

WASTE MANAGEMENT POLICIES FOR (CANDU) SPENT FUEL IN NIGERIA

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ABSTRACT

For every Nuclear Power Plant, the convention on the safety of spent fuel management and on the Safety of Radioactive Waste Management as well as Convention on the Physical Protection of Nuclear Material recommend that, there must be solid plan for waste management. Nigeria has signed and ratified these conventions.

It is the objective of this convention to ensure that a National Plan for the safe and sustainable Management of Radioactive Waste and Spent Nuclear Fuel is developed, including minimization of the generation of radioactive waste during the design, operation and decommissioning stages of radioactive waste management facilities as well as ensure the physical protection and security of such facilities in order to prevent the unauthorized access of individuals and unauthorized removal of radioactive materials from them.

1. Introduction

Nuclear technology applications have been on the increase in Nigeria. The use of radioactive materials in the fields of research, medicine, industry, agriculture, commerce, education and defense; as well as the extraction, processing and combustion of raw materials containing naturally occurring radioactive materials are among the most prominent. Other emerging activities include the development of nuclear reactors for research and electricity generation purposes. These activities generate radioactive wastes, which contain materials that emit ionizing radiation, and have been recognized as a potential hazard to human health and the environment.

2. Brief Overview of Nigeria

Nigeria is the most populous in Africa with over 170 million, situated on the Gulf of Guinea, with capital city-Abuja,36 states,6 geopolitical zones, with 3 major languages comprises of (Hausa, Igbo, and Yoruba),the country has four major International Airport through which goods and services are imported into the country, namely: (Abuja, **Lagos**, Port-Harcourt and Kano) with major sea ports (Port-Harcourt, Calabar, Lagos and Warri) the country also has neighboring countries (Benin, Niger, Cameroon and Chad).



Fig 1:Map Of Nigeria

3. International Obligations

Nigeria is a member state to the IAEA. In her drives for the peaceful application of nuclear technology has signed and ratify the following treaties and convention.

- ❖ 1964- Nigeria joined the IAEA
- ❖ 1968-Signed the NPT
- ❖ 1988- Signed the Comprehensive Agreement
- ❖ 2001- Signed the Protocol Additional to the Safeguards Agreement
- ❖ 2003- The CSA was brought into force
- ❖ 2006- Accepted the Code of the Safety and Security of Radioactive Source
- ❖ Convention on Nuclear Safety
- ❖ Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
- ❖ Convention on the Physical Protection of Nuclear Materials
- ❖ The Africa Nuclear-Weapon-Free Zone Treaty (Pelindaba Treaty)

4. National Framework

The Nigerian Nuclear Regulatory Authority (NNRA) was established by the Act No 19 of 1995. The Act charged the NNRA with the responsibility of nuclear safety and radiological protection regulation in Nigeria. Perform all necessary functions to enable Nigeria meets its International and National safeguards and safety obligations in the application of nuclear energy and ionizing radiation; Liaise

with and foster co-operation with international and other organizations or bodies concerned having similar objectives.

5. National Institutional Framework

The Nigeria Atomic Energy Commission (NAEC) was established through the enactment of Act 46 of 1976 as a specialised agency for the promotion and development of nuclear energy and technology. It has the mandate to develop the framework and technical pathway to explore, exploit and harness atomic energy for peaceful application in all its ramifications for Social-economic development of Nigeria.

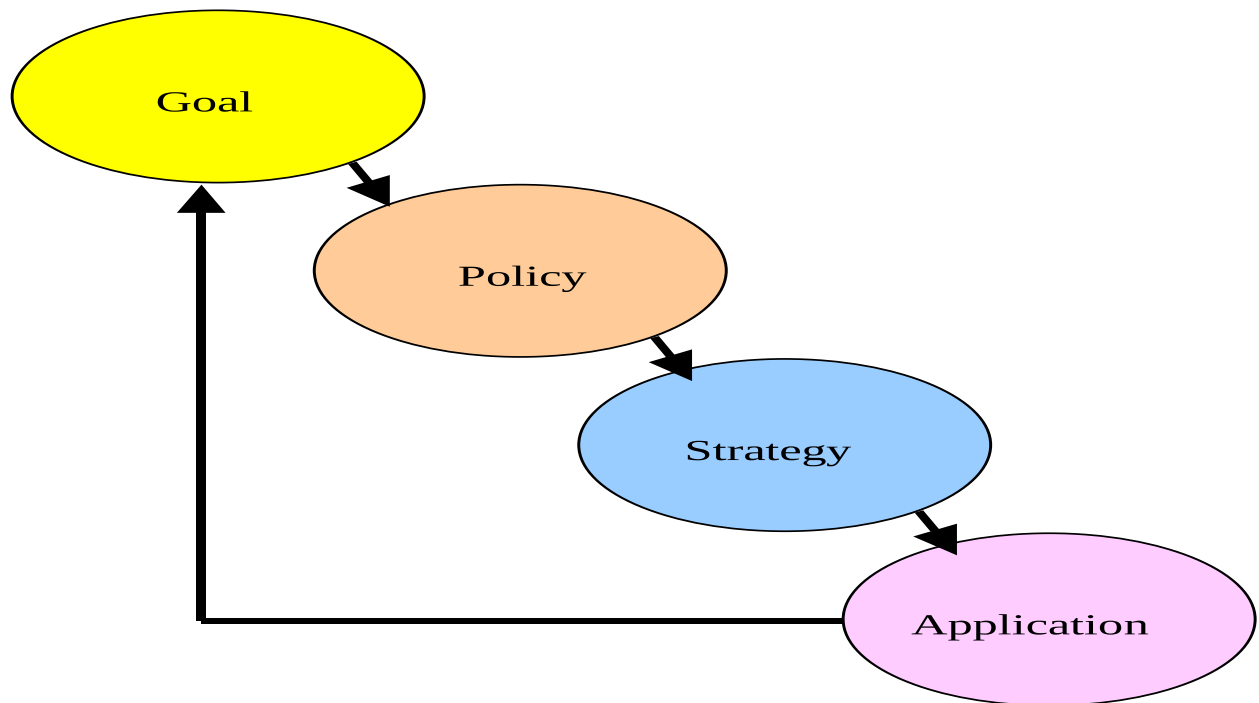


Fig 2. Plans for Waste Management

6. National Radioactive Waste Management Policy and Strategic Plan

The Policy on Radioactive Waste and Spent Nuclear Fuel Management has been developed and the draft waiting for final approval.

- It serves as a national commitment to address the country's radioactive waste issues in a coordinated and cooperative manner.
- It stipulates that the management of radioactive waste in Nigeria shall be performed in a safe, secure and sustainable manner, in accordance with national objectives and recognized international principles to protect individuals, society and environment from the harmful effects of ionizing radiation due to spent fuel, DSRS and radioactive waste, both now and in the future.
- It asserts that all radioactive waste management activities shall be conducted in an **open** and **transparent** manner, and the public will be provided access to information regarding waste management where this does not infringe upon national laws, security and defense.
- It specifies financial arrangements that ensure coverage of long-term liabilities resulting from :
 - i. Management of radioactive waste,

- ii. Decommissioning of facilities,
- iii. Remediation of contaminated sites,
- iv. Post-closure environmental monitoring of former nuclear sites.

It ensures:

- i. The minimization of radioactive waste generation during the Plant Life.
- ii. The physical protection and security of such facilities in order to prevent the unauthorized access of individuals and unauthorized removal of radioactive materials from them.
- iii. This Policy covers the following:
- iv. Future operation of nuclear reactors and other facilities within the nuclear fuel cycle;
- v. Current and future production and use of radioactive materials in the fields of research, medicine, industry, agriculture, commerce, education and defense;
- vi. Extraction, processing and combustion of raw materials containing naturally occurring radioactive materials (NORM); and
- vii. Environmental restoration programmes associated with any of the above.
- viii. The decommissioning of nuclear installations and other facilities at the end of their operational lifetime;
- ix. This Policy also establishes the roles and responsibilities of the organizations and the bodies concerned with radioactive waste management in Nigeria.

7. Applicable National Regulations for RWM in Nigeria

The Policy on Spent Nuclear Fuel and Radioactive Waste including DSRS is based on:

- i. Nigeria Atomic Energy Commission (Establishment) Act 46 of 1976
- ii. Nuclear Safety and Radiation Protection Act 19 of 1995 establishing the Nigerian Nuclear Regulatory Authority (NNRA)
- iii. Nigerian Radioactive Waste Management Regulations 2006
- iv. Nigerian Regulations for Safety and Security of Radioactive Sources
- v. Nigeria Basic Ionizing Radiation Regulation 2003
- vi. Nigerian Safety Regulations for the Management of Naturally Occurring Radioactive Materials (NORM) Regulations 2008
- vii. Nigerian Transportation of Radioactive Sources Regulations 2006(under review)
- viii. Nigerian Safety and Security of Radioactive Source Regulation 2006
- ix. The management plan shall also be in consonance with the provisions of other relevant authorities and regulations in the country, for example; Ministry of Environment, Ministry of Solid Mineral Development, Department of Petroleum Resources and National Emergency Management Agency etc. and in consonance with the provisions of international agreements to which Nigeria is a signatory.
- x. All the regulations implement international best practices as contained in the International Basic Safety Standard for Protection against Ionizing Radiation and for the Safety of Radiation Sources (BSS), other IAEA documents (GSR Part 3 and 5)and the provisions of the Act.

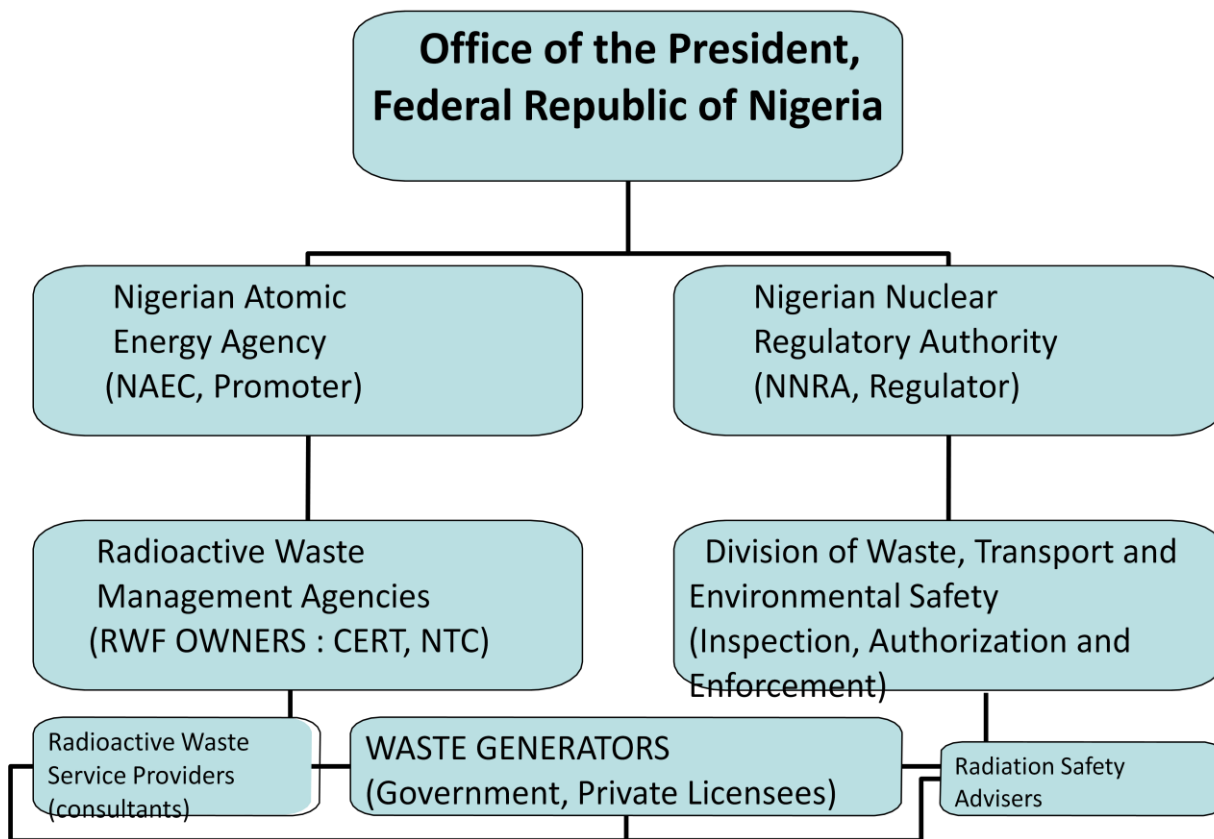


Fig. 3: Organogram for Radioactive Waste Management Programme In Nigeria.

8. Guidance Document

It is also important to note that the Nigerian Government have developed relevant Guidance Documents, they include the following:

- i. Guidance for Maintenance Engineers and Technicians
- ii. Guidance for the Provision of Dosimetry Services in Nigeria
- iii. Guidance for Licensing of Nuclear Research Reactor in Nigeria
- iv. Guidance for Licensing of Gamma Irradiation facility in Nigeria
- v. Guidance on the training and qualification of Research Reactor Operators in Nigeria
- vi. Guidance on the Licensing process for Nuclear Power Plants in Nigeria
- vii. Guidance on development, implementation and maintenance of Design Basic Threats for Nuclear and other Radioactive Material in Nigeria

9. Public Information

The public shall be provided access to information regarding nuclear activities where this does not infringe upon national laws, security and defense. The public shall participate fully in decision making through committees at community levels.



Fig 4: Public Reaction (RWM)

10. Relevance of CANDU in Nuclear Power Plant Program In Nigeria

Today, Nigeria has made the political decision to generate electricity from NPP and has therefore committed herself to the international nuclear requirements for nuclear safety, security, safeguards and liability regimes. It is an accepted norm that a Country embarking on a NPP must ensure the protection of lives and environment through the management of radioactive waste. **CANDU** seems an open and good alternative to Nigeria, since Nigeria is still an embarking **Nuclear Power Plant Program** country and therefore, an available bride to countries that have well developed NNP program and experience in waste management such as Atomic Agency of Canada.

The following reasons and consideration best explains why CANDU is an option:

- i. CANDU type unit is presently been used in Pakistan and India, which has a lot of similarities with Nigeria, in terms of population and economic policies.
- ii. Part of The Nigeria legal system, especially the Penal Code has part of its origin from India Pakistan

11. National Position on Radioactive Waste Management

- Expansion of RWSF in Zaria with assistance from the USDOE (completed)
- Packaging of disused sealed Radioactive sources used for the steel Industry in Ajaokuta for transportation and safe storage
- Training of staff on Radioactive Waste Management, Regulation and Radiation Protection
- Search and Secure operations for recovery of abandoned sources

The End-of-Mission Report on the “Development of Guidance Documents for the Licensing and operation of Nigeria’s Radioactive Waste Management Facilities” held in 2012 recommended:

- i. Establishment of a comprehensive national radioactive waste inventory
- ii. update the national inventory and establish a national waste registry
- iii. Conversion of HEU to LEU for NIRR-1
- iv. Survey of Depleted Uranium
- v. Draft Nigerian Regulation for Licensing of Nuclear Research Reactor in Nigeria
- vi. MOU between NNRA and NAEC on collaboration to establish a comprehensive national inventory and registry of radioactive wastes and disused sources
- vii. Training on the Use of SAFRAN and RAIS tools in Safety Assessment of waste facilities

12. Challenges

- ❖ **Manpower Development:** Capacity building of competent technical staff in the field of RWM and SNF is a challenge because Nigerian is a new comer country, who seeks to develop competences in these areas.
- ❖ **Repatriation of Legacy Sources:** This legacy source predates the establishment of NNRA and hence, pose a problem for repatriation because some of the manufacturing company have seized to exist and most have gone bankrupt

13. Funding

The national policy specifies Government’s commitment to adequately fund of Radioactive Waste Management in Nigeria.

- i. Establishment of a Radioactive Waste Management Fund (RWMF)
- ii. To ensure there is enough financial provisions to fund long-term RWM options for various waste forms.
- iii. RW generators, operators of nuclear facilities, State Departments amongst others will be funding the RWMF as contributors to the fund
- iv. An exclusive entity in charge of the fund (waste management organization) shall invest it for sustainability in accordance with financial regulations of the policy

14. Future Plan

Nigeria:

- Is planning to build a Nuclear Power Plant to add to its energy generation mix.
- Nigeria is in mile stone 2 of the IAEA mile stone approach
- Educational and training programme is planned
- Inter governmental agencies agreement signed

15. Conclusion

- There is need to develop capacity for the management of radioactive waste and enforcement of safety and security of radioactive sources regulations in Nigeria
- The Authority needs to ensure quick passage of the **Nuclear Safety, Security and Safeguard Bill** to repeal the Nuclear Safety and Radiation Protection Act, No 19 of 1995

16. References

1. International Atomic Energy Agency, *Policies and Strategies for Radioactive Waste Management Nuclear Energy Series No. NW-G-1.1*, IAEA Vienna (2009).
2. Federal Republic Of Nigeria, *Nigeria Atomic Energy Commission (Establishment) Act No. 46* (1976).
3. Federal Republic of Nigeria, *Nuclear Safety and Radiation Protection Act No.19*, Establishment of the Nigeria Nuclear Regulatory Authority (1995).
4. Nigerian Nuclear Regulatory Authority, *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, Nigerian National Report, NNRA, Abuja* (2008).
5. Nigeria Atomic Energy Commission, *Overview of Draft Policy Strategy for Radioactive Waste Management in Nigeria*, National Stakeholders Workshop, IAEA – NAEC, Abuja, (2010).
6. Atomic Energy Agency, *Options For Management of Spent Fuel and Radioactive Waste for Countries Developing New Nuclear Power Programmes, Nuclear Energy Series No. NW-T-1.24*, IAEA Vienna (2013)
7. International Atomic Energy Agency, *Management of Waste from the Use of Radioactive Material in Medicine, Industry, Agriculture, Research and Education*, IAEA Safety Standards Series No. WS-G-2.7, IAEA, Vienna (2005).