be considered when evaluating the replacement of radiation source irradiators with

alternative technologies to address nuclear security risks. Finally, the panellists emphasized that new technologies and processes can help to manage final disposal of radiation sources in a secure manner, for example, using borehole disposal and melt processing. The session concluded by encouraging the IAEA to continue to support and advocate the use of innovations in science and technology to provide effective, efficient, and sustainable nuclear security solutions.

Nuclear security of new nuclear technologies

During this technical session, panellists presented their national experiences as well as lessons learned related to nuclear security of new nuclear technologies. The panellists noted that the underlying principles of nuclear security for many new nuclear technologies—such as small modular reactors (SMRs)—are broadly the same principles as for traditional nuclear technologies. Thus, the panellists agreed that Member States that choose to pursue such technologies should refer to existing guidance documents, such as those in the IAEA Nuclear Security Series, for general guidance on securing these types of facilities. However, panellists also observed that for some new types of reactors, such as floating reactors, the threat environment and the nature of the technology are markedly different from traditional nuclear technologies. They underscored that efforts should be made to address the challenges associated with these types of technologies and suggested that the IAEA consider developing additional information to assist Member States with security regulation of these technologies.

Advances in nuclear security research and development: International cooperation on nuclear security research

During this technical session, panellists discussed a range of topics, with a focus on international cooperation and research in nuclear security. Panellists noted that international cooperation can provide opportunities for sharing experiences and good practices. It was also highlighted that bilateral and multilateral projects to build capabilities of Member States at the national and regional level could help to improve the long term sustainability and usability of detection equipment, and that participation in IAEA CRPs can provide useful benefits to Member States that participate. Moreover, panellists noted that a bilateral project between the US and Japan to proactively reduce material attractiveness has the potential to inform the global standard. Finally, one of the panellists suggested that reviewing the follow up actions that came out of the Nuclear Security Summit process could provide a roadmap for future high-level engagements in nuclear security. The technical session concluded that the IAEA and Member States should consider focusing research and development on projects that will have a practical application and will address a well-defined need or gap.

The interface between nuclear safety and nuclear security

Nuclear safety/security interface: National experiences

During this technical session, panellists addressed the many facets of interfaces between nuclear safety and nuclear security, with a focus on their national experiences in managing these interfaces. The briefings highlighted how the interface between safety and security is important in areas such as transport of nuclear materials, physical protection plans for nuclear power plants, disposal of disused radioactive sources, implementation of safeguards, development of security plans, and development and implementation of regulations. The panellists concluded that there are numerous differences and commonalities between safety and security that should be considered when developing regulations, fostering organizational culture and training experts.

Nuclear safety/security interface: Implementation

During this technical session, panellists addressed various aspects of accounting for the interface between safety and security at facilities using or storing nuclear and other radioactive material, including nuclear safety and security culture, physical infrastructure, stakeholder engagement and computer security. Panellists recognized the common goal of nuclear safety and nuclear security as well as commonalities between the two areas, such as the use of a graded approach. It was concluded that both nuclear safety and nuclear security play a critical role in the use and application of nuclear and other radioactive materials. However, challenges were noted, particularly regarding working with emergency responders to ensure that account is taken of both safety and security. Finally, it was emphasized that new and emerging technologies bring new challenges, not only due to the need for increased and adaptable computer security, but also related to changing legal requirements and increasing inter-connectedness.

Emergency preparedness and response and nuclear security interfaces

This technical session focused on strategies to prepare for responding to nuclear security and radiological emergency events. Common themes addressed included the need for States to have established organizational frameworks for emergency response incorporating robust mechanisms for internal coordination and public communication. Panellists noted the emergence of new sensing and computer modelling technologies that can be leveraged to increase the safety and security of responders and to support effective integrated response strategies by providing timely and accurate technical information. The panellists suggested that such technologies should be researched and provided to emergency response organizations for training and operational deployment. Lastly, they emphasized the need to establish guidance at the national level in order to work effectively with local jurisdictions and to ensure that there are no gaps in capabilities related to the response to nuclear security events including cyber-attacks. Finally, it was considered important for States to invest in continuous improvement for nuclear security and emergency preparedness interfaces.

Transportation of nuclear and other radioactive material

Transportation

The first of the technical sessions focused on transportation of nuclear material, with a focus on sharing national good practices. A major theme discussed was recognizing not only the differences between safety and security, but also the importance of their shared objective. Panellists also agreed on several points: first, that the technology used for tracking and securing nuclear materials needs to be effective and adaptable; second, that communication is key to maintaining positive relationships with stakeholders and relevant authorities; finally, that a robust security framework that is coordinated with all relevant and competent authorities is essential to effectively secure transport routes and the nuclear materials themselves. The session concluded that every country and authority should take safety and security into account in transport of nuclear materials; that transport of class 7 maritime material needs to comply with the International Maritime Organization (IMO) with INF Code, that security needs a high level of interagency coordination, cooperation, planning, and training; and that emerging challenges need to be accounted for.

The second of the technical sessions on transportation also focused on good practices for the transportation of nuclear and other radioactive material. The development and deployment of advanced transport containers—including how they meet revised security regulations—was addressed, as well as the complex challenges associated in developing regulatory frameworks for transport safety and security

and national experience in incorporating unpredictability into transport regulations. Further, the role of national law enforcement in addressing transportation security for nuclear and other radioactive material was reviewed, and an overview was provided of the role of industry in developing and reviewing nuclear security transport regimes, especially in addressing new and evolving threats. In addition, an overview was provided of the 2019 International Symposium on radioactive and nuclear material, and States were encouraged to sign on to INFCIRC 909 (Joint Statement on Transport Security of Nuclear Materials) and support regional frameworks for training and capacity development. The use of statistical analysis for designing the fundamental and necessary factors for a transport security regime was also discussed.

Nuclear security culture

Nuclear security culture: Performance indicators

The briefings provided in this first session on nuclear security culture highlighted the crucial role of the management system in successfully implementing and sustaining nuclear security culture. Panellists addressed in particular the importance of increasing understanding among staff of the crucial role that security culture plays in nuclear security and ensuring that the organization prepares, supports and assists staff during organizational changes, including those associated with the aging of expert staff in the nuclear area. Panellists also provided an overview of tools and methods for strengthening security culture, with the goal of keeping pace with evolving threats such as cyber security threats, noting that the current range of tools available to assess the performance of the security culture are not yet adequate. The panellists also agreed on the essential role of the human factor, including leadership and the engagement of all levels of staff in developing and maintaining a strong security culture.

During the second session on nuclear security culture, panellists further emphasized the important role of the regulatory body and management system in successfully enhancing and sustaining nuclear security culture. During the discussions, panellists stressed the importance of the involvement of top management at all competent authorities in building a strong nuclear security culture. They also underscored the role of top management in ensuring the sustainability of a nuclear security culture enhancement programme.

Closing of the Conference

In their closing remarks, the Conference Co-Presidents provided a brief overview of the key insights, statistics and conclusions of the Conference. They thanked and congratulated the Member States on the success of ICONS 2020 and also for adopting the Ministerial Declaration by consensus in a particularly difficult international context. They attributed this success to the collective support for nuclear security, which they see going in the right direction, with the IAEA in a crucial coordinating and assisting role.

The Co-Presidents recognized the upcoming 2020 NPT Review Conference as an important opportunity to enhance the political attention to nuclear security and to deliver the message that it is possible to achieve consensus on a topic as sensitive and complex as nuclear security.

They further thanked the Director General for his unwavering and inspirational support. They also thanked DDG Lentijo, Director Raja Adnan, the ICONS team and others from the Secretariat, who assisted the Co-Presidents in many different ways throughout the preparatory process and the Conference.

In his closing remarks, the Director General thanked the Co-Presidents, the Co-Chairs of the Programme Committee and the ICONS organizing team for the success of the Conference. He expressed his appreciation for the strong participation in the conference, the adoption of a substantive Ministerial Declaration and for the expression by Member States of their determination to counter the threat of nuclear terrorism and other malicious acts. He also appreciated the recognition of support for the role of the IAEA in nuclear security expressed throughout the Conference. Finally, he thanked the Conference Co-Presidents for bringing the Conference to a successful conclusion.

This document represents a summary record of the *International Conference on Nuclear Security: Sustaining and Strengthening Efforts* held in Vienna from 10 to 14 February 2020.

ANNEX 2

2020 International Conference on Nuclear Security: *Sustaining and Strengthening Efforts*

10–14 February 2020

MINISTERIAL DECLARATION

1. We, the Ministers of the Member States of the International Atomic Energy Agency (IAEA), gathered at the International Conference on Nuclear Security: *Sustaining and Strengthening Efforts*, reiterate our commitment to sustain and strengthen effective and comprehensive nuclear security of all nuclear and other radioactive material and facilities.
2. 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.
3. We remain concerned about existing and emerging nuclear security threats and committed to addressing such threats.
4. We acknowledge that nuclear security measures may enhance public confidence in the peaceful use of nuclear applications. We also acknowledge that those applications contribute to Member States' sustainable development and we should ensure that measures to strengthen nuclear security do not hamper international cooperation in the field of the peaceful uses of nuclear applications.
5. 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.
6. We support the work of the IAEA in assisting Member States, upon request, in establishing and improving effective and sustainable national nuclear security regimes, including through guidance development, advisory services, and capacity building, and accordingly its central role in facilitating and coordinating international cooperation to strengthen nuclear security, as well as its role in facilitating, as appropriate, regional activities.
7. We recognize physical protection as a key element in nuclear security, and support the further development of the IAEA's assistance in the relevant areas of importance to Member States to include prevention, detection and response.
8. We encourage Member States to implement threat mitigation and risk reduction measures that contribute to improving nuclear security including, but not limited to, ensuring the protection of nuclear and other radioactive materials and facilities, in accordance with national legislation.
9. We call upon all Member States possessing HEU and separated plutonium in any application, which require special precautions to ensure their nuclear security, to make sure they are appropriately secured and accounted for, by and in the relevant State, and we encourage Member States, on a voluntary basis, to further minimize HEU in civilian stocks, when technically and economically feasible.
10. We recognize the threats to computer security and from cyber-attacks at nuclear related facilities, as well as their associated activities including the use, storage and transport of nuclear and radioactive

materials, and call on Member States to strengthen protection of sensitive information and computer-based systems, and encourage the IAEA to continue to foster international cooperation and to assist Member States, upon request, in this regard.

11. We reaffirm the importance of continuing to promote the universalization and implementation by its States Parties of the Convention on the Physical Protection of Nuclear Material (CPPNM) and its Amendment, and look forward to the 2021 conference. We also reaffirm the importance of other relevant international legal instruments, such as the International Convention on the Suppression of Acts of Nuclear Terrorism (ICSANT).

12. We commit to maintaining effective security of radioactive sources throughout their life cycle, consistent with the objectives of the Code of Conduct on the Safety and Security of Radioactive Sources and its supplementary guidance documents.

13. We encourage the IAEA to continue to facilitate, in close cooperation with Member States, a coordination process to address the interface between nuclear security and nuclear safety, as appropriate.

14. We reiterate our commitment to combatting illicit trafficking of nuclear and other radioactive material and to ensure that the material cannot be used by non-State actors for malicious purposes and encourage Member States to continue sharing relevant information, on a voluntary basis, including through relevant channels and databases. The States providing notifications to databases are responsible for accuracy, objectivity and purely technical character of this information.

15. We support the IAEA's and Member States' efforts to strengthen nuclear security culture and also insider threat mitigation, in particular through providing education and training opportunities, and note the contribution of other relevant institutional entities, such as regulators and industry, in this regard.

16. We encourage Member States to use and contribute to the IAEA's nuclear security advisory services and peer reviews, on a voluntary basis.

17. We call upon Member States to support and contribute, as appropriate, to the IAEA's nuclear security activities by providing experts and sharing national expertise, best practices, lessons learned, as well as highlighting recent successes, with due regard to the protection of sensitive and confidential information.

18. We recognize the Nuclear Security Fund as an important instrument for the Agency's activities in the field of nuclear security. We will continue to provide, on a voluntary basis, funds to the Nuclear Security Fund, as well as technical and human resources, as appropriate for the IAEA to implement its work in nuclear security and to provide, upon request, the support needed by Member States.

19. We commit to promote geographical diversity and gender equality, in the context of IAEA's nuclear security activities, and encourage Member States to establish an inclusive workforce within their national security regimes, including ensuring equal access to education and training.

20. We call upon the IAEA Secretariat and Member States to take this Ministerial Declaration into account in the consultation process between the Secretariat and the Member States during the development of the IAEA's 2022–2025 Nuclear Security Plan, while also considering the proceedings of this conference, as appropriate.

21. We call upon the IAEA to continue to improve communication with Member States about its nuclear security activities and to facilitate the exchange of technical and scientific information on nuclear and radioactive security technology options.

We call upon the IAEA to continue to organize international conferences on Nuclear Security every four years and encourage all Member States to participate at a Ministerial level.



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