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Disused Sealed Radioactive Sources : Inventory and Characterization at IPEN

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Introduction : The generation of radioactive waste is a consequence of the many applications of nuclear energy on the daily life of society nowadays, thanks to the scientific and technologic advances. Many of the current applications utilize Sealed Radioactive Sources (SRS), which are widely used in the whole world by industry, medicine, agriculture and research. After the end of service life, mostly due to radioactive decay of the isotope, malfunction or technical replacement, these sources become “disused sealed radioactive sources” (DSRS) and thereafter are treated as radioactive waste. In Brazil, the Waste Management Laboratory (WML) of the Nuclear and Energy Research Institute (IPEN/CNEN-SP) is responsible for the management and treatment of these sources. An important aspect to consider is that Brazil has one of the biggest inventories of SRS in the world, not only because of the large industrial park, the well-developed health care infrastructure and the numerous mining operations, but also by the use of radioactive sources in consumer products, such as smoke detectors, lightning arresters, surge protectors and even cardiac pacemakers. Presently, the inventory of DSRS at the WML is of more than 10,000 [1]; if the sources from lightning arresters, smoke detectors and Ir-192 with activities above the clearance levels are included, the estimate is over 150,000. Brazil does not have a defined strategy or a protocol for screening and inventorying these sources, whose management was limited only to storage [2, 3]. The WML started the development of methods and operational work to characterize and reduce the total volume of this inventory for the borehole-type final disposal facility yet to be constructed, where the DSRS will be disposed [4].

Methodology: The information available from these sources is in a database created in 1980 [5, 6], when the sources began to be received. Several records on the FRSD that were checked are incomplete or simply incorrect, since there is no correspondence between the dates of entry of these sources in the storage and their physical characteristics. Some reasons can be listed to try to understand the divergences: the inspection when receiving the sources was not possible, no inspection procedure was defined, there were technical difficulties to open the packages. The objective of this work is to organize the inventory in a standardized way, control access, traceability, reduction of the necessary time to locate and characterize the sources upon reception, and of the repetitive work in the operational routine, and finally release of space in the storage. To establish a characterization and inventory protocol, sources were randomly selected in the storage and transported by forklift to a laboratory with low background. For radiation protection purposes, the dose rates [7] were firstly measured and a smear test was performed to verify any source leakage. The shielding was then opened and a second dose rate measurement was performed and used to estimate the activity of the sources. The source was then photographed and transferred to a standard disposal container.

Final Remarks: The information acquired in the operation was transferred to a computer database, developed for this purpose. The updating and organization of the DSRS database will assist on the selection of radioactive waste to be delivered to the repository in Brazil, in the coming years.

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