Transactions of the Korean Nuclear Society Spring Meeting
Taebaek, Korea, May 26-27, 2011

Review of Safety and Security of Radioactive Sources in Africa

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1. Introduction

Radioactive materials are used worldwide for peaceful applications in medicine, industry, agriculture, environmental science, education and research and military applications. Most of these radioactive sources used are imported therefore trans-boundary movement is a significant factor in consideration of safety and security measures during movement of these sources. It is estimated that 20 million packages of radioactive materials are transported annually worldwide and this number of shipments is expected to increase due to the renaissance of nuclear power generation.

The African continent has shown considerable leadership in its advocacy for the safety and security of radioactive sources. The First Africa Workshop on the Establishment of a Legal Framework governing Radiation Protection, the Safety of Radiation Sources and the Safe Management of Radioactive Waste held in Ethiopia in 2001 called upon the IAEA to form a forum for African countries to consider the Code of Conduct on the Safety and Security of Radioactive Sources and give it a legally binding effect so that the peaceful use of nuclear technology is not compromised.

Despite these laudable efforts, Africa still faces considerable challenges in the implementation of safety and security of radioactive sources because of weak regulatory control and lack of infrastructure to properly control, manage and secure radiation sources[1]. The purpose of this paper was therefore, to analyze, review, address and share knowledge and experience with regard to safety and security measures of radioactive materials in Africa. This project will benefit IAEA's African member states in creating nuclear safety and security networking in the region.

2. Methods and Results

This section describes the methodological approaches used to secure, recover and repatriate radioactive sources. The approaches used include; Off-site source recovery project, Global Threat Reduction Initiative program (GTRI); Mobile unit for Spent High Activity Radioactive Sources (SHARS); the Model Project on upgrading radiation protection infrastructure and the establishment of African nuclear free zone treaty.

2.1 Off- Site Source Recovery Project (OSRP)

The Off-Site Source Recovery Project (OSRP) is a U.S. government activity sponsored by the National Nuclear Security Administration's (NNSA) Office of Global Threat Reduction and is managed at Los Alamos National Laboratory through the Nuclear Nonproliferation Division. It was created in the late 1990's in order to recover abandoned, orphan, and unwanted radioactive sealed sources from licensees.

Under this initiative, neutron sources from four African countries (South Africa, Sudan, Uganda and Côte d´Ivoire) have been shipped to US for ultimate disposition, the country from which they originally came and 7 high-activity sources from two hospitals and one research centre in Nigeria were secured and shipped in transport containers for return to Canada[2]. A high degree of security was maintained during the mission, with police accompanying the transportation.

Fig. 1. *Sources recovered by OSRP in Africa*

2.2 The Global Threat Reduction Initiative (GTRI)

The Global Threat Reduction Initiative (GTRI)'s Search and Secure project was launched in 2004 and its goal is to help countries develop their own indigenous capabilities for assessing orphaned and disused radiological sources. GTRI works closely in this endeavor with the International Atomic Energy Agency (IAEA), which issues international standards and guidance on how to safely control radioactive sources. The initiative also trains the indigenous how to search, secure, locate, and identify orphan sources.

Approximately 550 people have been trained, and thousands of orphan sources recovered. The project has managed to secure radioactive sources from six countries in Africa as shown on map.

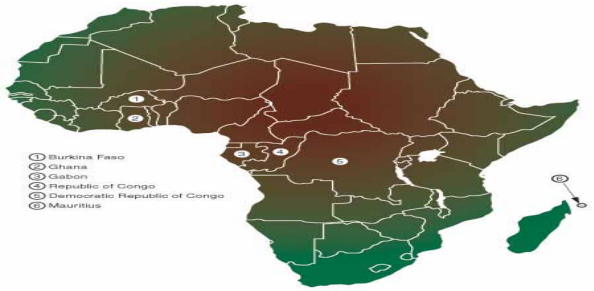

Fig. 2. *Sources recovered by GTRI in Africa*

2.3 Mobile unit for Spent High Activity Radioactive Sources (SHARS)

The concept of a mobile unit for the conditioning of Spent High Activity Radioactive Sources (SHARS) was conceived by the IAEA Technology Support Unit in 2003[3]. In its essence, this concept consisted of a mobile hot cell and storage container for the recovery, manipulation, conditioning and packaging of SHARS in developing countries. The first SHARS unit was manufactured and tested by the Nuclear Energy Corporation of South Africa (NECSA). A long-term storage shield (LTSS) storage cask was designed to accommodate a wide variety of SHARS. This outcome will make source re-use and repatriation much easier in the future.

2.4 Establishment of the African Nuclear Free Zone Treaty (NWFZ)

The African Nuclear Weapon Free Zone Treaty establishes a Nuclear-Weapon-Free Zone in Africa. The treaty came into effect in July 2009 and prohibits research, development, manufacture, stockpiling, acquisition, testing, possession and control of nuclear explosive devices in the territory of parties to the Treaty. The Treaty bans the export of source or special fissionable material for peaceful purposes to any Non-Nuclear Weapon State unless subject to a comprehensive safeguards agreement concluded with the IAEA. Its office is in South Africa[4] . The establishment of the African Commission on Nuclear Energy, has been established by the Treaty to promote international cooperation with other zonal states and organizations like OPANAL[5]. The Treaty has declared Africa a zone free of nuclear weapons, as an important step towards the strengthening of the non-proliferation regime.

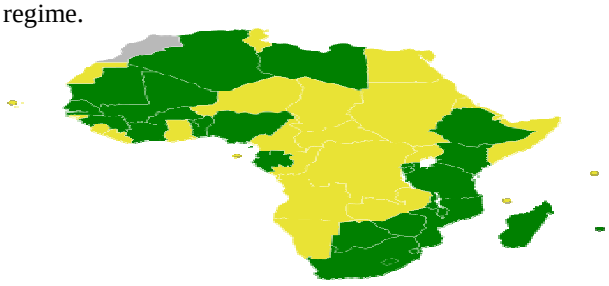

Fig. 3. Nations that have ratified the African Nuclear Weapon Free Zone Treaty (NWFZ)

2.5 Model Project on upgrading radiation protection infrastructure

The International Atomic Energy Agency Model Project was initiated in 1994 as a result of RAPAT mission reports and incidents around the world involving injuries and some deaths from uncontrolled and misuse of radioactive sources[6]. Networking and sharing of knowledge and experience has been considerably achieved in Africa with the model project as shown on the map.

Fig. 4. Nations that have joined the model project

3. Conclusions

Safety and Security of radioactive source in a country can only be effectively ensured if the regulatory body: is effectively independent; is strong and effectively functioning; cooperates and collaborates effectively and ensures no gaps and overlaps in regulatory oversight; has well established regulatory infrastructures; has a tracking source register from the operating industries; identifies and monitors radioactive sources as they proceed through the supply chain.

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