

Title: The Future of Nuclear Security - Finding Synergies in all the Right Places

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Abstract

Discussion on evolving developments in science and technology and potential impacts on international security, and the lowering of barriers for non-state actors to gain access to materials and manufacturing techniques for the development and use weapons of mass destruction were at the core of 2022 Comprehensive Review of the Status of Implementation of Resolution 1540. While nuclear security accomplishments to date have made great strides in meeting the non-state actor threat, more work needs to be done to identify methodologies that prevent and respond to non-state actor acquisition and use of nuclear and radioactive materials.

Due to the changing set political and financial challenges faced by the global nuclear non-proliferation and counter-terrorism community, the need for innovation to stay ‘one step ahead’ of determined adversaries who threaten nuclear security around the world has never been greater. While many will argue that accomplishments of the past decades have adequately addressed nuclear security threats, the fact remains that there are existing and developing gaps within the global nuclear security architecture. International practitioners must become nimbler in their approach to continue the evolution of an effective and enduring global nuclear security system. It is critical to identify mechanisms to continue to address outstanding commitments, preserve gains already achieved, continue to reinforce the basis for nuclear security and incentivize national implementation.

This paper provides an overview of three synergistic approaches nuclear security practitioners should consider in addressing existing and developing gaps within the global nuclear security infrastructure:

1. Development of stronger engagement with industry through value-based incentives to ensure that nuclear security is not creating an undue burden on commercial operation and thus ensuring greater adherence to international good practices;
2. Identification and deepening of collaborative relationships with nuclear safety and safeguards practitioners, in particular those focusing on operations, equipment and human resource development; and
3. Universalization of and demonstration of compliance with the international nuclear counter-terrorism and nonproliferation legal framework (e.g. International Convention for the Suppression of Acts of Nuclear Terrorism) through implementation of complementary nuclear security capacities (e.g. nuclear forensics).

Introduction

The threat of non-state actors gaining access to materials and manufacturing techniques for the development and use of weapons of mass destruction has reemerged a pressing concern for the global community. Discussion on evolving developments in science and technology, potential impacts on international security, and lowered barriers for non-state actors to gain access to materials and manufacturing techniques for the development and use weapons of mass destruction were at the core of 2022 Comprehensive Review of the Status of Implementation of Resolution 1540. The review emphasized the need to identify methodologies that prevent and respond to non-state actor acquisition and use of these materials.

Despite significant strides in nuclear security, more work needs to be done to prevent and respond to non-state actor acquisition and use of nuclear and radioactive materials. The political and financial challenges faced by the global nuclear non-proliferation, nuclear security and counter-terrorism community necessitate innovation to stay one step ahead of determined adversaries.

This paper provides an overview of three synergistic approaches nuclear security practitioners should consider in addressing existing and developing gaps within the global nuclear security infrastructure:

1. Development of stronger engagement with industry through value-based incentives to ensure that nuclear security is not creating an undue burden on commercial operation and thus ensuring greater adherence to international good practices;
2. Identification and deepening of collaborative relationships with nuclear safety and safeguards practitioners, in particular those focusing on operations, equipment and human resource development; and
3. Universalization of and demonstration of compliance with the international nuclear counter-terrorism and nonproliferation legal framework (e.g. Convention on the Physical Protection of Nuclear Material and the Amendment to the Convention on the Physical Protection of Nuclear Material, and International Convention for the Suppression of Acts of Nuclear Terrorism) through implementation of complementary nuclear security capacities (e.g. nuclear forensics).

Approach 1: Development of Stronger Engagement with Industry

Developing stronger engagement with the nuclear industry is at the forefront of ensuring long-term nuclear security sustainability. One of the primary challenges facing nuclear security practitioners is striking a balance between effective nuclear security and not creating an undue burden on commercial operation. Nuclear power plants and other nuclear facilities require significant investment and have long operating lives, making their success critical to continued development of the energy sector. However, security concerns can significantly impact on facility construction and associated costs, and the industry's ability to operate efficiently and effectively. Nuclear security requirements should not compromise commercial operations' efficiency, and this requires close collaboration with industry stakeholders.

Nuclear security practitioners should work to build and deepen partnerships with industry stakeholders to ensure that security measures are not overly burdensome and that security concerns are adequately addressed. The development of stronger engagement with industry through value-based incentives can ensure that nuclear security is not creating an undue burden on commercial operation. Further, the development of a value-based incentive system ensures and incentivizes industry adherence to international good practices.

Some value-based incentives to consider include regular consultations and engagement with national industry representatives, and international industry or non-governmental associations (e.g. World Association of Nuclear Operators or WANO, and World Institute for Nuclear Security or WINS), and working with international insurance companies to integrate nuclear security norms into insurance premiums and incentivize coverage in line with the status of national- and facility-level adherence to international good practices.

Nuclear security practitioners should work with national industry representatives and international industry associations to identify areas where industry can contribute to the development and implementation of effective nuclear security practices. While WANO does not have a mission regarding nuclear security, WANO networks and methodologies used for nuclear safety could be leveraged to exchange best practices and lessons learned for nuclear security. Engagement between WANO and WINS to exchange “best practices that could be applied to corporate review of security management, assess security culture and help organisations identify areas where management attention is needed”¹ is ongoing but further development and deepening of relationships between industry actors is needed. Industry engagement should involve more regular consultations and engagement between industry leaders to discuss nuclear security challenges and how best to mitigate them. This would enable the industry to share its expertise and experience in implementing nuclear security mitigation and response measures, and assist in the development and iteration of practical and effective security measures.

This approach will ensure that industry stakeholders have a better understanding of nuclear security concerns and develop better ways of addressing them at the operational level. Furthermore, partnerships between nuclear security practitioners and industry stakeholders could lead to the development of innovative security solutions that address the unique challenges faced by each facility. For example, industry players can inform the development of better and less intrusive detection systems that can detect and respond to unauthorized access to nuclear facilities or materials.

Given the potential risks and liabilities associated with nuclear power, insurance for onsite operations of nuclear facilities is often required by governments and regulatory agencies as a condition of operating the facility in question. Offsite risks and impacts are covered by a different form of liability insurance. This helps to ensure that businesses and organizations in the nuclear sector have the financial resources necessary to respond to a nuclear incident and to compensate, in line with requirements, those who may be affected by a nuclear security event. This type of insurance is generally offered through nuclear insurance pools (i.e. grouping of insurers who jointly insure a particular risk or class of business) that have the expertise and resources to assess and manage the risks associated with the nuclear industry. This type of insurance covers a range of risks associated with nuclear power plants and other nuclear facilities, including accidents, sabotage, terrorism and other events that could result in property damage, personal injury and environmental contamination. It is important to note, that damage as a result of war, is not covered through these

insurance schemes. Insurance pools work closely with nuclear power plant operators, governments and other stakeholders to develop customized insurance policies that meet the unique needs and requirements of each client.

One potential value-based incentive that could be implemented is to develop and utilize a system of nuclear security ratings to rank countries and facilities based on their level of adherence to international legal instruments, international guidance (e.g. IAEA Code of Conduct on the Safety and Security of Radioactive Sources and IAEA Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Revision 5)) and security standards. Such a system has been developed by the Nuclear Threat Initiative and could be leveraged by insurance pools in assessing insurance premiums and right sizing them to associated risk. This approach would create a competitive market that incentivizes the adoption of security best practices, ultimately leading to better security outcomes.

Approach 2: Deepening Collaborative Relationships with Nuclear Safety and Safeguards Practitioners

While nuclear security, safeguards and safety are inextricably linked at the facility and operational level, there is often a divide between international and national policy- and technical-level practitioners. Increased collaboration with nuclear safeguards and safety practitioners, particularly those focusing on operations, equipment and human resource development, can help address gaps within the global nuclear security infrastructure. By developing closer working relationships with their safeguards and safety colleagues, nuclear security practitioners can gain a better understanding of how safeguards and safety measures are integrated into the design, construction and operation of nuclear facilities, and dovetail security measures on those, thus facilitating inclusion of those measures without creating undue burden.

Further, collaboration between security, safeguards and safety practitioners can help ensure that nuclear materials are adequately protected throughout the entire nuclear fuel cycle. Safeguards practitioners are responsible for ensuring that nuclear materials are not diverted from peaceful uses, and their expertise and methodologies can be leveraged to improve the security of these materials, for example by leveraging nuclear material accounting and control systems for the purposes of national nuclear forensics libraries. Deepening these relationships will require a concerted effort from all parties involved. This can be achieved through regular consultations and joint training programs.

Regular consultations, through joint working groups on nuclear security, safety and safeguards, would facilitate the exchange of information and best practices between the different disciplines. This would enable the development of a more coordinated and effective approach to nuclear security, safety and safeguards. There are existing efforts (e.g. the IAEA Global Nuclear Safety and Security Network or GNSSN) to better harmonize and share safety and security knowledge and good practices but additional efforts should be taken to further integrate safeguards best practices and tools. Currently, the GNSSN works to “[enable and support] interaction and collaboration between organizations and subject matter experts; and [establish] a capacity building framework to support the national nuclear safety and security infrastructure in IAEA Member States.” Additional, discussions and debate should occur to add another ‘S’ to this network and expand the scope to include safeguards and create a holistic ‘3S approach’.

Whereas international assistance providers often provide separate security, safeguards and safety human resource development and training programs, operators at the national level often have responsibility for two or three of these disciplines. Nuclear security practitioners should work with nuclear safety and safeguards practitioners to develop joint international human resource development and training programs that focus on the integration of security, safeguards and safety measures. Joint international human resource development and training programs would allow nuclear security practitioners to learn from the experience of their counterparts in nuclear safety and safeguards, and vice versa. Joint training exercises can help to identify gaps in the security infrastructure and develop better ways of addressing them. Joint training would enable the development of a more comprehensive approach and further, allow for human resource development to be better integrated at the national level and not create and undue human resource development challenges at operational-level.

Collaborative relationships with nuclear safety and safeguards practitioners can help to address existing and developing gaps within the global nuclear security infrastructure. This is because nuclear safety and safeguards are essential components of nuclear security. Therefore, the identification and deepening of these relationships are vital to achieving a more comprehensive approach to nuclear security. Through their operational experiences, nuclear safeguards and safety practitioners can help identify vulnerabilities in nuclear facilities, which can then be addressed by nuclear security practitioners. For example by identifying potential pathways that material could fall out of regulatory control, safeguards and safety practitioners can help inform security practitioners approaches to countering illicit trafficking of nuclear materials at facilities and in transport.

Nuclear security, safeguards and safety practitioners should work together to develop common standards and practices for operations, equipment and human resource development that can be implemented across the nuclear industry to improve overall security outcomes.

Approach 3: Universalization of and Demonstration of Compliance with the International Nuclear Counter-Terrorism and Nonproliferation Legal Framework

The universalization and demonstration of compliance with the international nuclear counter-terrorism legal framework is an essential component of the global nuclear security architecture. This framework is made up of seven international legal instruments but at its core consists of instruments under the auspices of the IAEA – the 1980 Convention on the Physical Protection of Nuclear Material (CPPNM) and the 2005 Amendment to the Convention on the Physical Protection of Nuclear Material (A/CPPNM) – and the United Nations - 2005 the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT). This legal framework provides the basis for the development of effective nuclear security measures but what those measures are is at times not clearly understood by state signatories.

With no definitive set of nuclear security standards and capacities but rather abstract language in the A/CPPNM requiring ‘reasonable and practicable’ implementation of the Convention’s provisions – signatories are left to interpret how implement requirements when enacting legislative, administrative and technical measures laid out in the Convention, and are often left asking questions on what the best way to implement the provisions of the Convention. Further technical guidance to assist states in universalizing and demonstrating compliance with the international nuclear counter-terrorism legal framework is needed. One method the international community can leverage to help

states is supporting states in implementing the A/CPPNM and the other portions of the international nuclear counter-terrorism legal framework is supporting nuclear forensics capacity building.

Developing national nuclear forensics capacities offers States a valuable means by which they can implement national nuclear security laws and meet their responsibilities under CPPNM/ACPPNM and ICSANT. Nuclear forensics, in support of a national response plan and measures to prevent, detect and respond to nuclear or other radioactive material out of regulatory control, provides technical information and creates a context by which law enforcement and nuclear security investigators can understand the nature of a nuclear security incident involving nuclear and other radioactive material out of regulatory control, and provides a context by which a state can take legal and administrative actions in line with national laws and regulations, and international legal instruments.

The implementation of nuclear forensics capacities supports key provisions of CPPNM/ACPPNM and ICSANT. Specifically, nuclear forensics provides a technical and empirically informed basis by which investigators can understand whether domestic laws or regulations have been violated and punish criminal acts related to those offenses - CPPNM/ACPPNM Article 7 / ICSANT Articles 2 and 5. It enables administrative and procedural actions related to the violations of domestic laws and regulations such as exercising jurisdiction - CPPNM/ACPPNM Article 8 / ICSANT Article 9 - and prosecuting or extraditing alleged offenders - CPPNM/ACPPNM Articles 9-11 / ICSANT Article 11.

Being part of a State's nuclear security architecture and given its key role in combatting nuclear and other radioactive material out of regulatory control and associated threats, nuclear forensics supports the implementation of national laws and statutes, and international legal instruments, including requirements to criminalize under domestic law offenses related to the misuse of nuclear and other radioactive material; exercise jurisdiction over alleged offenses; prosecute or extradite alleged offenders; provide legal co-operation or assistance; share investigative and prosecutorial information; and return illegal obtained nuclear and other radioactive materials.

Conclusion

In conclusion, the evolving developments in science and technology have brought about significant challenges in the global nuclear security infrastructure. Non-state actors gaining access to weapons of mass destruction is a potential threat to international security. Nuclear security practitioners need to adopt a nimbler approach to continue the evolution of an effective and enduring global nuclear security system. The three synergistic approaches outlined in this paper - development of stronger engagement with industry, deepening collaborative relationships between nuclear security, safeguards and safety practitioners, and universalization of and demonstration of compliance with the international nuclear counter-terrorism – provide a for immediate actionable basis for increasing global and national nuclear security capacities.

In addition to the three synergistic approaches outlined in the paper, there are other longer-term areas where the international community can take action to strengthen nuclear security. These include:

1. Investing in research and development to develop new technologies and techniques for nuclear security;
2. Enhancing international cooperation and coordination on nuclear security; and
3. Raising public awareness of the nuclear security threat and engagement with civil society groups on the importance of nuclear security measures.

By taking the steps outlined in this paper, the international community can help to make the world a safer place by preventing the proliferation of nuclear weapons and materials.

References

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