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Tracking of Nuclear and Radiological Materials: An Approach to Minimize the Risk of Nuclear Security Incidents – Case Study: Nigeria

Goal of the Present Work

Nuclear materials and radioactive sources are used by every country for civilian, commercial, and military purposes. If not managed and secured properly, most especially while on transit, through effective tracking and monitoring, these sources are vulnerable and can pose significant security threats and safety concerns. Today, there is increasing concern that radioactive sources, especially highly active radioactive sources, are vulnerable during transport and can be attractive to adversaries with different motives.

This paper examines Nigeria's past and current efforts to secure nuclear and radiological materials, and explore international best practices regarding practical approaches to tracking nuclear materials, the regulatory body requirements, the licensee's effort and the role the Women, Peace and Security community will contribute to ensuring nuclear security and mitigating the consequence's if the materials fall out of regulatory control . The paper will conclude by outlining solutions to tracking the sources while in transport by emplacing regulatory-mandated requirement enforcing trackers on vehicles and containers of all nuclear materials and radioactive sources within the territory of Nigeria.

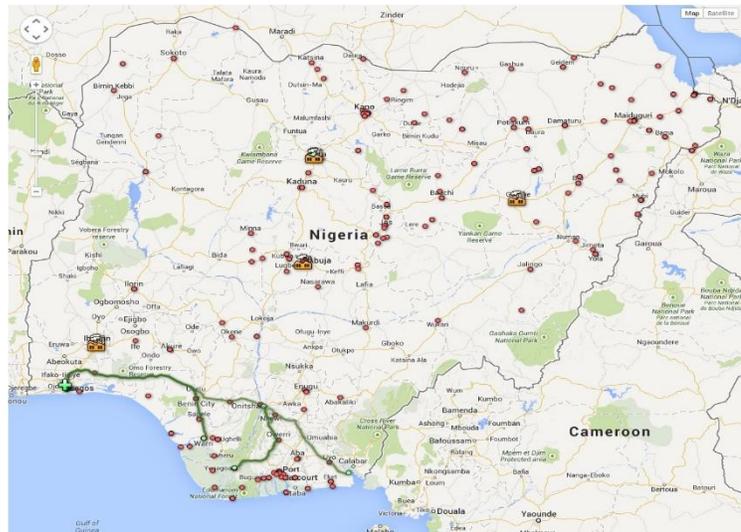


Figure 1 Map of Nigeria showing nuclear facilities in yellow and source transport routes in colour green – Premium Times, August 1, 2016

Tracking Radioactive Sources : Source Tracking System

Source tracking system is a highly secure system accessible and easy-to-use, computer system tracks high-risk radioactive sources from the time they are manufactured or imported through the time of their disposal or export, or until they decay enough to no longer be of concern. ”[1]

Tracking system is used to track the movement of radioactive sources from one point to the other and for rare event of an accident, for communicating capabilities, to share specific information among relevant response organizations and the transporter.

Nigerian Nuclear Regulatory Authority experts estimated that there are thousands of radioactive sources and 234 legacy industrial radioactive sources in Nigeria of various activity, which are all believed to be of Soviet-era/Russian origin and which contain Cs-137 and Co-60.[2]

Legacy Sources: Vulnerability and Security Implications

The legacy sources which are believed to be present in Nigeria have a potential to pose safety and security threats. In addition to having hazardous effects on health and environment when breached or mishandled (e.g by metal scrap collectors), they can be obtained by criminal or terrorist groups with an intent of constructing a radiological dispersal device (RDD). According to the IAEA reports, Cs-137 and Co-60 have been involved in numerous illicit trafficking incidents, and radioactive sources that are used in industrial and medical applications are particularly vulnerable. [3]

Presence of terrorist organizations in Nigeria and in Sub-Saharan region calls for concern because of security risks posed by the legacy sources at this and other sites. Access to these sources can have security implications both on domestic and regional level. It is not clear how much knowledge and expertise various criminal groups have about RDDs. However, they may have links to international terrorist organizations who may have such expertise, which make the threat of radiological terrorism in Nigeria and its neighboring countries real.

Past and Current Efforts to tract Radioactive and Nuclear Materials

Many countries show their commitments to nuclear security by improving their capacities to safely manage radioactive sources and secure them from malicious uses. However, by failing to explore technological advancement, less improvement is achieved in real time tracking of the movement of nuclear and radiological materials, most especially in developing countries like Nigeria. To enhance security and monitor the state of health of nuclear and radioactive sources in transit, more organizations are implementing remote electronic tracking and monitoring systems. If applied effectively and integrated successfully into a proper transport control system appropriate to the particular nature of the consignment, such systems can provide an added layer of security and functionality [4].

Nigeria conducted a number of national and international measures (in cooperation with the IAEA and US DOE GTRI) aimed at securing such sources. These include:

- Developing a national strategy for the management of legacy and orphan sources;
- Repatriation of high risk legacy sources, including Co-60 sources of Canadian and Soviet origin from a cancer treatment facility (Lagos University Teaching Hospital);
- Hosting IAEA International Nuclear Security Advisory mission;
- Organizing a Technical Expert mission (IAEA, US, Russia) to ASCL;
- Creating an inventory for radioactive sources in Nigeria ;
- Establishing an Inter-ministerial Committee on National Security;
- Revising and updating national legislation in the area of nuclear security;
- Developing a National Response Plan to deal with incidents involving radioactive materials;
- Organizing workshops and expert meeting to include tracking of radioactive source as part of the transport regulations
 - Invited tracking company and experts to make presentations on the possibilities of tracking nuclear materials and radioactive sources
 - Conducted transport security plan workshop
 - Reviewed the Nigerian Transportation of Radioactive Source Regulation 2016.

Proposed Solutions to Securing Radioactive Sources and How it Works

The author examine the possibility of adpting some tracking models similar to existing models used by developed countries to track nuclear materials :

An electronic tracking device is affixed to a transport conveyance (e.g. rail car, lorry cab, ship) or package in order to visibly track nuclear materials while they are in transit. A global positioning system (GPS) will be used, a satellite communication or cellular general packet radio service (GPRS) working together is to provide and transmit information. The GPS unit can identify the location of the device to within three meters anywhere in the world where GPS coverage exists.



Figure 2: Basic tracking systems Source: Google, 17 July 2019

Either the satellite transponder or the GPRS unit transmits the GPS data (location) information over the communication network to a server that enables viewing of the information.

Hosting the Monitoring Station

There are two types of electronic monitoring typically offered. The first is a hosted service that is engaged to receive and store on its server all data regarding the location of the device, as well as any other information requested. The Regulatory Authority may contract the hosted service to a service provider and can view the data via a secure web browser using the appropriate usernames and passwords. The second monitoring option is for the Regulatory Authority to host the service themselves. This enable the authority to protect the information within its own computer network and keep sensitive information's to themselves "on need to know bases" without the knowledge of a second party, have full control of all data received, and decide how it will be displayed. This option is more capital intensive, it will require lots of money and expertise

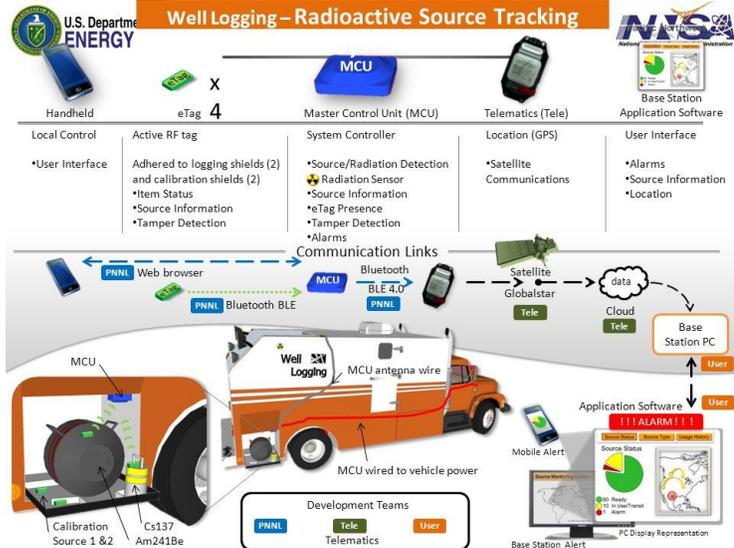


Fig 3 showing the USDOE model for tracking well logging sources. Source: USDOE

Conclusions

Tracking of Nuclear materials and radioactive sources in Nigeria and other African countries with presence of large amount of sealed sources is very important, it's high time for these countries to start implementing the electronic tracking systems, because nuclear and other radioactive materials are potentially most vulnerable while they are being shipped from one location to another, most of these countries do have security challenges shipments need to be monitored carefully from cradle to grave to avoid nuclear security incident as a result of theft. Women would have a great role to

play in these aspects because empowering female voices at every level of the policymaking process is the most crucial and most effective form of establishing feminist, nuclear security, non-proliferation and disarmament policies. The implementation of electronic tracking system may be achieved quickly by including more women in nuclear security policy delegations and deliberations, putting them in charge of implementation, having them lead discussion, deliberations and implementations of developmental ideas and technological advancement a lot can be achieved due to the passionate nature of women.

Although the IAEA provides general recommendations and guidance for tracking nuclear materials, no specific requirements pertaining to electronic tracking exist.

It is necessary to note that when considering to implement an electronic tracking programme, the first step is to clearly identify the objective of wanting to track nuclear and other radioactive materials, the various method of transport that will be used to move the material, the activity and the justification for tracking and how best to track it.

To achieve full compliance the competent authorities, i.e. the regulatory body has to make it a requirement for licensee's and operators to include electronic tracking system in there transport security arrangements, the regulatory authority too has to be ready to provide the plat form for tracking nuclear and radioactive materials by adopting one of the two electronic monitoring systems.

In conclusion electronic tracking systems have many benefits, depending on the particulars of the shipment; if applied effectively, they will add extra layer of security and functionality to materials transport.

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