

Transportation and Long-Term Storage Management of DSRS in the Bolivarian Republic of Venezuela

Starting in the second half of 2022, the Ministry of Science and Technology began receiving national powers regarding the peaceful and safe use of atomic energy policies, formally authorized by presidential decree, effective March 9, 2023.

Among the responsibilities received was addressing the DSRS reported by the IAEA in 2012 during a mission of experts that included various public hospitals located in different regions of the country. Specifically, 199 DSRS were identified, of which 170 were Radium-226 and 29 were associated to cobalt-therapy equipment with Cobalt-60.

In the last quarter of 2022, the inspection, collection, transportation, and safe long-term storage of these 199 DSRS were planned. This required the following:

- Advisor from IAEA through expert missions.
- Drafting of a bill proposal to create a single regulatory authority for atomic energy and ionizing radiation for discussion by the legislative assembly.
- Development of the National Policy for the Management of DSRS, identifying the stakeholders involved.
- Inspection schedule for the sites identified in the 2012 IAEA report.
- Purchase of equipment, vehicles, and supplies through funds from the Ministry of Science and Technology, amounting to approximately USD 340,000 for the management of the DSRS.

The sources identified in the last three years of management are detailed below:

- Collection, transport, and safe storage of 170 Radium 226 sources related to the 2012 IAEA report.
- Collection, transport, and safe storage of 20 Cobalt 60 cobalt therapy equipment heads related to the 2012 IAEA report.
- Inspection, collection, transport, and safe storage of new sources of Cesium 137 found in public hospitals. A total of 222 sources were identified and stored in temporary storage.
- Inspection, collection, transport, and safe storage of additional sources (new findings) in public hospitals of Radium 226. A total of 29 sources were identified and stored in temporary storage.
- Inspection, collection, transportation and safe storage of sources (new findings) in public hospitals of Cesium 137. A total of 222 sources were identified and stored in the temporary warehouse.

Below is a summary of DSRS's management over the past three years:



Radioisotope	Category	2012 IAEA Report	Collected and Safety Stored 2012 IAEA Report	New Findings 2022-2025*	Collected and Safety Stored New Findings 2022-2025*	Total Sources 2022-2025*	Total Collected and Safety Stored 2022-2025*
Cesium Cs-137	II	0	0	222	222	222	222
Cobalt Co-60	I	29	20	13	2	42	22
Radio 226	I y II	170	170	29	29	199	199
Uranium Depletion (collimators)	safeguards	0	0	6 (pending to quantify)	1 (pending to quantify)	6 (pending to quantify)	1 (pending to quantify)
Iridium Ir-192	II	0	0	6	0	6	0
Waste		0	0	1	0	1	0
Pending to ID		0	0	2	0	2	0
Total		199	190	273	253	472	443
%			95,48 %		92,67 %		93,86 %

Figure 1. DSRS identified in the last three years.

Additionally, work is underway to build a new temporary warehouse for DSRS long-term storage, with funding of approximately USD 800,000 from the Ministry of Science and Technology.

In terms of training, the following has been achieved in the last three years:

- More than 400 people were trained in the country by the IAEA in radiation safety through Expert Missions. Thirty-seven IAEA experts attended the country, 29 in person and 8 virtually.
- More than 1.227 people were trained in the country by national radiation safety specialists.

To manage the safe transport and storage of DSRS, it was necessary to develop national solutions such as:

- Construction of over-containers for Cobalt-60 head containers.
- Construction of racks to support the tons of weight of the Cobalt-60 heads.
- Placement of ID seals to identify DSRS containers.
- Development of software to inventory DSRSs during transport.
- Development of software for satellite tracking of DSRS containers and transport.

Above actions summarize the management of transportation and long-term storage in the Bolivarian Republic of Venezuela to identify 472 DSRS in the last three years and achieve the safe storage of 443 of them, all data and solutions validated by national regulatory body of the country.