Status of Radioactive Waste Management in United Republic of Tanzania After Goiania Accident

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Abstract
After the Goiania accident of 13 September 1987, which was a result of an abandoned radiotherapy source, the need for controlling and management of spent and disused sources has increased significantly in many member states. Lessons learned from previous radiological accidents shows that the trend of those accidents was due to the loss of control over spent and disused sources which lead to radiation injuries, unplanned exposure to workers and members of public, malicious acts and fatalities including environment impacts and serious economic consequences. In the United Republic of Tanzania the numbers of spent and disused sources are increasing rapidly due to obsolete technique, outliving their usefulness, being abandoned and illicit trafficking incidents. The management of spent and disused radioactive sealed sources in Tanzania started in 1986, three years after the establishment of regulatory authority in 1983. After the lesson learned from Goiania accident, the United Republic of Tanzania became extensively involved in the development of a radioactive waste management infrastructure and capability. As a result of this, Tanzania enacted radioactive waste management regulations in 1999. In the same year acquired a 30 feet ISO container bought by government funds in which spent and disused radioactive sources were temporarily stored. From 1999, the National Radiation Commission now the Tanzania Atomic Energy Commission started seeking funds from the Government for the construction of a Central Radioactive Waste Management Facility (CRWMF). In a year 2001 the Government allocated funds for the construction of the Facility, which was completed and commissioned in July 2005.The completion and commissioning of CRWMF paved the way to a better radioactive waste management regime in the country. Already a large number of disused sources from various industries as well as strong spent and disused irradiators and radiotherapy sources were removed from the public domain and brought to the CRWMF awaiting their safe and long-term storage in the Facility. Arrangements have already been made for the collected sources in the CRWMF to be conditioned and be kept in a "Long Term Storage Shield" that has been specially designed and approved by the International Atomic Energy Agency (IAEA). The IAEA in cooperation with experts from the South African Nuclear Energy Corp (NECSA) from the Republic of South Africa will condition the spent sources in January/February 2008.
This paper discusses the experiences on management of radioactive sources in Tanzania basing from the lesson learned after Goiania accident. The evaluation involve regulatory framework, management of spent and disused sources, radioactive sources inventories, collection of spent and disused sources, scrap metal monitoring, search of orphan

sources, control of illicit trafficking incidents and project and activities in which Tanzania participating in IAEA pertaining radioactive waste management.

Introduction

Experience has shown that many radiological accidents in the past two decades were the consequence of abandoned or insecurely stored disused sources [2,5]. When the safety requirements are properly complied risks and radiological hazards are strongly minimized. It is therefore necessary to enforce suitable radiation protection measures to minimize radiological accidents or mitigate their consequences should they occur. This paper will presents and discusses the status of radioactive waste management in the United Republic of Tanzania (URT) and lesson learned after Goiania radiological accident of September 1987.

Regulatory Framework

The control of radioactive sources in the United Republic of Tanzania is governed by the Atomic Energy Act No. 7 OF 2003, which repealed the former Protection From Radiation Act No. 5 of 1983 [1]. The legislation provides legal framework for protection of individuals, public and the environmental from harm by establishing and maintaining effective safety and security of radioactive materials used in the country. From the Act No.5 of 1983, which was repealed by Atomic Energy Act No. 7 of 2003, the Radioactive Waste Management Regulations of 1999 were promulgated. The regulations aimed to ensure the protection of human health and the environment [4]. These regulations, which consist of seven parts, set up the basic technical and organization requirements to be complied with by waste generators and operators of waste management facilities. Although these regulations were prepared after Goiania accident, some areas were not precisely spelled out. On going amendment of Waste Management Regulations will take care the drawbacks of each part to ensure that the risks of radiological accidents are minimized. The improvement will incorporate:

- To empower waste management personnel to ensure that any new practices involving radioactive sources before registration and licenses granted, the documents for new facilities are used and evidences that there are enough funds for decommissioning practices are produced;
- Introducing decommissioning license, which will require waste generators to make sure the radioactive waste on the sites is at all times adequately controlled, or contained, so that it can not leak or escape from control before transported to CRWMF;
- The level of training and qualification of personnel engaged with radioactive waste management;

Management of Spent and Disused Sources

The timely management of spent and disused sources is a key to a national strategy of source management. Radioactive Waste Management, which involves a safe decommissioning of the practices, started in 1980s after the establishment of Regulatory Authority in 1983. It must be realized that at that time there was no available documents of decommissioning plans and any regulations concern the management of radioactive waste [3]. After the Goiania radiological accident of September 1987, the need to have

specific regulation for waste management rose. As a result Tanzania enacted radioactive waste management regulations in 1999. In the same year acquired a 30 feet ISO container in which the spent and disused radioactive sources were temporarily managed and stored. Due to an incapability of ISO container to accommodate "Sealed High Activity Radioactive Sources" the Regulatory Authority made efforts to solicit funds from the Government for the construction of a facility which will accommodates all categories of spent/disused sources. In a year 2001, Government of United Republic of Tanzania allocated funds for the construction of the Central Radioactive Waste Management Facility (CRWMF), which was completed and commissioned in July 2005. Spent/disused radioactive sources, which were stored at the ISO container and from user's premises, were safely transferred to the CRWMF for safe and long-term storage in the facility in a year 2005. With the assistance from IAEA and experts from South Africa Republic, Sealed High Activity Radioactive Sources (SHARS) imbedded in walls at the old radiotherapy units of Muhimbili National Hospital and Ocean Road Cancer Institute were recovered and transferred to the CRWMF for safe storage in July 2005. Also during the same mission spent sources in category one (spent irradiators) were collected from the Tsetse and Trypanosomiasis Research Institute (TTRI) in Tanga and transferred to CRWMF for storage. With the availability of this CRWMF the Government of Tanzania is continuing effectively in solving the problems pertaining to the management of radioactive waste. Arrangements have already been made with IAEA assistance for the collected sources in CRWMF to be conditioned and kept in a "long term storage shield" before March 2008. During this period all spent/disused sources in the country, including neutron sources will be conditioned and safely stored in the facility.

Radioactive Sources Inventories

Inventorying means a campaign to physical check all sources possessed by specifically and uniquely identifying each individual source using appropriate means such as serial numbers [7]. All sources in use and spent/disused sources are recorded in hard copy and in electronic form. Spread sheets (Microsoft excels) are used in terms of electronics form. Special assigned staff updates these inventories regularly.

Collection of Spent and Disused Sources

From both safety and security point of view, all disused sources must undergo proper disposition [3]. Already a large number of spent and disused sources have been collected from various premises in the country and transferred to CRWMF. Only four neutron sources are still in user's premises and the plans are under ways to collect them to CRWMF before Nov.2007. The neutron sources are: Am/Be 241 (5Ci) for activation analysis and three Am/Be 241 (100mCi each) for moisture gauges.

Scrap Metal Monitoring

In Tanzania there is a need for scrap metal industries to be monitored as the application of radioactive sources started in 1940s, before the existence or regulatory authority [8]. Moreover in Tanzania scrap metals are cheaper to be used by metal industries when compared to imported iron. Therefore, the possibility of spent/disused sources to be collected and entered into scrap metal industries is high. Experiences provide evidence for incidences of melted radiation sources in metal industry such as in Goiania Brazil and

Juarez Mexico [2,5]. In reorganization of this, monitoring in the scrap metal industries done in October 2004 in two scrap metal industries based in Dar Es Salaam capital City. The two searches yielded no discovery of radioactive sources or contamination. From a year 2005 the TAEC decided to have a budget to finance regular monitoring/searches and provision of education to scrap metal industries in order to avoid what happened in Goiania Brazil and cause 4 deaths and wide spread contamination.

Search of Orphan Sources

In Tanzania Regulatory Authority was established in 1983, four decades after the application of radioactive sources in the country. Due to this fact, some of the sources, which were in use in various applications, were not registered. For example:

- Three disused sources (Cs –137) which were used as density gauges were discovered at Williamson Diamond Mining Company;
- Another source of (Cs – 137) which was used as in industrial radiography was recovered from the swamp at TAZAMA Pipeline Company;
- In 2005, five companies found to have imported radiation sources without importation license;
- Last year (2006) three neutron sources were collected from a drilling company each of 100mCi.

From the four searches that yielded the discovery of the orphan sources, more searches were initiated by TAEC from last year to ensure that before exercises of conditioning sources in next January/February 2008, all institutes/industries/schools which its activities attracts the application of radioactive sources are visited and searched.

Control of Illicit Trafficking Incidents

Lack of proper identification of key problem, which leads to theft or illicit trafficking of radioactive, is set back for formulating strategies to proper maintain the security of radioactive materials and preventing theft or illicit trafficking [8]. In Tanzania there are 13 incidents of illicit trafficking reported by police from 1996 to January 2007. The problem of illicit problems was identified as:

- Radioactive sources, which are outside the regulatory control because they were not registered or not known;
- Lack of proper security at user's premises;
- Lack of public assistance to reveal the secrets movements and sell of radioactive sources;
- Lack of proper training and equipment for officials at entries and exits points.

Following the work plan 2003 –2007 of the project report of nuclear security RAF/0/021 and the increase rate of illicit trafficking in the country. TAEC requested the IAEA expert for fact-finding mission on assess and advice on the state control and accountability of radioactive materials. Through the implementation of the INNServ recommendations and the national plan, TAEC in cooperation with IAEA prepared a three days local training course for front line officers on preventing illicit trafficking of radioactive materials in July 2004. Similar training will be held in October and November 2007. In this training the participants will come from Uganda, Zambia and Tanzania.

Projects and Activities Tanzania Participating in IAEA Pertaining Radioactive Waste Management in the Country

The Country has participated in a number of IAEA projects since 1984. Participating also in illicit trafficking data base (ITDB). Some of waste management projects which URT participating are: RAF/3/005, RAF/9/037 and URT/9/004. Through these projects the country has benefited expert mission advisory from IAEA, fellowships, on job training courses including local and overseas and various equipments have been received.

Conclusion

In this paper infrastructure of radioactive waste management has been presented. Much has been done by the government in cooperation with IAEA to strengthen radioactive waste management infrastructure in the country. It is anticipated that through RAF/3/005, RAF/9/037 and Government commitments the infrastructure of radioactive waste in the country will continue be enhanced.

References

[1] United Republic of Tanzania, The Atomic Energy Act, No.7 of 2003

[2] International Atomic Energy Agency, The Radiological Accident in Goiania, 1988

[3] Shao Didas, Sungita Yesaya and Banzi Firmi; Challenging Issues in the Management of Disused Sources in the United Republic of Tanzania, IAEA, Symposium Proceedings 13 –17, Cordoba, Spain

[4] United Republic of Tanzania, Radioactive Waste Management for the protection of Human Health and Environment Regulations 1999

[5] COMISIOJN NACIONAL DE SEGURIDAD NUCLEAR Y Y SALVAGUARDIAS Accidente por contaminacion con Cobalt –60, Mexico Rep. CNSNC –IT –001 1984

[6] National inventory of radioactive sources in use and disused/spent radioactive sources

[7] International Atomic Energy Agency, Interim guidance for comment 19 March revision

[8] Didas Shao; International Conference on the Safety and Security of Radioactive Sources: Towards a Global System for the Continuous Control of Sources throughout their Life Cycle, IAEA-CN-134, 27 June - 1 July 2005, Bordeaux, France.