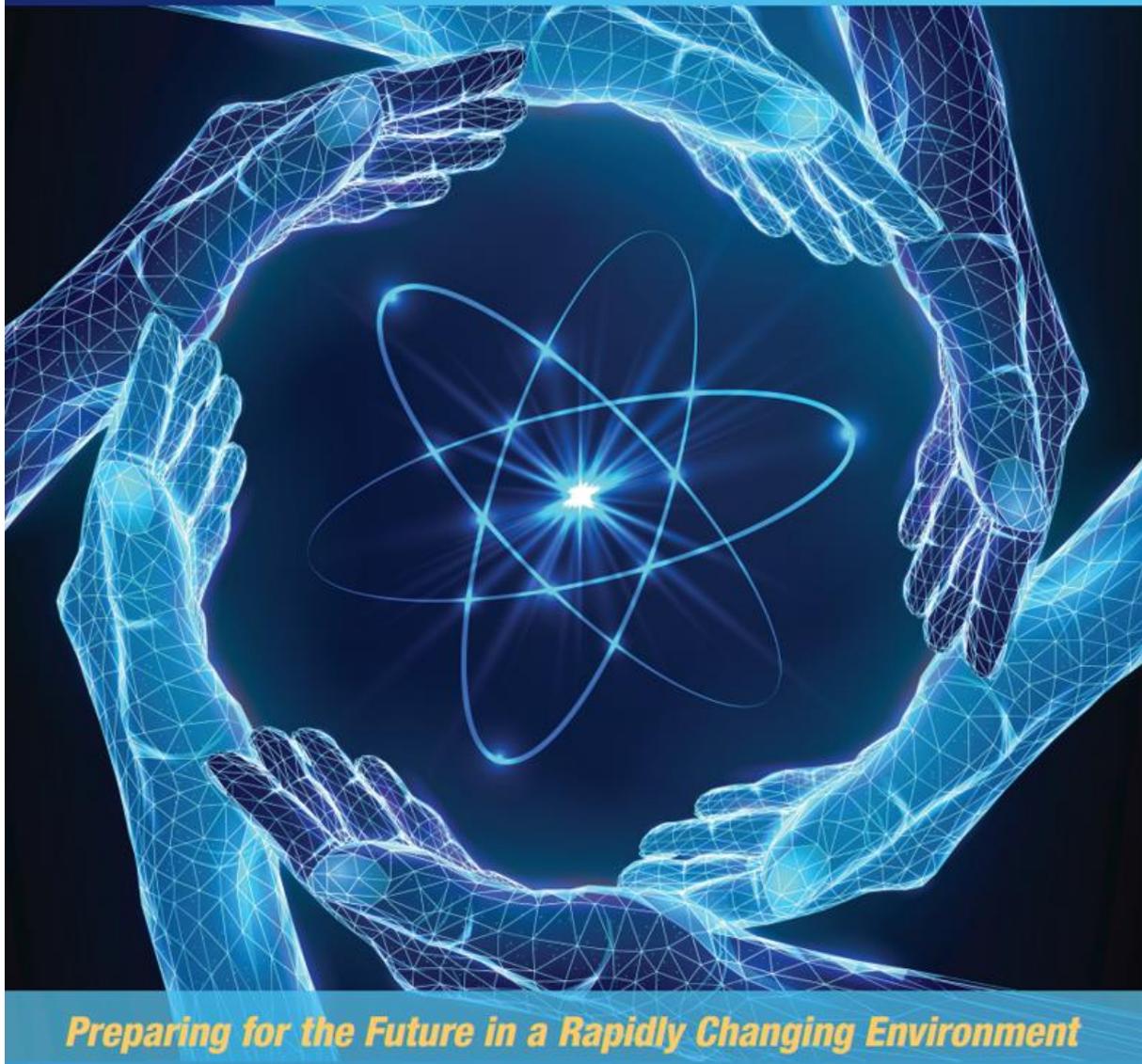


INTERNATIONAL
CONFERENCE ON

Effective Nuclear and Radiation Regulatory Systems



Summary and Conclusions from the President and Vice-President

**International Conference on Effective Nuclear and
Radiation Regulatory Systems**
Preparing for the Future in a Rapidly Changing Environment

Abu Dhabi, United Arab Emirates

13-16 February 2023

**The SUMMARY AND CONCLUSIONS
of the PRESIDENT and VICE PRESIDENT
of the CONFERENCE¹**

Mr Christopher T Hanson
Chair of the US Nuclear Regulatory Commission

and

Mr Christer Viktorsson
Director General of the UAE Federal Authority for Nuclear Regulation

¹ Views and recommendations expressed here are those of the President and the Vice-President of the Conference and the participants and do not necessarily represent those of the IAEA.

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Introduction

The International Atomic Energy Agency (IAEA) International Conference on Effective Nuclear and Radiation Regulatory Systems: *Preparing for the Future in a Rapidly Changing Environment* took place February 13-16, 2023. This Conference, hosted by the Government of the United Arab Emirates (UAE), was the sixth in a series on the topic of effective nuclear and radiation regulatory systems. The five preceding conferences were held in The Hague, the Netherlands in 2019, Vienna, Austria in 2016, Ottawa, Canada in 2013, Cape Town, South Africa in 2009, and Moscow, the Russian Federation in 2006. Building on the conclusions and deliberations of these earlier events, this Conference in Abu Dhabi reviewed issues of importance to the global regulatory community, focusing on the importance of regulators in ensuring a high standard of performance while navigating a rapidly changing environment.

More than 600 registrants participated in the most widely attended Conference to date, including senior regulators from around the world. There were approximately 360 attendees from 95 Member States and 4 international organizations participating in person in Abu Dhabi; others followed the Conference remotely.

The various events and undertakings in the period since the 2019 conference in the Hague were summarized in the opening session of the Conference to contribute to the professional discourse and exchange of views in Abu Dhabi.

Additionally, significant themes from other events influenced the discussions during the Conference, namely from the seventh Review Meeting of the Contracting Parties to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (June–July 2022); the open-ended meetings of legal and technical experts on implementation of the Code of Conduct on the Safety and Security of Radioactive Sources and its supplementary Guidance; the 2022 International Conference on Safety and Security of Radioactive Sources; and the work performed by the Commission on Safety Standards and related activities.

The objective of the Conference was to facilitate the sharing of global regulatory experience, particularly with regard to building resilience and agility to respond to new and emerging challenges in a rapidly changing environment. Approaches to regulating in an environment impacted by natural and man-made crises such as a health pandemic and military operations, technical innovation, and emerging and new technologies were discussed in the context of necessary regulatory harmonization and international and regional cooperation. Regulatory credibility, trust, and capacity building for future needs through education, human resources, knowledge management and networks were core topics.

Topics for discussion at the Conference included:

- Leadership through new and emerging challenges;
- Harmonization, innovation and new technologies: approaches to enhance regulatory agility;
- Full lifecycle challenges and strategies;
- Trusted regulator: cooperative techniques to promote credibility and resilience;
- Capacity building for the future – holistic approaches for nuclear and radiation safety and security;

- Regulating a modern era of medical and radioactive materials facilities and applications – the journey continues;
- Climate change;
- Novel ideas presented by young professionals.

Opening Session

Ms L. Evrard, IAEA Deputy Director General (DDG) and Head of the IAEA Department of Nuclear Safety and Security, opened the Conference. In her welcome address she first noted with pleasure the record number of more than 620 registered representatives from 95 IAEA Member States to participate in this important event, the first time it has been hosted in this region of the world.

Ms Evrard extended her appreciation to the United Arab Emirates for hosting the Conference and to the Federal Authority for Nuclear Regulation (FANR) for its support with the logistics of the Conference. She also took the opportunity to thank Mr Christopher Hanson, Chair of the U.S. Nuclear Regulatory Commission (U.S. NRC), and Mr Christer Viktorsson, Director General of FANR, for serving as President and Vice-President, respectively, of this Conference, and she thanked the members of the Programme Committee. Ms Evrard also commended national representatives who had been inspired to make regulatory improvements at home following the outcomes of earlier conferences and expressed every confidence this Conference would have the same result as testament to the commitment of the IAEA and its Member States to strengthen nuclear and radiation safety across all regions.

Referring to the theme of the week, *Preparing for the Future in a Rapidly Changing Environment*, Ms Evrard highlighted that even though the environment we are working in is always evolving, this reality has taken on a very specific meaning over the last three years, citing the impacts of a global pandemic, the severity of external hazards, and in some context extremely difficult conditions for ensuring nuclear safety and security over the last year. She emphasized the need for resilience and adaptability in response to unexpected and unprecedented events. Ms Evrard reinforced that the Conference aimed to review issues of importance to the global regulatory community and to highlight the role of the regulator in ensuring a high level of nuclear safety and security.

Ms Evrard also drew attention to the challenges associated with new and innovative technologies and their applications. Given the growing interest in advanced new reactor technologies and strong expectations from many Member States in this regard, the IAEA Director General Rafael Mariano Grossi had launched the Nuclear Harmonization and Standardization Initiative (NHSI) to facilitate the deployment of safe and secure small modular reactors (SMRs), through strengthened international cooperation on licensing approaches as well as in the standardization of industrial approaches for SMRs.



To conclude, Ms Evrard underlined the benefit of having such a wide range of panellists selected for their expertise, knowledge and experience, who represent the diversity that the IAEA is committed to promoting. As such, this Conference provided a rare opportunity to collectively reflect on how to strengthen nuclear safety and security amidst an environment of new challenges, and contributed to the high interest in this Conference.

Following Ms Evrard's remarks, His Excellency **Ambassador H. AlKaabi**, Permanent Representative of the UAE to the IAEA and UAE Special Representative for International Nuclear Cooperation, took the floor, addressing the audience as host of this Conference and noting the record participant numbers drawn from 95 IAEA Member States.

His Excellency referred to the steady increase in demand for nuclear energy, with about 60 reactors being under construction today and many countries considering embarking on their own nuclear energy programmes to meet the increasing demand for energy in addition to meeting clean energy goals. In this context, Dr AlKaabi offered the UAE as an example of this evolution towards de-carbonization, the UAE being the first country in the Arab region to build and operate a nuclear power plant and the first in three decades to start and commission a nuclear power programme. Today, two units of the Barakah Nuclear Power Plant are commercially operational and delivering electricity around the clock, Unit 3 is in the commissioning phase and soon will move into commercial operation and Unit 4 is expected to receive an operating licence later this year from (FANR).

His Excellency explained that the UAE is taking concrete steps towards diversifying its energy mix, in accordance with its 2050 Energy Strategy and its commitment to achieve its Net Zero Goal by the year 2050. He said the development of a robust nuclear regulatory infrastructure in the UAE was the result of his country's long and strong cooperation with its national and international partners and in particular, the UAE's ongoing close cooperation with the IAEA.

Mr C. Hanson, Chair of U.S. NRC and President of the Conference, followed Dr AlKaabi, calling the meeting to order. He extended his welcome to all and congratulated the Programme Committee members and the IAEA Secretariat for their efforts. In particular, the President thanked Mr Viktorsson, the Director General of FANR, for serving as Vice President of the Conference, and expressed his conviction that the combined efforts of the Programme Committee, the IAEA Secretariat, and FANR have resulted in the largest attendance ever in this series of conferences.

The President encouraged everyone to share what has changed in their respective organizations since the previous conference so that together, the global nuclear community can learn from our collective wisdom and experience to strengthen nuclear safety worldwide.

Regarding the theme of this week, *Preparing for the Future in a Rapidly Changing Environment*, President Hanson made clear that the words had been chosen intentionally to acknowledge the many dynamic environments impacting the role of regulators globally. First, he noted that climate change is leading to increased interest in nuclear power, keeping existing plants open and building new ones. Second, the regulatory environment is changing due to significant advancements in nuclear technologies, not just new reactor designs, but also advances in the use of radiological materials, including medical technologies. In addition, the world is facing the unprecedented situation where the safety of nuclear power plants is threatened by war.

In conclusion, the President encouraged participants to make the Conference a success by engaging, asking questions and sharing views. Participants would hear from regulators with decades of experience and regulators that are only now establishing their programmes. Noting this is an exciting time to be involved in nuclear and radiological safety, the President emphasized the imperative that we learn from each other and hold each other accountable for the safety and security mission we all share.

Conventionally, the President of the previous conference provides a summary and overview of actions since the last event. In 2019, the President of the conference had been Dr Carl-Magnus Larsson, then Head of the Regulatory Services Branch of the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). Dr Larsson has since retired and so **Mr J Scott**, Chief Regulatory Officer, ARPANSA Regulatory Services, provided a summary and overview of actions since the 2019 conference. For example, to address several challenges identified in 2019, the IAEA had published technical documents on the application of the graded approach to regulation and on the effective management of regulatory experience for safety. The issue of the management of disused sources had been discussed at the 2022 International Conference on the Safety and Security of Radioactive Sources and addressed in a new Technical Reports Series publication on Notification, Authorization, Inspection, and Enforcement for the Safety and Security of Radiation Sources. Additional activities to enhance emergency preparedness, peer review missions, and capacity building were also highlighted.

Keynote Panel: Preparing for the Future in a Rapidly Changing Environment

Keynote points from Her Excellency Mariam bint Mohammed Saeed Hareb Almheiri, Minister of Climate Change and Environment of the United Arab Emirates



The keynote speech was delivered by video. Her Excellency, the UAE Minister of Climate Change and Environment said that 2023 is to be the year of sustainability, as announced by the UAE President, His Highness Sheikh Hamad bin Zayed Al Nahyan and in line with the country hosting of the United Nations Framework Convention on Climate Change Conference of the Parties (COP 28) later this year.

The Minister stated that, as the host country of COP 28, the UAE has two roles to play: first, to welcome the 197 attending countries and bring them together to address the threat of climate change, gain consensus and define firm actions and next steps to accelerate progress towards a climate neutral world by mid-century; second, as a member of the Paris Agreement, to ensure that the UAE continues to make substantial efforts to realize its own commitments for combating climate change and reaching net zero by 2050.

Given that climate change threatens all of us and our planet, the Minister urged collective action to mitigate and adapt to the future effects of climate change. Among the many measures to address the climate crisis, the Minister affirmed that peaceful clean nuclear energy is a significant pillar and that a paradigm shift was necessary to enable a just energy transition.

The Minister described UAE progress as the first Arab country to use nuclear energy for peaceful purposes, with the first three units of the 5,600MW Barakah nuclear power plant already connected to the grid. Once fully operational, the Minister stated, the plant will provide up to 25% of the country's electricity needs, eliminating up to 22 million tons of carbon emissions every year, equivalent to removing 4.8 million cars from UAE roads - half the number of private vehicles registered in the country today.

In conclusion, while the COP 28 UAE Presidency will highlight decarbonization as a global imperative, the Minister stressed that enhancing the effectiveness of nuclear as well as radiation regulatory systems is essential to a global response to new and emerging environmental challenges to combat the climate crisis.

Keynote points from Ms Rumina Velshi, President and Chief Executive Officer of the Canadian Nuclear Safety Commission

Ms Velshi noted that this conference series has always been and continues to be an important forum for advancing nuclear safety and regulatory excellence and this year's timely theme, *Preparing for the Future in a Rapidly Changing Environment*, focused the Conference on a time of change and challenge. She noted that nations are motivated to accelerate the fight against climate change and at the same time, are increasingly concerned with achieving energy security. Nuclear is being seen, therefore, as a critical tool in achieving these goals.



In this changing environment, Ms Velshi considered the onus to be on the global nuclear community to work together to deploy a safe, reliable and effective nuclear fleet. To fulfil this responsibility, she emphasized the need for international standardization of designs and the pursuit of greater harmonization of regulations across borders. Ms Velshi, noting that forces at work today will shake the nuclear and wider energy industry for decades to come, asked: 'how shall regulators react'? She reinforced that regulators exist to protect people from risk. They must be ready for whatever technology comes next and keep pace with changing times across society. The evolving nature of information sharing and communications demands that regulators globally,

without any surrender of national sovereignty, be more transparent in their operations, more inclusive in their structure and more global in their vision. In this regard, Ms Velshi considered there was both an opportunity and an obligation to work together more closely and to share ideas, perspectives and experiences for the benefit of all.

In her remarks, Ms Velshi posed three questions for regulators to consider:

1. What practical and immediate steps can we take to contribute to global efforts in developing harmonized approaches to regulatory regimes?
2. How can we improve the implementation of the IAEA's safety standards to ensure a robust and safe global deployment of new technologies?
3. What best practices can we share that will help advance the harmonization of regulations and standards?

Ms Velshi urged regulators to keep the focus on safety, but to avoid becoming an obstacle to progress or an impediment to the deployment of SMRs or new technologies. Noting that the COVID-19 pandemic was a generational challenge for scientists, policymakers and regulators, it exemplified how we can seize opportunities to collaborate internationally and adapt to new challenges. For SMRs, the focus had shifted from national to global and regulators would need to adapt.

Concluding, Ms Velshi said that working together and sharing experiences more closely makes for more efficient and effective regulation. It reduces duplication of effort and it leads to better, quicker, more informed decisions, all without surrendering regulatory sovereignty or compromising safety.

Keynote points from Olivier Gupta, Director General of the French Nuclear Safety Authority and Chairman of WENRA

Mr Gupta reaffirmed that the nuclear community has entered a new and challenging era in the post-Fukushima decade, during which all stakeholders have been focusing on safety. European nuclear power plants undergoing stress tests are benefiting from substantial modifications to face potential loss of power. The benefits of such improvements have become more apparent with the war in Ukraine and with some nuclear power plants (NPPs) facing loss of power.

Countries are seeking to be more energy independent in terms of nuclear fuel supply. In this context, Mr Gupta noted there may be safety consequences arising from undue pressure and burden on nuclear stakeholders, pressure from citizens and from governments on nuclear power plant licensees to put priority on electricity supply, and pressure on nuclear regulators to not delay the development of nuclear projects.

The Western European Nuclear Regulators' Association (WENRA) has reflected on this new situation and issued three recommendations: one for governments, one for licensees and one for regulators. The first recommendation is that energy policy decisions be taken in due time and remain stable in the long term. This is essential because an absence of predictability and a lack of stability are detrimental not only to the industry but also to nuclear safety. The second recommendation is that licensees continue to have prime responsibility for safety and thus, be expected to demonstrate the safety of their operations and activities and submit these demonstrations in a time frame that enables rigorous regulatory review. The third recommendation is that regulators commit to work effectively and efficiently to make regulatory decisions in a timely manner. Also, the continued independence of regulatory decision-making is essential so there is no undue interference in regulatory decisions.

Keynote points from Dr Khalid Aleissa, Chief Executive Officer Nuclear and Radiological Regulatory Commission of the Kingdom of Saudi Arabia

Dr Aleissa, speaking especially as a new regulator established 3 years ago, highlighted the importance of cooperation and collaboration, and learning from other regulators. He also recognized the importance of communication among regulators and had worked to establish positive working relationships with regional and international regulators. He emphasized the importance of establishing and upholding cross-border coordination and collaboration between state nuclear regulators in order to provide stronger transboundary control over matters like nuclear security and nuclear emergency preparedness and response, as well as state-level nuclear control.

The IAEA, on the other hand, functions as an important global nuclear regulatory platform to promote harmonization, establish standards and guidelines, and provide assistance in building capacity. However, the IAEA alone will not be enough to play the necessary roles for several reasons, among which are its limited financial resources and the rapidly expanding needs of its Member States. States, in particular their national nuclear regulators, can generate several diversified supports to the IAEA that contribute to a more effective nuclear control and safety regime around the world.

General Conclusions of the Keynote Panel

Collectively, the keynote panel considered that nuclear power must be in the energy mix to reach global climate change goals, decarbonization and electrification. On energy security, the keynote panel recognized the growing concern of some countries about their ability to achieve the short, medium and long-term balance between electricity production and consumption. The global nuclear community was encouraged to support nuclear embarking countries and work together to deploy a safe and reliable nuclear fleet while ensuring that regulatory independence and effectiveness is preserved and continuously improved.

The keynote panel considered that ongoing regulatory readiness and efficiency call for forward thinking about the growing needs of the sector in the face of the rapid evolution of nuclear technologies. Regulators must develop a performance-based, risk-informed approach to regulatory readiness and effective communication and engagement.

Given the above, the keynote panel agreed that, from the perspective of regulatory bodies globally, safety must be kept at the forefront and any associated political decisions should be expedited because unpredictability and lack of stability are detrimental to nuclear safety. Above all, the continued independence of regulatory decision-making is essential.

Despite these challenges, the keynote panel saw opportunities (not least through this Conference) to consider acceptable levels of safety, to reinforce international cooperation and to develop joint safety assessment approaches to new technologies. The need for enhanced harmonization to enable the development of new projects was emphasized by all speakers in the context that regulation need not be an obstacle to innovative design if regulatory bodies become engaged early in new design development.

Summary of the Sessions and Panels

Topic 1: Leadership through New and Emerging Challenges

The session focused on leadership in the face of emerging challenges, including pandemics, economic uncertainty, conflict situations, civil unrest, and climate change, and the need for the nuclear power industry and radiation technology practitioners to work with regulators to ensure a resilient national infrastructure for safety. The session addressed regulatory resilience and the need to adapt and respond to unexpected challenges. The COVID-19 pandemic alerted the nuclear community to regulatory implications in relation to business continuity, hybrid-working, remote inspections, and lessons learned for future regulatory enhancements. Regulators globally must expect the unexpected and develop regulatory programmes to keep ahead of rapidly changing threats, such as cyber security and unmanned aerial vehicles, while sustaining human performance under chronic stressors on operations. Additionally, the panel highlighted the importance of reinforcing the international framework for the safe operation of nuclear facilities devoted to peaceful purposes in situations of armed conflict and the need for new regulatory strategies to ensure resilience of existing and new nuclear installations in the face of climate change.



Topic 2: Harmonization, Innovation and New Technologies: Approaches to Enhance Regulatory Agility

The session discussed regulatory strategies and programmes for advanced nuclear technologies, international cooperation, harmonization of safety requirements and licensing approaches, and the use of artificial intelligence (AI) in regulatory activities. The panel noted that to achieve net-zero, a significant increase in the global build of new nuclear power plants is needed, which will challenge regulatory competencies and capacity. The IAEA's NHTSI was highlighted as an essential tool for licensing harmonization and regulatory body readiness. Panelists also discussed the challenges of building up to 100 new nuclear reactors of differing sizes each year between now and 2050 to advance efforts to decarbonize electrical grids in line with climate change goals. Broader utilization of new technologies needs further research and development activities, early successful demonstration projects, consolidation of global market and supply chains, and establishment of suitable financing models. The panel urged governments to be bold in their policy decisions and to mandate their regulators and technical support organizations to engage in international cooperation to develop the capacity to meet these technological challenges. Finally, the panel discussed the use of AI in regulatory activities and the need for caution in its adoption to ensure the benefits outweigh the risks, especially for the security of data.

Topic 3: Full Lifecycle Challenges and Strategies

The session discussed challenges and strategies related to the full lifecycle of nuclear and radiation facilities, including the establishment of new programmes, managing ageing

facilities, decommissioning, and radioactive waste storage and disposal. The participants noted that the licensing process for long-term storage facilities, including geological repositories, is complex; specific legal requirements and responsibilities for safety and security need to be addressed and be unambiguous; and transparency should be a priority in order to engender trust with stakeholders. The management, control and recovery of orphan sources were discussed, and panellists suggested that regulators should assess the financial viability of source users as part of the authorization process.

Decommissioning of cyclotrons is a new experience for most States, and ageing management of NPPs requires specific competences in the regulatory body. Political decisions that switch rapidly from phasing-out to life-extension are a challenge for any regulator. The session noted the need for adaptation and development of national regulatory frameworks and infrastructure for an environment with new or expanding nuclear and radiation facilities. In addition, participants advocated for regulatory supervision of the supply chain, planning for ageing management, and waste management of power and research reactors. They also discussed the use of financial assurance instruments for lifecycle confidence, recognition of State regulatory verification, and collaborative work in assuring adequate and effective nuclear security across the lifecycle of nuclear and other radioactive materials and their facilities as a global priority.

Topic 4: Trusted Regulator: Cooperative Techniques to Promote Credibility and Resilience

This session focused on the importance of building and maintaining stakeholder and public trust in nuclear and radiation safety and security activities through effective communication strategies and stakeholder involvement. The session emphasized that trust is built through regulatory independence, competency, impartiality, credibility and transparency, as well as mutual understanding of the roles of regulators, operators and other stakeholders. The session also discussed the benefits of including transparency and stakeholder involvement as key performance indicators in regulatory policymaking and benchmarking. Panellists highlighted that new forms of communication, such as social media, present challenges and risks, and regulators should establish methods to avoid these risks. The



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The use of social media can be a fast and effective way to spread information during emergency situations, but regulatory bodies must be vigilant in monitoring and preventing the spread of false information. Trust is earned when regulatory activities are visible, useful and reliable, especially during emergencies. Emergency preparedness plans are reviewed and updated regularly, and regulatory bodies participate in international exercises and collaborate with neighboring countries. Openness and transparency are important in building trust, and providing accurate and timely information is crucial. Even if there is limited information available, it's important to be open and honest with the public and explain the next steps to be taken. The language used in communication should be clear, concise and easily understandable.

session also called for enhanced international and regional cooperation, regulatory self-assessment and peer reviews, and effective emergency preparedness and response programmes.

Topic 5: Capacity Building for the Future – Holistic Approaches for Nuclear and Radiation Safety and Security

This session focused on sustainable capacity building strategies and programmes in nuclear and radiation safety and security. The discussion emphasized the importance of systematic, harmonized, and globalized approaches to human resources and education and training in nuclear sciences and technology. The session addressed the challenges regulators face in the current environment, including financial constraints, an ageing workforce, and the need for

new competencies in areas such as cybersecurity and digitalization. The importance of leadership for safety and safety culture were highlighted as essential components in driving capacity building, along with greater diversity and inclusion. The session also noted the necessity of developing durable capacity building programmes, transferring knowledge to the next generation, and cultivating a global workforce of regulatory practitioners.

Special Panels: Regulating a Modern Era of Medical and Radioactive Materials Facilities and Applications – the Journey Continues

The Special Panel discussed the challenges of regulating the use of radioactive sources, which has a significant impact on global society. The panel was divided into two segments. The first segment addressed regulatory frameworks and partnerships for ensuring source safety and security, while the second segment focused on technologies and applications involving radioactive sources in industries such as medicine, research and academia.

Summary of Special Panel 1

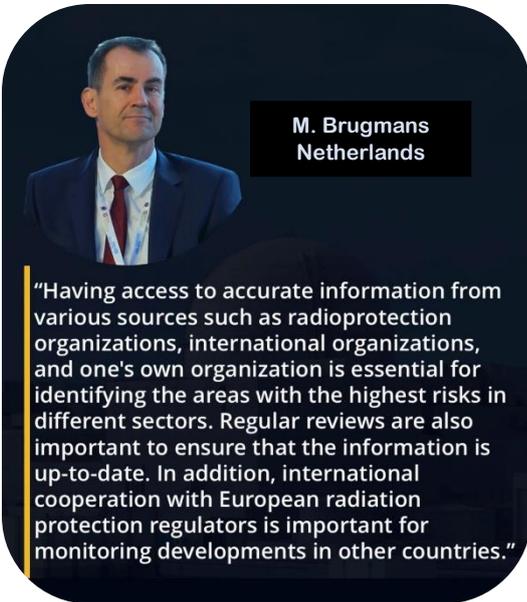
The first segment of the Special Panel on Regulating a Modern Era of Medical and Radioactive Materials Facilities and Applications emphasized the importance of international collaboration among regulators to ensure the safe and secure use of radioactive sources. The panel, chaired by President Hanson, discussed the need for a legislative and regulatory framework for the safety and security of sources, and the benefits of implementing the Code of Conduct on the Safety and Security of Radioactive Sources.

The panel highlighted the challenges in managing and controlling the large number of radioactive sources in circulation, especially in the rapidly advancing field of medical technologies. Access to radiotherapy is a growing challenge, and strategic partnerships and initiatives like the IAEA's Rays of Hope are needed to improve access to diagnostic and therapeutic treatments in underserved areas, while creating sustainable regulatory programmes for oversight of the radioactive sources used in the treatments.

Regulatory infrastructure for medical applications can be complex, and training for users of medical radiation technologies is an area that requires cooperation with professional bodies and sharing of experience among regulators. Safety culture should be prioritized in the use of medical radiation technologies, and concerns about emerging innovative radiation technologies were also noted. Sharing of knowledge and successful strategies for controlling the safety of such systems was emphasized as a priority for the global regulatory community.

Summary of Special Panel 2

The second segment of the Special Panel, chaired by Mr Stephen Burns, discussed challenges faced by national regulatory authorities responsible for nuclear and radiation safety, and security of radioactive sources. The panel recognized that developing and sustaining safety



infrastructure is complex and lengthy, especially for countries with limited resources or a small number of facilities. The regulatory frameworks must ensure safety and security of radioactive sources across various applications in different lifecycle stages. To address these challenges, regulators should apply risk-informed approaches to use limited resources efficiently and effectively. The panel urged regulators to leverage the expertise resident in regional leaders to provide training and technical assistance to nearby Member States. Measures should be taken to account for and prevent the loss of radioactive materials through legislation and regulations, international cooperation, and clear roles and responsibilities of all actors. Implementation of import/export control provisions remains challenging, and the importance

of risk-informed decision-making and a graded approach to regulatory control was emphasized. The IAEA is focusing on this area, but much support is still needed.

Summary of the Side Events

Side Event: Youth Panel – Young Professionals Competition



A side event for young professionals, defined for this event as up to 35 years of age, was held during the Conference to bring innovative ideas on various topics, including climate change,

regulatory strategies and programmes, decommissioning and radioactive waste management, capacity building, digitalization and innovative technologies, and regulatory communication and outreach. The IAEA received 56 synopses from 18 Member States; from these submissions, 14 were shortlisted to submit extended papers to further describe their ideas. Ultimately, the evaluation committee selected five submissions for oral presentations during the panel and four submissions for posters. The event aimed to encourage new and fresh perspectives on important topics within the nuclear industry.

During the Conference, young professionals from five IAEA Member States presented innovative ideas within regulatory frameworks for safety. A panel of experts from the IAEA, ARPANSA, U.S. NRC, and FANR asked questions and judged the presentations. Conference attendees voted through the IAEA Conference App. The votes were weighted as 60% from the floor, 20% by the judging panel, and 20% assigned earlier to the competing essays. The UAE team was declared the winner for their design of a *Nuclear Ferris Wheel Application* to modernize information sharing on nuclear safety and radiation protection; the United States of America team finished in second place and the United Kingdom team in third place. The awards were presented by IAEA DDG Ms L. Evrard and Conference Vice President Viktorsson, and Ms Evrard invited the winners to share their projects at the 67th IAEA General Conference in Vienna.

Side Event: Regulatory Consideration of Climate Change Challenges to Nuclear Installation Safety

This side event discussed the increasing threat of climate change to nuclear installation safety, noting that many incidents reported to the joint IAEA- OECD Nuclear Energy Agency International Reporting System for Operating Experience (IRS) are related to climate change scenarios such as severe weather and flooding. Some damage recorded at nuclear sites in recent years may be direct manifestations of climate change. The panel suggested using climate models to project potential climate impacts and incorporating climate projections into risk and vulnerability assessments. Robustness and resilience assessments should be used as valuable stakeholder communication tools, and periodic safety reviews should facilitate global reassessment of nuclear installation safety. The starting point for assessment of risk induced by climate change should be lessons learned from recent events, and an IAEA monitoring system with systematic event analysis and real-time alerting would provide an opportunity for international cooperation. Panellist considered the need for nuclear fleets to develop climate adaptation plans, and contingency plans supported by innovative safety assessment tools.

Closing of the Conference

At the closing session of the Conference, the President and Vice-President thanked the IAEA for planning the Conference and reiterated that this series of conferences provides a unique opportunity for regulators to collaborate and share experience on myriad challenges and on the individual and collective progress made by the nuclear regulatory community.

Special thanks were extended to IAEA DDG Evrard for her leadership as well as to Ms Anna Bradford and Mr Ronald Pacheco of the IAEA for their facilitation and leadership.

Both the President and Vice-President made clear that the collective efforts of the Programme Committee had assured a successful week.

Many individuals were named who contributed to a seamless experience throughout, including the conference services staff of both the IAEA and FANR, the IAEA administrative staff, and the U.S. NRC team working in lockstep with their IAEA and FANR peers to support the President. The President expressed his appreciation to the volunteers who had monitored the sessions and served as rapporteurs in support of the generation of the Conference Report, which would be prepared in the following weeks.

President Hanson offered his gratitude to all speakers and participants for their active engagement, questions and input on a daily basis. He thanked the poster presenters and made a point of mentioning the impressive Barakah NPP virtual reality exhibit.

Turning to the key threads and major themes of the week, the President considered they centred around four major areas:

1. Leadership
2. Organizational readiness and agility
3. Trust
4. Collaboration and capacity building

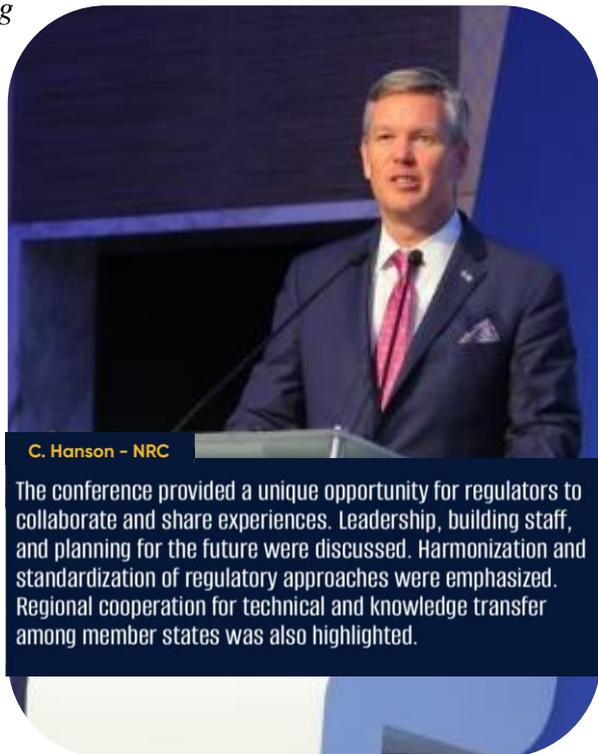
Each of these key threads would be reflected in a Call for Action by both the President and Vice-President of the Conference. The Call for Action is appended as an Annex to this report.

The Vice-President expressed that he trusted that the Conference had captured issues of importance, but to keep the momentum on these topics, its outcomes must be turned into action globally. He announced efforts to create a mechanism to track progress on Conference outcomes between now and the next conference.

The Vice-President referred to the successful youth competition conducted during the Conference and recommended that events of this kind continue.

General Observations of the President and Vice-President of the Conference

The theme of this week in Abu Dhabi, *Preparing for the Future in a Rapidly Changing Environment*, generated dynamic, lively discussions on important topics through four keynote presentations, five topical sessions and five panel discussions. Additionally, a youth side event highlighted the critical role of the younger generation of professionals and the innovative ideas they bring to the profession, while another side event on climate change addressed regulatory approaches to the impact of climate change on the resilience of existing and new nuclear power plants. A special panel on regulating modern era medical and materials facilities and applications proved of interest to the broad spectrum of participating global regulators, and finally, the Conference highlighted security, emphasising the importance of regulatory measures for prevention, detection, and response to nuclear and other radioactive material outside regulatory control.



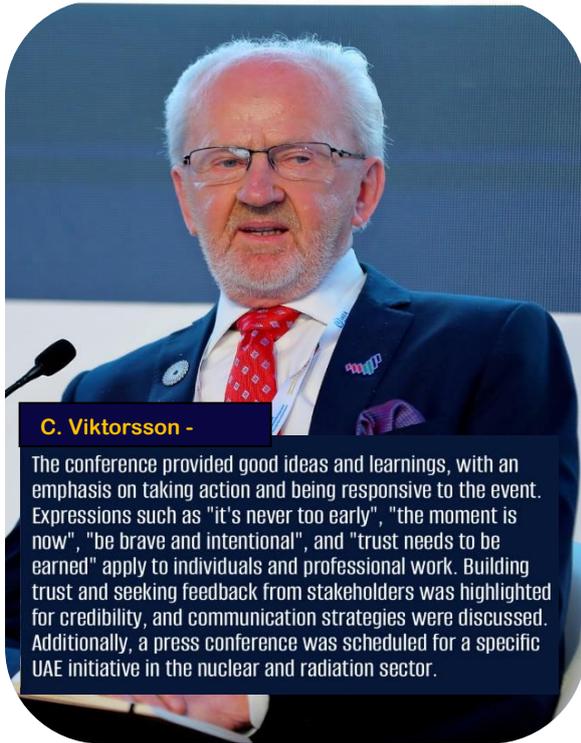
C. Hanson - NRC

The conference provided a unique opportunity for regulators to collaborate and share experiences. Leadership, building staff, and planning for the future were discussed. Harmonization and standardization of regulatory approaches were emphasized. Regional cooperation for technical and knowledge transfer among member states was also highlighted.

The Conference focussed on emerging challenges such as the safety and security of advanced reactors and new technologies, the full lifecycle challenges of nuclear and non-nuclear applications, ensuring regulatory agility and resilience and being prepared for the unexpected, information sharing, transparency and international cooperation in the event of nuclear or radiological emergencies and capacity building.

The Conference stressed the need to use regulatory experience gained from successfully managing the COVID-19 pandemic to improve preparedness for other unprecedented and immediate threats, such as civil unrest or armed conflict in the vicinity of nuclear facilities.

The pandemic has caused Member States to adopt new ways of working to maintain the safe, secure and reliable operation of nuclear and radiation facilities and activities. Additionally, the unprecedented situation in Ukraine, in which an armed conflict threatens the nuclear safety and security of a nuclear power plant and the safety of its operating staff, has led regulators to assess how this affects their planning and legislative frameworks and to confront the operational limits on their capability to regulate safety and security. All these issues were at the forefront of discussion at this Conference, which had been convened at the beginning of the post-Fukushima decade, with the current situation highlighting that the effectiveness of a common, sometimes global response to crises lies in sustaining our commitment to international cooperation.



C. Viktorsson -

The conference provided good ideas and learnings, with an emphasis on taking action and being responsive to the event. Expressions such as "it's never too early", "the moment is now", "be brave and intentional", and "trust needs to be earned" apply to individuals and professional work. Building trust and seeking feedback from stakeholders was highlighted for credibility, and communication strategies were discussed. Additionally, a press conference was scheduled for a specific UAE initiative in the nuclear and radiation sector.

At a more technical level, the current energy crisis gave cause for discussion about States' ongoing capacity to achieve a balance between electricity production and consumption. This raised issues such as increased enthusiasm for embarking on nuclear power programmes; extended plant operating lifetimes and reviews of planned closure dates for operating NPPs together with a trend towards turnkey facilities such as SMRs. At the same time, concern was expressed about undue pressure on nuclear stakeholders including the regulators, who must keep safety at the forefront.

In all the above respects, the President and Vice-President concluded that significant political decisions may need to be made, but noted that this Conference has demonstrated that opportunities exist – to reinforce international cooperation; to develop joint approaches to regulatory functions and activities;

to cooperate on safety assessments; and to enhance global harmonization – while employing global best regulatory practices, particularly with regard to early engagement of regulatory bodies in design development of new technologies.

Issues to be considered by the regulatory body

Regulators globally must 'expect the unexpected' and develop regulatory strategies to keep ahead of emerging threats in a rapidly changing environment, such as cyber-security and potential risks associated with unmanned aerial vehicles, economic uncertainty, armed conflict or civil unrest. New and evolving threats reinforce the need to review regulatory frameworks and activities to assure resilience and continuing oversight of safety and security in similar circumstances.

Regulators should consider the strategies and resources needed to respond to new regulated technologies in an era of rapid development in nuclear reactors and extended operating life of existing plant and waste management facilities. In addition, techniques for effective assessment and regulation of new technologies must be developed and maintained in a period of rapid development both in the field of nuclear power and the medical and industrial environments. In this regard, forward planning and workload forecasting are of great importance to regulatory bodies to ensure that the appropriate resources and capabilities are maintained for future needs.

On the topic of climate change new regulatory strategies are needed to ensure resilience of existing and new nuclear installations and radiation facilities together with enhanced efforts to monitor the external environment to prepare for future energy, industrial, and healthcare demands arising from climate change.

Regulators should make use of risk insights and research and development, together with information technology for greater connectivity and give consideration to the potential benefits of AI and other technologies to fulfil the functions of the regulatory body.

Acquiring and sustaining competences for managing this digital transformation, and increasing the use of AI and cyber-security should be planned and resourced in order to assure the regulatory capacity to deliver timely, effective and appropriate regulatory responses in an environment of rapid electronic communications, media disinformation and digitization.

The Conference addressed the challenge of stakeholder involvement in nuclear and radiation applications and the necessity for regulators to build good relationships based on trust and transparency. This aspect of good regulatory practice must continue to be enhanced in the current environment and focusses regulators globally on international cooperation and harmonization of regulatory activities in the face of fast-changing technologies, social and political circumstances. In this respect, regulatory programme effectiveness and credibility can be enhanced through self-assessment and peer reviews.

Maintaining a safety and security culture is fundamental. Leadership in this respect is essential both for regulators and regulated facilities and activities. In addition, safety and security culture should be instilled in the new generation of professionals through capacity building programmes.



Issues to be considered by governments

The energy crisis challenges nations' ongoing capacity to achieve a balance between electricity production and consumption. In response, governments may consider new nuclear power programmes or reviews of planned closures. At the same time there is growing demand globally for medical and industrial radiological applications. However, significantly enhanced resources will be needed to maintain regulatory effectiveness, particularly where new and innovative technologies such as SMRs are being considered.

In this environment, assuring the continued independence of regulatory decision-making is essential, especially after revision of nuclear plant closure dates and the increasing trend towards new and expanding projects in nuclear and radiation applications.

In the light of recent global crises, governments should consider enhancing their promotion and resourcing of national programmes for capacity building to ensure the ongoing capacity of national regulators to ensure the safety and security of nuclear facilities, materials and radioactive sources.

Governments should give priority to the coordination of activities of all national bodies with interfacing and overlapping regulatory responsibilities, including for emergency preparedness and response.

Issues to be considered by international organizations

International organizations should consider the following:

- The need to strengthen international cooperation, knowledge transfer, mutual learning and efficient networking in particular, through regional networks;
- Increased and coordinated international cooperation to develop resilience of the nuclear and radiological sector through cooperation of regulators and industry at regional and global level;
- Support for regulatory strategies for managing the unexpected, and increasing regulatory agility, adaptability and resilience;
- Support for leadership for nuclear and radiation safety and security together with safety and security culture, especially when developing the new generation of professionals;
- Support for diversity and gender balance in the regulatory workforce and the need to fully prepare and empower a new generation of leadership;
- The need to maintain effective and agile emergency preparedness and response programmes, with modernization options such as regulatory utilization of emerging technologies, timely coordination with off-site competent authorities and responders, effective coordination with neighbouring countries, international and regional organizations and jurisdictions, and communication with the public;
- How international peer review and advisory services can contribute to trust and transparency in addressing regulatory challenges.

Conclusions for the Conference as a whole

Since the previous conference in The Hague in 2019, regulatory frameworks and infrastructure have continued to improve, but in the same period, regulators globally have been faced with unprecedented challenges including the COVID-19 pandemic, climate change and the energy crisis, compounded in some regions by armed conflict, which additionally has added risks to some nuclear and radiological facilities and activities to an extent never before experienced.

There is a realisation that stability is a tenuous concept and regulators (and operators by requirement) must be ready for the unexpected. Agility and flexibility are keywords of this Conference and apply also to the regulatory capacity to maintain oversight and control of rapidly developing new technologies as they are deployed across the spectrum of regulated nuclear and radiation practices, facilities and activities.

This Conference has shown that global coordination and cooperation are the key to so many of the challenges facing regulators today. This Conference has urged the global nuclear community to engage in international cooperation efforts to accelerate regulatory progress through harmonization and to gather best practices to be applied to a coordinated approach to the safety of nuclear and radiation facilities and activities and security.

Annex

Call for Actions by the President and Vice-President of the Conference

- **Leadership:** invest in people skills and capabilities, develop the next generation, be brave and intentional:
 - Define the traits needed for regulatory leaders and take concrete actions to train and empower them so they can drive our regulatory missions forward in changing environments.
 - Integrate young professionals into regulatory bodies, provide structured learning and support programmes for career advancement, and ensure that diverse viewpoints and backgrounds are incorporated in decision-making.
 - Make regulatory decisions in an effective and efficient manner. Uphold a strong safety and security focus while striving to not impede progress.
- **Organizational Readiness and Agility:** use proactive planning frameworks and adaptive management techniques to assess the environment, plan for the future, and address the unexpected :
 - Adopt comprehensive strategic planning and workload forecasting methods for the planning and prioritization of regulatory activities and initiatives; revisit assumptions on a routine periodicity (e.g., yearly) to assess the need for changes. Seek early engagement with designers and industry to understand planned technology adoption and deployment as a means to inform regulatory priorities.
 - To be prepared to address new challenges, evolving threats, and unprecedented stressors on safe operation of facilities, establish a risk-informed strategy that fosters continued safety and security – leverage international partners as needed for support and benchmarking, and share feedback from experiences to elevate global safety and security.
 - Start with the end in mind. Incorporate security by design for small modular reactors and advanced reactor designs. Consider facility lifecycle at the design and authorization stages and have clear responsibilities and frameworks for ageing management and waste disposal. Develop and enhance international and domestic regulatory frameworks for source management and disposal, to include safety standards, security practices, and liability guidelines.
- **Trust:** demonstrate competence, openness, and impartiality:
 - Prioritize actions that engender trust between the regulator, the regulated community and members of the public.
 - Meaningful communication and engagement with the public on policy and oversight activities should be tailored to specific communities through appropriate media and direct engagement.
 - Demonstrate reliability and credibility by re-evaluating safety and security legislation, regulations and regulatory approaches to ensure they remain effective

and valid to ensure that guidance is easily understood. If gaps exist, create a plan to close them, leveraging expertise and model frameworks from regulators, technical support organizations, or other relevant resources.

- **Collaboration and capacity building:** accelerate progress by engaging in joint reviews (harmonization), region-focused capacity building and sharing of best practices:
 - Transition to a global mindset. Invest in harmonization of regulatory approaches and incentivize standardization of small reactor designs as a means to maintain a high level of safety and security, leverage collective technical expertise, and achieve timely and consistent authorization decisions.
 - Leverage regional cooperation for training, technical assistance and knowledge transfer among Member States to build regulatory competence and stakeholder confidence in the licensing and oversight of peaceful uses of nuclear and radioactive materials.

- **Recommendations for Moving Forward**
 - Create a method to track progress between now and next conference.
 - Encourage bilateral and multilateral exchanges on design and technical / regulatory matters and make the fruits of these exchanges well known to the public. Bilateral and multilateral technical exchanges, using the Regional Networks, Global Nuclear Safety and Security Networks as well as national efforts are and should be augmented. For instance, by the activities of a variety of international enterprises that facilitate nuclear and radiation safety -- intergovernmental organizations, multinational networks among operators, multinational networks among regulators, the international nuclear industry, multinational networks among scientists, and other stakeholders (public, news media, NGOs) that are engaged in nuclear safety. All these efforts should be harnessed to enhance the achievement of safe and security goals.
 - Accelerate opportunities for youth to engage with experienced regulatory communities (e.g., have the winner of the youth competition present progress from youth competition at next General Conference, and integrate a young professional on the next planning committee).
 - Challenge ourselves to be stewards of these recommendations.