IAEA BRIEF 2019/4

Nuclear Safety and Security

The IAEA Supports the Safe and Secure Management of Sealed Radioactive Sources

Radioactive sources are widely used for beneficial purposes in industry, medicine, agriculture, research and education. For example, sources are used for medical diagnostics and therapy, for controlling industrial processes, and for sterilizing food and medical products. (Photo: IAEA)

SUMMARY

1. Sealed radioactive sources (SRSs) are important for many nuclear applications, including in industry, medicine, agriculture and research.
2. During their manufacture, and when in authorized use, SRSs are expected to be managed in accordance with national requirements, IAEA safety standards and nuclear security recommendations. When a source reaches the end of its useful life, the risk of inadequate control, improper management or loss of regulatory control increases, which could lead to possible unauthorized or malicious use, as well as the potential exposure of people and the environment to radiation.
3. The IAEA supports Member States in ensuring the safe and secure management of SRSs throughout their entire life cycle, including when they have reached the end of their useful life and are required to be disposed of safely and securely.

INTRODUCTION

SRSs have many uses, including treating cancer, extending food shelf life, sterilizing medical supplies, irradiating seeds to enhance food production, supporting oil and gas prospecting, measuring soil density for construction, and detecting smoke. Their use contributes to the achievement of national development goals and the United Nations Sustainable Development Goals.

Effective and continuous regulatory and management control of radioactive sources is of the utmost importance in preventing unauthorized use, accidents or malicious acts with harmful radiological consequences. Once SRSs reach the end of their useful life, the safe, secure and sustainable long-term management of **disused sealed radioactive sources** (DSRSs) is essential to reduce radiation hazards to the public and the environment. This is because **DSRSs** may

Sealed radioactive sources consist of radioactive materials isolated from the environment in a sealed metal capsule.
(Photo: IAEA)

still contain large amounts of radioactivity and may emit ionizing radiation.

The IAEA's **Code of Conduct on the Safety and Security of Radioactive Sources** and its supplementary documents — **Guidance on the Import and Export of Radioactive Sources** (2012) and **Guidance on the Management of Disused Radioactive Sources** (2018) — provide advice on the appropriate management and protection of radioactive sources. They provide guidance on the development, harmonization and implementation of national policies, laws and regulations, as well as on cooperation among Member States.

The guidance documents describe a variety of options for the management and protection of disused radioactive sources and outline the responsibilities of the relevant parties, including operators and regulatory bodies. They emphasise disposal as the final management option for disused sources and encourage countries to implement national policies and strategies to manage DSRSs in a safe, secure and sustainable manner. The documents also contain, advice on returning sources to their country of origin in cases where such arrangements have been agreed, as well as on reusing and recycling DSRSs.

The IAEA facilitates the exchange of information between Member States and supports Member States in implementing these documents through various projects that aim to enhance the nuclear security and radiation safety of DSRSs. Qualified Technical Centres and the DSRS Network also provide practical information to assist in managing DSRSs.

CHALLENGES: ENHANCING END OF LIFE MANAGEMENT

Small radioactive sources may be easily misplaced if not properly tracked and managed. For example, disused industrial or medical equipment containing radioactive sources could be mistakenly discarded, or disused radioactive sources could be used for malicious purposes. Inadequate DSRS management over the past 40 years has led to incidents and accidents that have resulted in fatalities, often caused by the actions of people who were unaware of the radiation hazard.

The end of life management of SRSs — particularly their disposal — can be a challenge for many IAEA Member States. The IAEA provides support to countries that have expressed a need for proper knowledge, improved management and enhanced technological capabilities in order to address these difficulties.

IMPROVING NATIONAL CONTROL OF SRSs

Many countries request IAEA assistance to help them strengthen their national regulatory framework, so that it addresses all elements of the use, storage and disposal of SRSs. Furthermore, developing and sustaining knowledge, in addition to capacity building, for the proper management of SRSs are other areas of IAEA support.

Storing and disposing of radioactive sources requires careful assessment and planning, an effective institutional framework, comprehensive operational procedures, specialized knowledge and appropriate human and financial resources. Upon request, the IAEA is ready to extend support to its Member States in these areas.

END OF LIFE MANAGEMENT OPTIONS FOR DSRSs

DSRSs may be temporarily stored before their final disposal. There is also an opportunity for the sources to be reused or recycled, thereby reducing or delaying their disposal. Countries have three major options for the disposal of DSRSs: near surface disposal, borehole disposal or deep geological disposal. The choice depends on the volume and type of sources generated in a country, on the national inventory of sources, and on existing or planned disposal facilities. This decision should be considered when countries are developing their national radioactive waste management policies and strategies.

In some cases, DSRSs may be removed from the country and sent back to the supplier/vendor or to other authorized organizations, according to specific national regulatory criteria and international guidelines and agreements.

The IAEA helps its Member States to strengthen their national management and regulatory infrastructure for the control of radioacwtive sources, including the safe and secure disposal of disused sources

(Photo: IAEA)

IAEA SUPPORT FOR MEMBER STATES

The IAEA works closely with its Member States for the long-term objective of harmonized, safe and secure SRS management. It promotes the development and use of optimized technological solutions for cradle to grave control of radioactive sources and pays particular attention to the end stage of the life cycle.

The IAEA's assistance and guidance includes developing and revising national radioactive waste management policies and strategies; preparing action plans for their implementation; improving the licensing, inspection, enforcement and management systems; and strengthening the capacities of national regulatory authorities in accordance with IAEA safety standards, security guidance and best international practice. The IAEA also provides extensive assistance in establishing SRS inventories and tracking systems.

The IAEA has contributed extensively to developing safe, secure and sustainable approaches for managing SRSs, as well as to developing specific technical solutions for the conditioning, storage and disposal of DSRSs, including the **mobile hot cell**, Mobile Tool Kit Facility, and the **borehole disposal system**. Carrying out **removal projects** of Category 1 and Category 2 DSRSs from Member States for repatriation or recycling is part of the assistance offered by the IAEA, in addition to capacity building, training and supplying equipment. Support for Member States also includes efforts to search for sources that have fallen out of regulatory control.

The IAEA also develops software tools for radioactive waste management, which allow users to transparently, systematically and logically address and assess the safety of radioactive waste management and disposal.

The IAEA has worked closely with decision makers, regulators, waste management operators and other interested parties and partners to enhance the safe, secure and effective management of SRSs at both national and international levels. The IAEA's support for Member States in this field is due to the combined efforts of the various IAEA Departments as well as the Office of Legal Affairs.

AREAS WHERE MEMBER STATES MAY BENEFIT FROM IAEA ASSISTANCE

- Increasing awareness among policymakers of the importance of developing and implementing effective cradle to grave management of radioactive sources.
- Implementing appropriate governmental and regulatory frameworks for the safe and secure management of radioactive sources.
- Developing national radioactive waste management policies and strategies for the end of life management of SRSs.
- Assisting in long-term resource planning for the management of SRSs, including their final disposal.
- Establishing effective infrastructure for DSRS management facilities. This infrastructure should be based on a national radioactive waste management policy and strategy, as well as on the national inventory, and should be supported by an appropriate regulatory infrastructure for radiation safety and nuclear security.
- Engaging in international cooperation for the safe and secure cradle to grave management of radioactive sources.
- Providing technological solutions and capacity building for the safe, secure and sustainable management of DSRSs.

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IAEA, Vienna International Centre, PO Box 100, 1400 Vienna, Austria

Email: info@iaea.org • Telephone: +43 (1) 2600-0 • Facsimile +43 (1) 2600-7