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Paper No. 6029 IAEA Practical Approach to Security of Nuclear and other Radioactive Material in Transport

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Introduction

All Member States with nuclear power programs or research reactors possess nuclear material and virtually all Member States possess and use other radioactive material, e.g. radioactive sources for medical, industrial and other non-nuclear applications. During the life-cycle of these materials, safe and security transport is required. With several million shipments of nuclear and other radioactive materials taking place all over the world every year, security during transport is one of the most complex aspects of physical protection. Transport of these materials takes place in the public domain outside of secured facilities, often involves international transfers and multiple national and international stakeholders, and results in multiple security interfaces that must function seamlessly for continuous security.

In recent years, perception of the risk involved in transporting nuclear and other radioactive material has shifted emphasis from a safety-based approach to recognizing the need to also address security as a priority. It is important to recognize Member States' needs for assistance and guidance on how to develop an effective and efficient security regime for transport of these materials. The IAEA's transport security program assists Member States, upon request, in strengthening transport security arrangements through practical implementation of the necessary recommendations into their national frameworks.

Practical Approach to Transport Security

The IAEA practical approach for security in transport includes several areas, with its foundations building from the IAEA Nuclear Security Series recommendations and guidance publications. These publications assist Member States to develop, implement, and maintain their nuclear security regime from a top down approach by providing security fundamentals, recommendations, and implementing and technical guidance. Transport security training courses and workshops also provide support to Member States to raise awareness of the need for security in transport. The increased awareness and fundamental skills acquired enable Member States to effectively develop and implement transport security frameworks by targeting policy makers, regulators, shippers, carriers, law enforcement and other organizations and stakeholders. Practical activities take the form of model exercises to assist Member States to apply IAEA recommendations on security in transport. These exercises

support the training, validation and enhancement of many areas of the security regime in an efficient and effective manner. Other areas of support include expert and assessment missions, technical meetings, and coordinated research projects (CRPs).

Recommendations and Guidance Documents

Nuclear security issues relating to the prevention and detection of, and response to, theft, sabotage, unauthorized access and illegal transfer or other malicious acts involving nuclear material and other radioactive substances and their associated facilities are addressed in the IAEA Nuclear Security Series (NSS) publications. These publications are consistent with, and complement, international nuclear security instruments such as the Convention on the Physical Protection of Nuclear Material[1] and its Amendment[2], the Code of Conduct on the Safety and Security of Radioactive Sources and its Supplementary Guidance on the Import and Export of Radioactive Sources[3], the United Nations Security Council resolutions 1373[4] and 15405 and the International Convention for the Suppression of Acts of Nuclear Terrorism[6].

Publications in the IAEA Nuclear Security Series are issued in the following categories:

- **Nuclear Security Fundamentals** specify the objective of a State's nuclear security regime and the essential elements of such a regime. These provide the basis for the Nuclear Security Recommendations.
- **Nuclear Security Recommendations** publications set out measures that States should take to achieve and maintain an effective national nuclear security regime consistent with the Fundamentals.
- **Implementing Guides** provide guidance on means by which States could implement the measures set out in the Recommendations. As such, they focus on how to meet the Recommendations relating to broad areas of nuclear security.
- **Technical Guidance** publications provide guidance on specific technical subjects to supplement the guidance set out in Implementing Guides. As such, they focus on details of how to carry out the necessary measures.

The IAEA transport security program is built from an underlying set of supporting fundamentals, recommendations, and guidance documents. The NSS documents which support transport security are as follows:

- NSS No. 20, “Objective and Essential Elements of a State’s Nuclear Security Regime[7],”
- NSS No. 13, “Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225 Revision 5)[8],”
- NSS No. 14, “Nuclear Security Recommendations on Radioactive Material and Associated Facilities[9],”
- NSS No. 15, “Nuclear Security Systems and Measures for Nuclear and Other Radioactive Material out of Regulatory Control[10],”

- NSS No. 26-G, "Security of Nuclear Material in Transport[11]"
- NSS No. 9, "Security in the Transport of Radioactive Material[12]" (under revision)
- NST 053, "Security of Nuclear and Other Radioactive Material in Transport" (not yet published; in development)

Radioactive Material Implementing Guidance

NSS No. 9 is the implementing guide which supplements the recommendations found in NSS No. 14; it speaks directly to the security of radioactive material in transport. The guidance within applies to all radioactive material, including the radioactive properties of nuclear material.

Its intent is to provide States with a uniform and consistent approach to ensuring security during transport; guidance on how a State can implement and enhance a sound security regime, and guidance on how operators can implement a sound system to protect radioactive material during transport.

Its purpose is to ensure protection of shipments of radioactive material against theft, sabotage, and malicious acts by:

- Providing a uniform and consistent approach to security in transport for both States and Operators;
- Providing security measures for transport of all types of radioactive material;
- Includes nuclear material (Convention on the Physical Protection of Nuclear Material and Nuclear Facilities);
- Establishing a graded approach based on activity levels in a package; and
- Emphasizing stronger security for those quantities of radioactive material that could pose a significant radiological hazard

NSS No. 9, published in 2008, is currently undergoing revision and is expected to be published in the 2017-2018. It will contain the latest internationally developed guidance on transport security, including guidance on the State nuclear security regime, characterization of radioactive material for transport security, establishing regulatory programs, security measures to protect against unauthorized removal and sabotage of radioactive material in transport, measures to locate and recover radioactive material missing or stolen during transport, setting security levels, transport security plan, and transport security verification.

Nuclear Material Implementing Guidance

NSS No. 26-G, recently published in 2015, covers security of nuclear material during transport. The objective of this publication is to provide guidance to States and their competent authorities on how to implement and maintain a physical protection regime for the transport of nuclear material. It applies to the physical protection of nuclear material in transport and provides guidance against three types of malicious act:

- Unauthorized removal with the intent to construct a nuclear explosive device;

- Unauthorized removal which could lead to subsequent dispersal; and
- Sabotage.

Technical Guidance Development

The IAEA is also developing technical guidance on transport security to support practical implementation in Member States that covers nuclear and other radioactive material. The draft text is currently under development and publication is planned for late 2018 or 2019.

The technical guidance includes the following transport security topics:

- Overview of nuclear and radioactive material categorization;
- Establishing transport security regulations and requirements;
- Design, evaluation, and implementation of a transport physical protection system;
- Development, implementation, and evaluation of a transport security plan;
- International, safety, and response interfaces with security; and
- Material categorization and security measures for nuclear and radioactive material.

International Transport Security Meetings

The IAEA transport security program gets input and direction from Member States in a variety of ways. This may come in the form of official correspondence, bilateral meeting, the annual General Conference, Nuclear Security Conference, or other avenues. One typical method is through technical meetings, which bring together a large group of Member States to discuss recent work in the field of transport security and to help direct the transport security program's work and activities.

A technical meeting was held in June 2014 to garner input from Member States for further development and improvement of the IAEA transport security program. The technical meeting also served to identify Member States' needs specific to transport security. All transport security stakeholders were invited. Almost 70 participants from 44 Member States and international organizations, representing ministries, government agencies, regulatory authorities, transport industry, including shippers, carriers, receivers, freight forwarders, law enforcement agencies, and security technology providers were in attendance. The technical meeting recommended the IAEA continue and, if possible, increase its transport security activities, including providing regular opportunities for Member State interactions and to include government agencies, transport industry, and security technology providers in future activities in order to foster mutual understanding and develop effective solutions to transport security issues.

A technical meeting on nuclear and radioactive material transport security was held in July 2016 to promote effective security in transport of nuclear and other radioactive material worldwide. The 2016 technical meeting saw some growth over the 2014 meeting. All relevant stakeholders were once again invited. The overall objective was similar to the previous meeting. Member States encouraged the transport security program to seek a better

understanding of the interface between transport security and transport safety and build on the regional network model.

Coordination between Safety and Security

A major priority for many years in transport has been the interface between transport security and transport safety. Several things have been done to address this. Contacts have been established with several safety-based organizations, including the UN (United Nations) Committee of Experts, UN Economic Commission of Europe (UNECE), International Civil Aviation Organization (ICAO) and International Maritime Organization (IMO). In early 2015, a meeting with relevant international organizations took place to discuss the safety/security interface.

Also in 2015, the IAEA Senior Transport Security Technical Officer at the time met with the Inter-IAEA Group (IAG) to discuss how to ensure consistency with the latest IAEA nuclear security recommendations and guidance and how to more fully incorporate the recommendations into the other international instruments. The IAG meets regularly to discuss coordination between IAEA transport safety requirements and the UN Model Regulations and modal requirements, and this was the first time security topics were discussed in depth. The conclusion from the IAG meeting was that there are opportunities to facilitate wider application of the IAEA transport security recommendations and guidance for nuclear and other radioactive material.

Continued close cooperation with safety-based international organizations is continuing and is planned to continue for many years.

Nuclear Security Support Centres (NCCSs) and Regional Approach

The transport security program is exploring the possibilities of having NSSC's deliver standard/basic transport security training courses based on the IAEA training material, (modules and exercise workshops). NSSC's in the different geographic regions are being identified and approached to discuss how this best can be achieved. The technical meeting in June 2014 recommended that the IAEA should:

- Seek cooperation with Nuclear Security Support Centers (NSSC's) and Centers of Excellence to provide standardized transport security training;
- Organize regional train the trainer courses to ensure necessary availability of qualified lecturers; and
- Consider developing a transport security regional approach, to strengthen regional cooperation and capabilities, in line with the existing transport safety regional approach.

In following with the regional approach, discussions are currently being held with the transport safety unit to build security into existing regional networks in line with recommendations from the 2014 and 2016 technical meetings. This approach allows

Member States to identify regional challenges and formulate plans to tackle these challenges utilizing strengths found within the region. The IAEA would assist through providing capacity building materials such as training courses, however the expertise would be found within the region. This approach encourages an inward looking approach where support is found from a collection of Member States rather than a select few experts.

Training Courses and Workshops

The IAEA has continued to organize and deliver transport security training courses and workshops. The two training courses for security of nuclear material in transport and security of radioactive material in transport are complementary and address the fissile and radioactive properties respectively.

Each training course is offered for one week and is taught through a selection of expert and participant lectures, group discussions, and exercises. Each training course is taught to either a national, regional, or international audience, and several courses are held. Member States may request training courses (and other activities) through a variety of mechanisms, such as official letters, Integrated Nuclear Security Support Plans (INSSPs), and bilateral meetings.

Nominally, each year the IAEA offers one international training course (ITC), 2-3 regional training courses (RTCs), and several national training courses (NTCs).

The training course for security of nuclear material in transport was recently updated to align with the new implementing guidance found in the recently published NS No. 26-G and revised in order to:

- be more practical;
- better encourage discussions between participants;
- encourage participation of all relevant transport security stakeholders (e.g., ministries, regulatory authorities shippers, carriers, receivers customs, officials and law enforcement agencies);
- involve expert lecturers with both regulatory and industry expertise;
- make full use of related IAEA education products, such as textbook and course content.

Following the publication of the revised NSS No.9 there will be a need to revise the training material on security of radioactive material in transport.

Specific material to be used in national workshops on security in transport of nuclear and/or radioactive material needs be developed, including a template agenda that can be adjusted to the need of a specific Member State's requests. A pilot national workshop was held in Slovakia in January 2015. Workshop material also needs to be developed on the practical implementation of transport security measures, including on how to develop and review a transport security plan (TSP). The Agency has been encouraged by its MS to also develop a transport security workshop which focuses on operators and carriers. In general, workshops

and exercises would meet this request. A pilot of this workshop was held in Burkina Faso in May 2015.

The IAEA is currently considering the standardization of a transport security and transport safety workshop to be provided to regulatory and operators from both security and safety areas. This considering is borne from strong encouragement from MS during the 2014 and 2016 technical meetings.

Exercises

Exercise Guide

A transport security exercise guide has been developed and is in the beginning stages of publication as of late 2016. The work took place over four consultancy meetings from 2014 to 2015. The work was presented at the 2014 technical meeting and once again at the 2016 technical meeting and the meetings strongly encouraged the IAEA to continue to develop transport security model exercises. The exercise guide includes planning worksheets for three types of model exercises:

1. Table top exercise to test and evaluate roles and responsibilities of organizations and agencies involved in security of nuclear and radioactive material in transport.
2. Table top exercise to validate the provisions of a transport security plan, to check if planned security measures provide the intended level of protection against an attempted unauthorized removal of nuclear material (theft).
3. Field exercise (partial scale) to evaluate the response to an attempted unauthorized removal of nuclear or radioactive material (theft).

It should be noted that the guide is relevant to all IAEA Member States, not only those where nuclear material is present. The applications where radioactive material is used are different from and involve other entities than those for nuclear material, but the level of security maturity is lower in some Member States and the need for awareness raising activities is high. Therefore, the model exercises are tailored to transport of both nuclear material and radioactive sources. The intention is to make the guide available for Member States to use and as a tool for the IAEA to assist Member States to organize and conduct transport security exercises.

Pilot National and Regional Exercises

The Swedish regulatory authority, SSM, and the Swedish Nuclear Fuel and Waste Management Company (SKB) together with other national authorities hosted a pilot table top exercise to test the draft exercise guide in February 2015. It was followed by a pilot field exercise on May 2015. 20 international experts from 13 member states and the World Nuclear Transport Institute (WNTI) attended the pilot exercise in February and around 40 international experts from more than 15 Member States attended a three day program and observed the field exercise.

Starting in September 2014, the IAEA has worked together with Morocco and Spain to coordinate and plan for a joint Moroccan-Spanish radioactive material transport security exercise covering a maritime transport of high-activity radioactive sources between the two countries.

To prepare for the two joint exercises, the IAEA organized national transport security workshops in Rabat in February 2015 and Madrid in April 2015. Additionally, national table top exercises were conducted in May 2015 in Rabat and in June 2015 in Madrid. The two national table top exercises had observers from Spain and Morocco respectively.

A joint table top exercise with Spain and Morocco in cooperation with IAEA was held in October 2015 in Madrid, Spain, and was followed by a joint field exercise just two days later held in Spanish and Moroccan territorial waters. International organizations and almost 40 Member States attended a three day program in October to observe the exercises.

Experiences from the coordination, planning, and conduct of the radioactive material exercises helped to improve and validate the IAEA transport security exercise guide.

Coordinated Research Project (CRP)

The IAEA's Coordinated Research Activities create fertile ground for bringing together scientists from developing and developed countries to meet, focus on well-defined areas of research and exchange of knowledge, experience and ideas for their mutual benefits. Most of the Coordinated Research Activities are carried out under its Coordinated Research Projects (CRPs), which bring together an average of 15 scientific institutes from developing and developed countries to concentrate on problems of common interest.

Just approved in 2016, the transport security CRP is titled, "Enhancing Security in Transport of Nuclear and other Radioactive Material. Its objective is to identify, research, and develop technologies and their applications that can be used to strengthen the security of nuclear and radioactive material during transport.

This transport security CRP is intended to identify and evaluate technologies that can be applied to strengthen security of nuclear and other radioactive material during transport. This will include identifying gaps between existing transport security systems and more technologically advanced systems that can provide more efficient comprehensive security coverage appropriate for the potential consequences of the material being transported (i.e., in a graded approach).

This CRP will focus on developing and applying security systems suitable for use on normal commercial shipments of radioactive material and Category III and below nuclear material. Security systems for nuclear material shipments that must meet the most stringent security requirements (Category I and II) are already comprehensive but can be very expensive and classified. Consequently, the CRP is not intended to address these shipments.

The CRP will advance the development and deployment of transport security technologies that can be used for not only domestic but also international shipments. The technologies must be capable of:

- Operating in all modes of transport and capable of moving seamlessly from one mode to another;
- Functioning in different regions of the world where technology approaches differ, e.g., cellular phone systems that are CDMA or GSM; and
- Accommodating varying national legal restrictions such as laws and regulations on electronic communications

The CRP provides opportunities for research institutes, commercial transport security providers and systems vendors, shippers and carriers to collaboratively advance the use of technologies in improving security in operationally efficient ways.

- Identify security systems applicable to transport of nuclear and other radioactive material.
- Support implementation of security technologies that can be used to strengthen security during transport, including technologies that can be integrated into effective overall security systems.
- Support development and improvement of package tracking technologies to increase performance and reduce costs.
- Support development and improvement of conveyance tracking, mobile sensors and integrated transport security systems.
- Support adoption of improved vehicle security capabilities.
- Provide analysis of transport security experience in other sectors to identify vulnerabilities, trends and solutions that can be applied to nuclear and other radioactive material shipments.

A strong interface exists between transport security and transport safety. Transport safety colleagues at the IAEA are aware of this CRP and will be consulted and included as appropriate.

Expert and Assessment Missions

Upon request by a MS, IAEA can assess the legal and regulatory transport security framework and the practical implementation of transport security by applying the IPPAS modules on security of nuclear material in transport or security of radioactive material including during transport. An assessment approach has also been drafted and piloted in some Member States in which challenges can be addressed and needs determined.

Conclusions

With increasing demand from Member States, the IAEA transport security program is focusing its efforts on a new, practical approach to capacity building. While experts remain

key to disseminating knowledge, developing recommendations and guidance, and capacity building, through regional networks, assistance to Member States can come from within an existing network of neighbouring competent authorities. The IAEA transport security program focuses on building a national-level capacity through regional and international training courses, workshops, and exercises, and continues to offer activities focused at the national level.

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