

DISPOSAL OF RADIOACTIVE WASTE IN NIGERIA

1. Origin, type, form and amount of radioactive waste disposed of in Nigeria

Use of radioactive sources in Nigeria is common in the petroleum, mining, manufacturing, construction industries, and also in the agricultural & water resources, health sector, education & research and in custom and screening. These sources are either sealed, where they are primarily sealed in capsules, closely bounded in solid forms or unsealed, where there are not sealed nor closely bounded.

The main radioactive waste management options available at the moment for the disused sealed sources and spent research reactor fuel include return to the supplier or manufacturer, and this forms part of the licensing conditions to ensure its compliance. Others include authorized reuse or transfer to another user and authorized storage. This is against the backdrop of non availability of suitable disposal facilities in the country. For radioactive waste, usually in liquid form, arising from use of unsealed sources in nuclear medicine, disposal in sanitary sewers are common but with approval from the Authority. The radionuclides in these types of wastes are exempt because of its low activity and short half-life (usually below, or stored to decay to clearance level) and may be cleared from regulatory control. There are also high activity solid sealed sources such as sources used in radiotherapy. However, management of depleted uranium used as container for storage and transporting these sources remain a significant radiation risks, even though the amount of radiation emitted is quite low. Technically enhanced naturally occurring Radioactive Materials (TENORMs) are another type of wastes, although occurring naturally, but enhanced through human activities, particularly in the mining, oil & gas industries. These wastes, which can be in any physical form, may be released for unrestricted use provided they

are below clearance levels and all other requirements fulfilled as provided by the Authority.

2. The Standards Used to Protect the Population

The standards required to ensure the protection of the population from activities involving disposal of radioactive waste have been drafted in three (3) regulations and the Nuclear Safety and Radiation Protection Act 1995, establishing the Nigerian Nuclear Regulatory Authority (NNRA) some of which have been reviewed to incorporate recent changes and updates in international safety standards, particularly the International Atomic Energy Agency (IAEA) safety standards, with the overall purpose of strengthening existing measures, and introducing new ones to enhance protection of the people. The Regulations include the Nigerian Basic Ionizing Radiation Regulations 2003 (NiBIRR), Nigerian Radioactive Waste management Regulations 2006 and Nigerian Naturally Occurring Radioactive Materials (NORM) Regulations 2008. The requirements in the regulations make it mandatory for radioactive waste or NORM generator not to discharge radioactive effluents or radioactive releases into the environment for unrestricted use unless it is below relevant clearance levels established by the Authority for that particular radionuclides, and with adequate authorization. The activity or activity concentrations established as clearance levels, which are not to be exceeded, guarantee most probably that public is unlikely to be exposed beyond 0.25mSv/y. For disposal in repository in geological formation below the earth surface, such repositories must be approved by the Authority and most conform to the type of waste as indicated in the regulations. However, these types of disposal facilities are yet to be available

3. How the Joint convention on the Safety of spent fuel management and on the safety of radioactive waste management addresses

concerns about the import of waste from other countries

The convention addresses concerns about the import of waste from other countries by recognizing that every state (country) has the right to ban import into its territory of foreign spent fuel or radioactive waste. The convention also allows, provided it's included in regulatory framework, for implementation of agreements or understanding between contracting parties that allow accepting or returning back disused sealed sources to a manufacturer qualified to receive and possess the disused sealed sources in the territory where it originated (Article 28). Additionally, the convention stated conditions for transboundary movement of spent fuel or radioactive waste (Article 27), and among such conditions include prior notification and authorization and subject to international obligations which are relevant to the particular modes of transport utilized. Contracting Party which is a State of origin shall authorize a transboundary movement of spent fuel or radioactive waste only if it can satisfy itself in accordance with the consent of the State of destination that it has the administrative and technical capacity, as well as the regulatory structure needed to manage the spent fuel or the radioactive waste in a manner consistent with the convention. Nigeria will not accept any radioactive waste into her territory for disposal or other purposes. Regulation 11 of the Nigerian Radioactive waste management regulations prohibits the importation of radioactive waste into the country. Nigeria will not however accept any radioactive waste into her territory for disposal or other purposes. Regulation 11 of the Nigerian Radioactive waste management regulations prohibits the importation of radioactive waste into the country.

4. Liabilities due to Radioactive waste disposal each year in Nigeria

There is no radioactive waste disposal facility for now in Nigeria. The NNRA pays up to three

million five hundred thousand naira (N3,500,000.00) annually to centre for energy research and training (CERT) Zaria waste storage facility for the storage of legacy radioactive sources prior to taking final decision regarding their repatriation to country of origin or permanent disposal in near surface or geological facility envisaged to be developed in the future. However, Nigeria supports the International community policy adoption through the development of the IAEA's waste standards that storage of radioactive waste is an interim measure and national policy should regard disposal as the ultimate solution for dealing with radioactive waste. Also, more liabilities are expected as the country embark on environmental radiological survey of potential NORM contaminated sites across the country. Contaminated sites will be characterized and appropriate remedial actions constituted.

5. Proposed disposal technology for Nigeria

The disposal technology is most appropriate, provided the practice of disposal is without significant uncertainties (precautionary principle), for intractable radioactive waste because it prevents a situation of passing the burden of waste management to future generation. It also reduces the likelihood of human and environment intrusion to waste. However, the technology is still subject to study. It is recommended that borehole disposal of disused seal sources (BOSS System) should be the most appropriate for Nigeria now considering the type and quantity of radioactive waste available in long-term storage. The BOSS system is a safe, economic, practical and permanent means of disposing of disused sealed radioactive sources. Other options of disposal facilities will definitely be considered when Nigeria begins to operate nuclear power plant and in line with the policy and strategy for radioactive waste and spent nuclear fuel management

6. Characteristics of a near surface repository for low and intermediate waste and for high level waste

The half-life (time taken for the activity of a radionuclide to reduce by one-half) and activity of relevant radionuclides determine the classification of the waste for long-term storage and disposal. The activity concentration and half-life of relevant radionuclides in waste also determines the depth burial and isolation required to contain the waste. Near surface repositories are for disposal of radioactive waste that consist of radionuclides with activity or radioactivity which may be slightly more than clearance limit (activity of radionuclide at or below which it can be free from regulatory control). The radionuclides may be short-lived or long-lived or combination of both but more of short-lived radionuclides. There are two particular types of this repository. One is a landfill facility that requires limited regulatory control and may also contain other hazardous wastes. The other consists of engineered vaults or trenches in near surface disposal facility for robust isolation and containment of the waste for a period of up to few hundred years because the activity of radioactive waste in this classification is higher than those for disposal in landfill facilities. The former are for very low level radioactive waste (VLLW), while the later are for low level radioactive wastes (LLW). The intermediate and high level wastes (ILW & HLW) consist of engineered disposal facilities situated in deep and stable geological formations that require greater degree of containment and isolation than that provided for near surface. The HLW facility provides for dissipation of heat considering that the radionuclides have very high radioactivity that generate heat while the ILW facility does not provide for heat dissipation.

7. Progress made in Nigeria to safely manage radioactive waste

The problem of managing radioactive waste in Nigeria still exists, however this is a common global issue. One of the challenges of management of waste in Nigeria is having adequate infrastructure to manage large volume

of waste, particularly arising from the management of NORM and radioactive sources which had been abandoned before the establishment of the NNRA, or sources whose owners are no longer capable of managing (orphan or Legacy sources). In addressing this issue, through a memorandum of understanding with Center for energy research and training (CERT) Zaria storage facility, legacy or orphan sources are temporarily stored at CERT prior to identifying owners to repatriate back to supplier or manufacturer country, and also while an acceptable disposal facility is onboard. The NNRA, in its efforts to increase compliance with NORM management regulations, and for effective management, licensed Metrix Radiological Waste and Environmental Management Nigeria Limited (Metrix) as consultant, to interface with NORM generating companies, bringing its professional expertise and experience to bear in the management of NORM. Additionally, Low and Intermediate level radioactive waste management facility is under construction by the Nigerian Atomic Energy Commission at Sheda, for processing and long term storage of low and intermediate level radioactive waste from industries and nuclear power plant (NPP) which is yet to come on board. The international community has adopted the policy through the international Atomic Energy Agency (IAEA) waste standard that storage of waste is an interim measure, and that national policy should regard disposal as the ultimate solution to dealing with the waste. In this regard, a radioactive waste management policy and strategy document has been developed for Nigeria and at advance stage of adoption into law. This policy document lays emphasis on the direction of the country as regards to management radioactive waste, and ensures that there is adequate provision for effective and safe management and disposal of radioactive waste.

Conclusion

The Nigerian Nuclear Regulatory Authority (NNRA) is actively involved in the ongoing development of safety and security regime for a robust regulatory control regime for all activities associated with radioactive waste in line with best international practice. Part of the steps being taken to ensure that all phases in the lifecycle of radioactive waste, particularly its disposal perform safely and securely are noted in this write-up

References

- Draft Nigerian Radioactive waste Policy and Strategy framework
- Draft Nigerian Radioactive waste and spent nuclear fuel Regulations
- Joint Convention on the safety of spent fuel management and on the safety of radioactive waste management
- Nigerian Basic Ionizing Radiation Regulations 2003 (NiBIRR)
- Nigerian Radiation Safety in the management of NORM Regulations 2008
- Managing Radioactive Waste in Australia (Australian Radiation Protection and Nuclear Safety Agency Radioactive)

JIMOH L. Taiye

Nigerian Nuclear Regulatory Authority (NNRA)