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Security of radioactive sources

1. Introduction

The first Nuclear Security Summit in Washington in April 2010 focused on the security of weapons-usable nuclear material, i.e. highly enriched uranium (HEU) and separated plutonium. At the summit some leaders however emphasized the importance of also securing other radioactive material, especially radioactive sources and urged participants to adequately address the risks associated with their use. These risks comprise

- accidents following loss of control over, improper use or disposal of radioactive sources (disused and orphan sources),
- malevolent use ranging from theft over illicit trafficking to the potential misuse by terrorists through building so-called dirty bombs.

Whilst the risks associated with nuclear material can be reduced e.g. through nuclear disarmament or replacing nuclear power plants by conventional plants or renewable energy there is in most cases no alternative to the use of radioactive sources, especially in medical applications.

2. Areas of usage of radioactive sources

Radioactive sources – sealed for obvious radiation protection reasons - are widely used in industry (calibration, material testing, product irradiation and sterilisation, fill level and density measurement), medicine (radiation therapy for cancer treatment, medical diagnostics, blood irradiation), agriculture (seeds irradiation) and research. The most commonly used radionuclides in these sources are cobalt-60, iridium-192, caesium-137, strontium-90 and americium-241. Unfortunately due to their high radioactivity these radionuclides belong to a group of "high-risk radioisotopes" that require highest safety and security standards likewise and should be given special attention. The fact that about 100,000 sealed radioactive sources are used in Germany alone (among them 7,000 high-activity sources) demonstrates that securing them is anything but a hypothetical exercise. Given the fact that radioactive sources

are readily available all over the world, assuring a certain minimum level of radiological security is an important task in virtually all countries.

3. Challenges in securing radioactive sources

To reach this goal governments have to tackle potential shortcomings: weaknesses in their legal security architecture for radioactive sources, insufficient financial or human resources, lack of training, substandard physical protection of sources during production, storage, transport and use, improper disposal, abandonment, theft. In many countries the institutional framework for the control of radioactive sources in their jurisdiction is not sufficient. Therefore cases of "orphaned" radioactive sources, which were abandoned or simply disposed of illegally cause grave concern.
It must also be emphasized that securing radioactive sources comprehensively is generally far more difficult than securing nuclear material:

– Whilst nuclear material is present only in a relatively small number of countries, radioactive sources are almost ubiquitous everywhere in the world.
– Whilst nuclear material is usually located in secure facilities and hard to remove radioactive sources can often be found in places with very limited physical protection, some of them even open to the general public (e.g. hospitals).
– Whilst the legal framework for the security of nuclear material is well developed (legally binding "Convention on the Physical Protection of Nuclear Material"; IAEA's in-depth "Nuclear Security Recommendations on the Physical Protection of Nuclear Material and Nuclear Facilities" (INFCIRC/225)) the one for radioactive sources is considerably less developed (IAEA's non-legally binding "Code of Conduct on the Safety and Security of Radioactive Sources" and a supplementary "Guidance on the Import and Export of Radioactive Sources").
– Controlling the multitude of transfers of radioactive sources – generally in small quantities per transfer - is much more difficult than that of highly protected nuclear material -generally in much larger quantity per transfer. Therefore radioactive sources are much more vulnerable to theft or cross-border trafficking than nuclear material.

Terrorists could not only try to acquire radioactive sources but also other radioactive material as means to disperse radioactivity. As possible targets like high-level nuclear waste storages or reprocessing plants are – due to various security measures already in place - easier to protect than singular radioactive sources we again regard the latter as the more vulnerable material and confine this paper to their securing.

4. International instruments to improve the security of radioactive sources

- The "International Convention for the Suppression of Acts of Nuclear Terrorism" (ICSANT) (http://untreaty.un.org/cod/avl/ha/icsant/icsant.html) serves as legal basis for measures to protect radioactive material against terrorist acts. It urges state parties to make every effort to adopt appropriate measures to ensure the protection of radioactive material taking into account relevant recommendations and functions of the IAEA.
– The "Code of Conduct on the Safety and Security of Radioactive Sources"

(http://www-ns.iaea.org/tech-areas/radiation-safety/code-of-conduct.asp?s=3) is a non-legally binding IAEA instrument which summarizes the main aspects of dealing with radioactive sources in a safe and secure manner. Among others, it contains specific guidance on the import and export of radioactive sources.

– Subsequently, the IAEA developed a "Guidance on the Import and Export of Radioactive Sources" which is voluntary in nature and does not impede international cooperation or commerce.

– The IAEA has issued and regularly updates its "Nuclear Security Series". Implementation of the recently published "Recommendation on Radioactive Material and Associated Facilities" would constitute an important step to increase radiological security.

– The IAEA has established the "International Database on Illicit Trafficking" (ITDB). It contains data on illicit trafficking and other unauthorized activities and events related to nuclear and other radioactive material from 1993 onward. (http://www-ns.iaea.org/security/itdb.asp)

– In 2003, the EU established the Council Directive 2003/122/Euratom on the control of high-activity sealed radioactive sources and orphan sources. (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32003L0122:EN:HTML)

– The "EU CBRN Action Plan" aims at strengthening chemical, biological, radiological and nuclear (CBRN) security in the European Union. Its overall goal is to reduce the threat and damage from CBRN incidents of accidental, natural or intentional origin. The EU CBRN Action Plan is broadly based on an all-hazard approach, including terrorist threats, and contributes to the implementation of the EU Counter Terrorism Strategy. (http://europa.eu/legislation_summaries/justice_freedom_security/fight_against_terrorism/jl0030_en.htm)

– At the junction of international and national instruments, the IAEA's "Nuclear Law Handbook" (http://www-pub.iaea.org/books/IAEABooks/6807/Handbook-on-Nuclear-Law) serves to facilitate states' self-assessment - complementing the assistance provided by the IAEA - whether their national nuclear legal infrastructures are in line with the relevant international undertakings and best practices.

5. Gaps to be filled to meet Seoul 2012 summit targets

Whilst the Washington 2010 summit documents remained very general on radioactive sources, the Seoul 2012 summit communiqué is much more concrete. Among others it encourages States to:

- ratify or accede to the **ICSANT;**
- put relevant IAEA "**Nuclear Security Series"** documents and the IAEA **"Code of Conduct on the Safety and Security of Radioactive Sources"** into national practice;
- establish **national registers of high-activity radioactive sources;**
- cooperate internationally to **recover lost, missing or stolen sources** and to maintain **control over disused sources.**

6. The way forward to reach summit goals

- ratify or accede to the **ICSANT**: achieving universality of the ICSANT would be a major breakthrough in international attempts to secure radioactive material. Acceding to ICSANT however could be easier once a country has signed and implemented the IAEA "Code of Conduct on the Safety and Security of Radioactive Sources" (CoC). As many states have not yet signed the CoC, they might first establish an overview of their positions on this instrument, identify reasons for their not signing and ask signatories of the CoC for help in achieving that goal. This could include addressing differing standards of implementation of the CoC by states who have signed it.
- put relevant IAEA "**Nuclear Security Series"** documents and the IAEA "**Code of Conduct on the Safety and Security of Radioactive Sources"** into national practice: Once the relevant national legislation is in force, states should implement key provisions of these documents and of the IAEA "Guidance on the Import and Export of Radioactive Sources" to the extent possible.
- establish **national registers of high-activity radioactive sources**: The establishment of national inventories of all radioactive sources is of vital importance. As a first step towards that aim states should establish national registers of high-activity sealed radioactive sources as they pose the highest safety and security risks. States that already possess such inventory should make sure that it is up to date. These actions should be complemented by active participation in the ITDB of the IAEA.
- cooperate internationally to regain **control over orphan sources**: States should facilitate a fast information exchange between member states, supported by the IAEA, to improve the handling of orphan sources.
- facilitate the **repatriation of** vulnerable **disused sources**: States should jointly address end of life issues (national secure disposal, repatriation: leasing instead of buying; supplier's obligation to take back disused sources).

7. Country-specific approaches to the security of radioactive sources

Each country has its own way of meeting the challenges relating to the security of radioactive sources depending on the extent of usage and a variety of country-specific factors.

National approaches to the security of radioactive sources are **described in the appendices** to this paper.