



NIGERIAN  
NATIONAL  
REPORT

2017

SIXTH REVIEW MEETING OF THE JOINT CONVENTION ON  
THE SAFETY OF SPENT FUEL MANAGEMENT AND ON THE  
SAFETY OF RADIOACTIVE WASTE MANAGEMENT



## FOREWORD

Nigeria became a party to the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management (Joint Convention) in 2007

*Article 32* of the JC states that: "In accordance with the provisions of *Article 30*, each Contracting Party shall submit a national report to each review meeting of contracting parties.

Sequel to above, Nigeria is presenting her National Report to the Sixth Review Meeting of the Joint Convention showing developments since the last Review meeting. This report shall address the measures taken to implement each of the obligations of the Convention.

Radioactive sources are widely used in various sectors in Nigeria such as Education and Research, Petroleum and Gas industry, Health, Agriculture and other sectors of its economy. Sequel to the above, The Federal Government of Nigeria has implemented all necessary programmes, policies and framework to express her commitment in the ratification of all international conventions related to radiation protection and nuclear safety which culminated to the accession to the Joint Convention on the Safety of Spent Fuel Management & Safety of Radioactive Waste Management as contained in the instrument deposited with the IAEA in 2007.

This Report highlights safety issues in Nigeria's quest for proper management of radioactive waste. The report also considers the steps to be taken in handling the spent fuel that is generated at NiRR1 and those expected from other Nuclear Installations

**Part A** is the introduction. **Part B** deals with Policies and Practices. Scope of Application is in **Part C**. while, inventory of radioactive waste is described in **Part D**. Legislative and Regulatory framework regarding radioactive waste management in Nigeria are highlighted in **Part E**. General safety provisions regarding building competences in both regulators and operators as well as emergency preparedness in the radioactive waste facilities is captured in **Part F**. Safety of Spent Nuclear Fuel and Radioactive Waste are described in **Parts G & H**. Trans-boundary movement and issues bordering on Disused sealed radioactive sources, are mentioned in **Part I & J**. Nigeria has instituted several planned activities for the purpose of improving both the safety and security of radioactive waste generated within its territory as documented in **Part k**. Finally, **Part L** highlights several annexes which are relevant to this report.

## **TERMINOLOGY**

**ACT** ó The Nuclear Safety and Radiation Protection Act, 1995

**ASCL** – Ajaokuta Steel Company Limited

**CERT**- Centre for Energy Research and Training Zaria, Nigeria

**CRWMF** - Centralized Radioactive Waste Management Facility

**DSRS**- Disused sealed radioactive sources

**GSR** ó General Safety Requirement

**IRRS** ó Integrated Regulatory Review Services

**LILW** -Low and intermediate level radioactive wastes

**NAEC**-Nigeria Atomic Energy Commission

**NCRWM**-National Committee on Radioactive Waste Management

**NiBIRR**-Nigeria Basic Ionizing Radiation Regulations 2003

**NNRA**-Nigerian Nuclear Regulatory Authority

**NRWMPS** - Nigerian Radioactive Waste Management Policy and Strategy

**NRWMR** ó Nigeria Radioactive Waste Management Regulations, 2006

**NTC**-Nuclear Technological Centre

**PSA** - Project Supply Agreement

**RWMO** ó Radioactive Waste Management Organization

**RWSNFF**-Radioactive Waste and Spent Nuclear Fuel Fund

**RWTSF**-Radioactive Waste Temporary Storage Facility

**SAFRAN**-Safety Assessment Framework

**SARIS** ó Self Assessment of Regulatory Infrastructure for Safety

**SHESTCO** ó Sheda Science and Technology Complex

**SNF**-Spent nuclear fuel

**SSR** ó Specific Safety Requirement

**TAC**-Technical Advisory Committee

**WMO**-Waste Management Organization

**WTE**-Waste Management, Transport and Environmental Safety (division of the Department of Radiological Safety in NNRA)

**WTSF**-Waste Treatment and Storage Facility

## **CONTRIBUTORS TO THE NATIONAL REPORT**

The Nigerian Nuclear Regulatory Authority prepared this report incorporating contributions from:

Center for Energy Research and Development, Zaria

Nigeria Atomic Energy Commission, Abuja

Nuclear Technology Centre, Sheda, Abuja

Fig. 1: Organogram for Radioactive Waste Management Programme in Nigeria

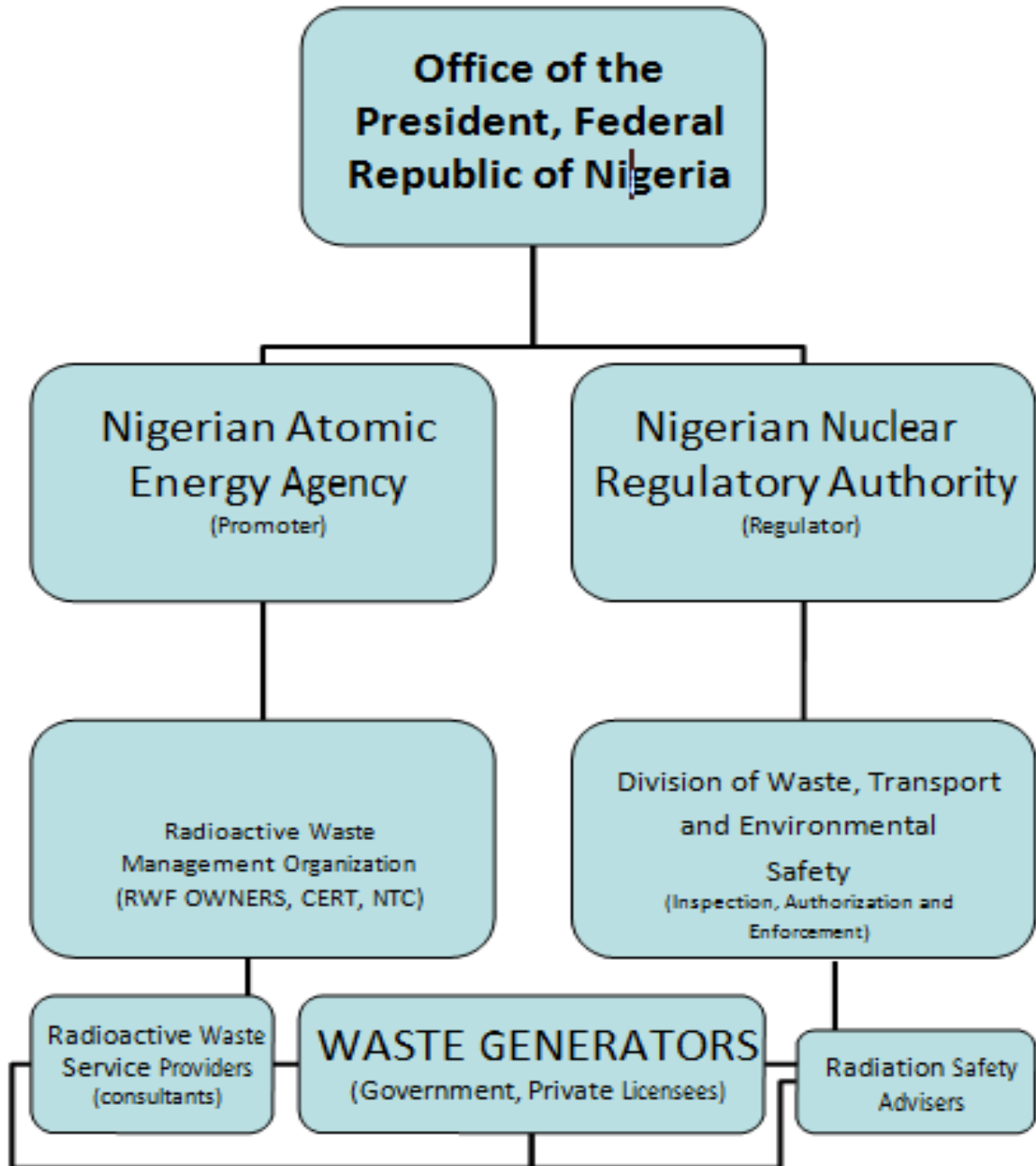


Fig. 2: Locations of Radioactive Waste Management Facilities in Nigeria





**Plate 1: Temporary Storage at ASCL, Ajaokuta, Kogi State**



Legacy Radioactive sources used in gauges by the defunct Steel Company are stored in this facility prior to repatriation or permanent decision on disposal



**PLATE2: Radioactive Waste Management Building at CERT Zaria.**



**ACCESS SECURITY BARRIERS**



**MAZED ENTRANCE TO VAULT I.**



**INSIDE VAULT I.**



**ENTRANCE TO VAULT II WITH A FORK LIFT.**

# CONTENTS

Foreword	i
Terminology	ii
Contributors to the report	iv
Fig. 1: Organogram for Radioactive Waste Management Programme in Nigeria	v
Fig. 2: Map showing the Locations of Radioactive waste storage and management facilities in Nigeria	vi
Plate 1: Legacy Sources Temporarily stored in Ajaokuta	vii
Plate 2: Temporary Radioactive Waste Storage Facility, CERT, Zaria	viii
Contents	x
A. INTRODUCTION	1
B. POLICIES AND PRACTICES	2
C. SCOPE OF APPLICATION	3
D. NATIONAL RADIOACTIVE WASTE REGISTRY	4
E. LEGISLATIVE AND REGULATORY SYSTEM	4
F. OTHER GENERAL SAFETY PROVISIONS	6
G. SAFETY OF SPENT FUEL MANAGEMENT	7
H. SAFETY OF RADIOACTIVE WASTE MANAGEMENT	7
I. TRANSBOUNDARY MOVEMENT	8
J. DISUSED SEALED SOURCES	8
K. PLANNED ACTIVITIES TO IMPROVE SAFETY	8
L. ANNEXES	10
Annex A ó List of Spent Fuel Management Facilities	10
Annex B - List of Radioactive Waste Management Facilities	10
Annex C - List of Nuclear Facilities in the process of being Decommissioned	10
Annex D - Inventory of Spent Fuel	10
Annex E - Inventory of Radioactive Wastes	11

## **INTRODUCTION**

The Federal Government of Nigeria in 2005 made a political decision to deploy nuclear power for electricity generation in the country. The vital role that nuclear energy could play as a major source of base load electricity generation in the energy mix was recognized in the National Energy Policy, 2003. Deployment of nuclear power plants was also seen as a national strategy for diversifying the energy mix in the country, which would ensure sustainable development. Consequently, the National Nuclear roadmap was approved in February 2007 and the Technical Framework for the development and deployment of nuclear power plants for electricity generation in the country was approved. The National Strategy for its implementation was finalized and approved in December, 2009. Subsequently, Nigeria has ratified necessary instruments and is committed to International Best Practices and requirements for nuclear safety, security, safeguards and liability regimes.

There are diverse applications of nuclear techniques and radioactive sources in Nigeria. Some of which include: Oil and Gas Industries; Research Institutes; Medical Applications; Manufacturing and Construction Industries and Agriculture.

It is important to note that all the radioactive sources are imported mainly from the Group of Eight States and recently from South Africa, China and South Korea. The petroleum industry is the largest importer and user of radioactive sources in the country. There are thousands of radioactive sources for various applications in these practices. These practices include nuclear well-logging, industrial radiography, nuclear gauging, and radio-tracing amongst others. These activities generate radioactive wastes, which have been recognized as potential hazards to human health and the environment.

The low and intermediate level radioactive wastes (LILW) containing different radionuclides are diverse and variable in nature and with a wide range of radioactivity levels. The safe management of these wastes is essential for sustainable protection of human health and the environment.

The prime responsibility for safe management of radioactive wastes (spent fuel inclusive) lies with the organization generating the wastes. The responsibility for management of radioactive wastes (spent fuel inclusive) lies with the organization generating the wastes. The Nigerian Nuclear Regulatory Authority (NNRA) is responsible for regulating the management of radioactive materials as stated in section 6 of the Nuclear Safety and Radiation Protection Act 19 of 1995 (the Act 19 of 1995). Section 6 (a) of the Act provides that: the Authority shall have power to categorize and license activities involving exposure to ionizing radiation, in particular, the possession, production, processing, manufacture, purchase, sale, import, export, handling, use, transformation, transfer, trading, assignment, transport, storage and disposal of any

radioactive material, nuclear material, radioactive waste, prescribed substances and any apparatus emitting ionizing radiation

The management of Spent Fuel is aptly spelt out in the Draft Nuclear Safety, Security and Safeguards Bill (NSSS Bill). With the commencement of the NPP and the ratification of the necessary international treaties for a successful NPP, the Act was reviewed and a Draft Nuclear Safety, Security and Safeguards Bill (Bill) was developed by a Technical Cooperation Agreement with the IAEA.

The Nigeria Atomic Energy Commission (NAEC) was established by the Nigeria Atomic Energy Commission Act No. 46 of 1976 and charged with the responsibility for the promotion of the development of atomic energy and for all matters relating to the peaceful uses of atomic energy. Presently there is a draft bill for an Act to repeal the Nigeria Atomic Energy Commission (Establishment) Act 46 of 1976 as the National Agency for Development of Atomic Energy and to make comprehensive provisions for the use of Nuclear Energy

Nigeria is operating a 30kw miniature neutron source reactor (MNSR) for research and training at the Center for Energy Research and Training, Zaria. However, owing to the growing local, national and regional requirements and rapidly expanding stakeholders' needs, Nigeria plans to introduce a multipurpose research reactor at the Nuclear Technology Centre, Sheda to address the diverse stakeholders' needs at local, national and regional levels.

## **B. POLICIES, PRACTICES AND STRATEGY**

The Nigeria Radioactive Waste Management Policy and Strategy is the reference document concerning the management of RW and SNF. It also serves as a national commitment to address the country's RW and SNF issues in a coordinated and cooperative manner. The Federal Government of Nigeria provides leadership and gives policy direction regarding all RW&SNF management issues. The Government has the responsibility to provide adequate resources for the effective implementation of policies and programmes, the enabling environment, legal framework as well as fulfilling the national obligations in terms of international treaties and conventions with regard to RW & SNF management.

The NNRA and NAEC are by their respective mandates, the statutory and key agencies of the Federal Government responsible for developing policy and strategy on radioactive waste and spent nuclear fuel management.

The NNRA is charged with the development and enforcement of legal framework and regulatory control of radioactive waste (RW) and spent nuclear fuel (SNF) management; issuance of regulations, guidance and monitoring, licensing and other oversight functions necessary for the management of RW and SNF in Nigeria.

The NAEC is charged with the responsibility for the promotion of the development of atomic energy and for all matters relating to the peaceful uses of atomic energy; to acquire, treat, store,

transport and dispose of any radioactive substances in compliance with National Laws, Legislative and Regulatory Requirements. The NAEC, in collaboration with the stakeholders shall define the policy for the long-term management of radioactive waste from different waste streams and spent fuel; and draw up a strategy for the management of radioactive waste and spent nuclear fuel by the consolidation of individual RW generators' strategies into a coherent, comprehensive and integrated National Strategy complying with the RWM Policy objectives, principles and requirements.

The National Policy, Draft NSSF Bill and the Draft Regulation on Waste Management provide that all the generators of RW and SNF shall be responsible for all financial and administrative management of wastes generated. The execution of waste management plans, establishment and development of appropriate waste management facilities and processes for now shall be the responsibility of NAEC until such a time when the Waste Management Organization (WMO) is established.

The policy 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.

The National Policy specifies financial arrangements that ensure coverage of long-term liabilities resulting from: management of radioactive waste, decommissioning of facilities, remediation of contaminated sites and post-closure environmental monitoring of former nuclear sites

The National Policy ensures the minimization of radioactive waste generation during the design, operation and decommissioning stages of radioactive waste management facilities. It also lays emphasis on the physical protection and security of such facilities in order to prevent the unauthorized access of individuals and unauthorized removal of radioactive materials from the facilities

The National Policy for the Management of RW and SNF complies with all international Treaties and Conventions and also complies with all the provisions of the IAEA Joint Convention on the Safety of Radioactive Waste Management. The National Policy specifies government's commitment to adequately fund RWM in Nigeria. It also provides that an exclusive entity in charge of the fund shall invest it for sustainability in accordance with financial regulations

### **C. SCOPE OF APPLICATION**

This report covers the management of radioactive waste arising from facilities and activities in the industrial, research, agricultural and medical practices as well as LL& ILL radioactive wastes and SNF from nuclear power plants and other nuclear installations. The spent fuel referred to in this report will be generated from civilian applications only. No form of radioactive waste of Military origin has been declared in Nigeria; therefore, this report does not discuss this type of waste.



## **D. NATIONAL RADIOACTIVE WASTE REGISTRY**

Nigeria has fully adopted the Regulatory Authority Information System (RAIS) and has compiled an inventory of radioactive sources based on RAIS. However, a Plan is currently underway to carry out a comprehensive update of national inventory and establish a RW Registry using the Registry Software. This is to be done under a Memorandum of Understanding between NAEC and NNRA. The comprehensive national inventory will take into account all radioactive waste, spent fuel and sources (active, disused, legacy and orphan) in different practices in various locations in Nigeria. All radioactive sources will be quantified in terms of volume and number, characterized and their locations established. This will provide information for tracking the sources and make projections for their management, as well as to effectively implement programs of notification, inspection, authorization and enforcement.

## **E. LEGISLATIVE AND REGULATORY SYSTEM**

A draft copy of National Policy and Strategy on RW and SNF management was produced as an outcome of a National Stakeholders Workshop. This document has undergone numerous reviews to incorporate current updates and to reflect all that Nigeria is doing in the entire nuclear fuel cycle. The document presently at the IAEA; comprises of two parts. **Part1** is the National Policy, which addresses all policy related elements relevant to Nigerian Legislation, while **Part2** is the National Plan or strategy for the Safe and Sustainable Management of Radioactive Waste and Spent Nuclear Fuel in Nigeria.

NNRA has been empowered by Section 47 of the Act to make regulations prescribing anything required to be prescribed under the Act. The following regulations have been developed and are relevant to radioactive waste management and spent fuel;

- Nigeria Basic Ionizing Radiation Regulations 2003 (NiBIRR 2003)
- Draft NiBIRR, 2015 ( in line with GSR Part 3)
- Nigerian Radioactive Waste Management Regulations 2006 (NRWMR, 2006)
- Draft Nigerian Radioactive Waste and Spent Nuclear Fuel Management, 2014 (in line with GSR Part 5 & SSR Part 5)
- Nigerian Radiation Safety in NORM Regulations, 2008 (NRSNR, 2008)
- Nigerian Transportation of Radioactive Sources Regulations 2006
- Draft Nigerian Transportation of Radioactive Materials Regulations, 2016 (in line with SSR Part 6)
- Nigerian Safety and Security of Radioactive Sources Regulations 2006
- Draft Nigerian Safety and Security of Radioactive Sources

Other relevant legislations include:

- a) Nigeria Environmental Standards and Regulations Enforcement Agency Act 2007
- b) The Department of Petroleum Resources Act (as amended).
- c) National Office for Technology Acquisition and Promotion (NOTAP) Act No.82 of 1992
- d) Nigerian Investment Promotion Council (NIPC) Act No. 16 of 1995
- e) Nigerian Oil and Gas Industry Act 2b of 2010
- f) Public Procurement , Act of 2007
- g) The Electric Power Sector Reform Act no 6 of 2005
- h) National Policy on Energy

Nigeria is a signatory to the following international conventions and treaties:

- a) Joint Convention on the Safety of Spent Fuel Management and Safety of Radioactive Waste Management acceded to on 4<sup>th</sup> April,2007
- b) Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (1986),
- c) Convention on t<sup>he</sup> Prevention of Marine Pollution by Dumping of Wastes and Other Matter as amended (1994).
- d) The Convention on Nuclear Safety (CNS) ratified on 4<sup>th</sup> April,2007
- e) Convention on Physical Protection of Nuclear Material acceded to on 4<sup>th</sup> April,2007
- f) Amendment to the Convention on Physical Protection of Nuclear Material acceded to on 4<sup>th</sup> April,2007
- g) Convention on Early Notification of Nuclear Accidents ratified on 10<sup>th</sup> August, 1990.
- h) Convention on Assistance in the case of Nuclear and Radiological Accidents ratified on 10<sup>th</sup> August,1990
- i) Protocol Additional to the Agreement between the Federal Republic of Nigeria and the International Atomic Energy Agency for the Application of Safeguards in connection with the treaty on the Non-proliferation of Nuclear Weapons signed on 20<sup>th</sup> September, 2001.
- j) Vienna Convention to the Civil Liability for Nuclear Damage acceded to on 4<sup>th</sup> April, 2007.
- k) Revised Supplementary Agreement Concerning the Provision of Technical Assistance by the IAEA signed 13<sup>th</sup> March,1989
- l) Application of Safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons (with Protocol) signed February 29, 1988
- m) Agreement on the Privileges and Immunities of the International Atomic Energy Agency

Please note that the above list is not exhaustive.

## F. OTHER GENERAL SAFETY PROVISIONS

The NNRA in her oversight functions implemented a training programme to sustain manpower development to handle all matters pertaining to regulation and control of all types of RW and SNF Materials, the programme is still ongoing.

The siting, design, construction, operational and decommissioning stages for all proposed RWMF shall be licensed by NNRA in line with the Draft NSSS Bill, Regulations, Guidance and International Best Practices.

- Training of Staff on Radioactive Waste Management, Regulation and Radiation Protection through Bilateral and Multilateral cooperation with the IAEA and other friendly nuclear power countries.
- Nigeria, through the NNRA requested for and completed an Integrated Regulatory Review Services (IRRS) mission in July 2017. The review services covered aspects of radioactive waste storage and management. The report of the mission is being reviewed and may be released for the public. The NNRA has commenced a process to ensure that all recommendations and suggestions proffered at the mission are implemented. A follow up mission for the next 3 ó 4 years is under preparation

The NNRA has an emergency division which is being equipped to carry out supervision of emergency drills, exercises and rehearsals by operators of facilities involving radioactive sources including RWTSE. The division has also conducted emergency exercises in February 2016 involving off site accidents and events that could result in Trans-boundary movement of radioactive materials. The NNRA hosted Emergency Preparedness and Response Review (EPREV) mission in 2015 to improve our national emergency arrangement in line with IAEA Safety Standard GSR Part 7, and it has started implementing the recommendations from the EPREV Mission. It has plans to call for follow-up mission towards the end of 2019.

Records of events concerning radioactive waste management shall be kept by the Waste Management division of the NNRA.

All licensees shall ensure that all radioactive waste management operations are carried out in accordance with a suitable quality assurance programme commensurate with the scope of activity and as approved by the NNRA

All the recorded abandonment of radioactive sources carried out under NNRA supervision is from the oil and gas sector, specifically well logging. These abandonments are only permitted to commence by the NNRA after it has been reliably demonstrated by the operator that efforts to retrieve the radioactive source stuck in a hole has proved abortive. In line with international best practice, the NNRA ensures that the nature of the containment as well as the location of the abandonment is such that, radioactive release to the environment after a period of time is very minimal thereby reducing the possibility of contaminating the environment. There has been a total of thirty one (31) radioactive sources mainly **AM-241-Be** and **Cs-137** which has been properly abandoned via issuance of relevant NNRA licenses since 2010.

## **G. SAFETY OF SPENT FUEL MANAGEMENT**

Nigeria does not have a Nuclear Power Plant hence she has no spent fuel; however, Nigeria has successfully and safely operated a Nuclear Research Reactor (NIRR-1). NIRR-1 is the first nuclear reactor in Nigeria and it is sited at the Centre for Energy Research and Training (CERT), Ahmadu Bello University, Zaria. It was acquired specifically for neutron activation analysis, radioisotope production, training and research. NIRR-1 is a low power, tank-in-pool research reactor fueled with about 1 kg of HEU.

Nigeria, China and USA had a tripartite meeting and agreed to develop a joint statement on cooperation to the objectives of the High Enriched Uranium (HEU) to Low Enriched Uranium (LEU) fuel Conversion Programme for the NIRR -1. The two years project, is a joint undertaking of the Nigeria Atomic Energy Commission (NAEC), the China Atomic Energy Authority (CAEA), the U.S. Department of Energy's National Nuclear Security Administration (DOE/NNSA) and the IAEA, would be completed in July/August 2018 thereby making Nigeria the second of the five countries operating a Chinese-supplied Miniature Neutron Source Reactor (MNSR) to successfully convert and repatriate its irradiated HEU core to China.

Spent Fuel is also expected from the Multipurpose Research Reactor to be developed at the Nuclear Technology Centre, Sheda and Nuclear Power Plants.

## **H. Safety of Radioactive Waste Management**

The NNRA has an ongoing nationwide survey of radiation sources covering all sectors of the economy where sources of ionizing radiation are used. The inventory exercise is to ascertain the number and classification of practices using sources of ionizing radiation to aid the NNRA in the planning of its regulatory functions. The success of this exercise will in the long term enable the NNRA to effectively implement its programme of notification, inspection, authorization and enforcement using a graded approach.

The National Survey covers the following practices and activities:

- i Nuclear Gauges in the Manufacturing Industries
- ii Steel Rolling Plants and Scrap Metal Dealers
- iii NORM survey
- iv Depleted Uranium
- v Medical Applications

The National Survey result has revealed amongst others that there are legacy sources stored temporarily at Ajaokuta Steel Company Limited (ASCL), Kogi state, North Central Nigeria. These sources are awaiting repatriation to the country of origin or transfer to Radioactive Waste Temporary Storage Facility (RWTSF) in CERT Zaria Kaduna state, North West Nigeria.

Sequel to the above, the Federal Government constituted a ministerial committee on the management/disposal of radioactive sources at ASCL. Inventories of these sources are given in Annex E.

The Committee is currently exploring the best option for management of disused sources. There is also high level discussion to collaborate with the IAEA on the possibility of repatriation of the disused radioactive sources to their country of origin.

The RWTSF in Zaria, Kaduna State has been expanded to take more radioactive wastes with assistance of the US-DOE/GTRI and IAEA. The facility has been upgraded to meet all practicable safety and security requirements in line with International Best Practices.

## **I. TRANSBOUNDARY MOVEMENT**

The Nigerian Government is preparing to organize a stake holder workshop on Transboundary movement of scrap metals and other commodities across the six Geographical Zones of the Country. Radioactive wastes are not imported into the country and the Nigerian Government encourages repatriation of disused sources after use through export License issued by the NNRA. This applies to all forms of waste as defined in the Act.

## **J. DISUSED SEALED RADIOACTIVE SOURCES**

Disused Sealed Radioactive Sources (DSRS) are stored at the facility at CERT, Zaria for short term Storage. Normal storage procedures and practices are in use which includes: Receiving and Acceptance, Records taking Packaging (card box or metal pail) and Transport (type. A or B, security details, Organization) i.e. from user to RWMF and from RWMF to Disposal facility. It is important to note Legacy and orphan sources are tracked on regular basis through search and secure programme and when found the sources are sent to the RWTS. Source information (type, activity, maker & date, dose rates, collection date), Facility at Zaria.

## **K. PLANNED ACTIVITIES TO IMPROVE SAFETY**

Monitoring unit has been set up within the NNRA to ensure a baseline data of radiation levels across the country is produced as well as implementation of routine monitoring of controlled releases of radioactive waste arising from operator activities with a view to ensuring public exposure is reduced as low as reasonably practicable. In line with the provisions of GSR part 3 (**Requirement 32**), this feat is achieved by issuing relevant guides for routine monitoring of such controlled releases, approving monitoring.

Nigeria recognized the effort of the IAEA on the Post Fukushima Nuclear accident and has availed herself of all the trainings and workshop on the Post Fukushima Nuclear accident to her staff.

Consequently, the NNRA is planning to have monitoring systems (Water Air and Soil) capable detecting trans-boundary releases in the case of similar events

Develop regulations and guidance documents relevant to spent fuel and radioactive waste management:

The following draft Regulations have been developed and are being gazetted:

- Draft Nigerian Regulations on Siting of Nuclear Power Plants
- Draft Nigerian Regulations on Uranium Mining and Milling
- Draft Nigerian Regulations on the Safety of Research Reactors
- Draft Nigerian Regulations on the Physical Protection of Nuclear Material and Nuclear Facilities
- Draft Nigerian Safeguards Regulations.
- Draft Nigerian Regulations on Emergency Preparedness and Response
- Revised Nigerian Regulations on Radioactive Waste Management
- Revised Nigerian Regulation on Safety and Security of Radioactive Sources Regulations

The following guidance documents have been developed and are being implemented:

- Guidance documents for implementation of waste management regulations and registration of service, guidance document on spent nuclear fuel is still in process.
- Guidance for Maintenance Engineers and Technicians
- Guidance for the Provision of Dosimetry Services in Nigeria
- Guidance for Licensing of Nuclear Research Reactor in Nigeria
- Guidance for Licensing of Gamma Irradiation facility in Nigeria
- Guidance on the training and qualification of Research Reactor Operators in Nigeria
- Guidance on the Licensing process for Nuclear Power Plants in Nigeria

The NNRA has initiated a process to conduct a comprehensive national registry including the inventory of radioactive waste



## **L. Annexes**

### **Annex A – List of Spent Fuel Management Facilities**

- None

### **Annex B - List of Radioactive Waste Management Facilities**

- Radioactive Waste Temporary Storage Facility (RWTSF) at Centre for Energy Research and Training (CERT), Ahmadu Bello University, Zaria, Kaduna State, North West Nigeria.

### **Annex C - List of Nuclear Facilities in the process of being decommissioned.**

- None

### **Annex D - Inventory of Spent Fuel**

- None

**Annex E - Inventory of radioactive Wastes**

**CERT ZARIA**

<b>S/N</b>	<b>RADIONUCLIDES</b>	<b>QTY</b>	<b>ACTIVITY</b> (13-10-14)	<b>AGGREGATE</b> <b>ACTIVITY</b> (13-10-14)	<b>D -</b> <b>VALUE</b>	<b>A/D RATIO</b>	<b>CATEGORY</b>
1.	Sr-90 Cs-137 Co-60 Ir-192	23 4 4 1	390 $\mu$ Ci ó 39.32mCi 5.4mCi ó 21.85mCi 50 $\mu$ Ci ó 7mCi	0.134Ci 38mCi 7.24mCi 0	30Ci 3Ci 0.8Ci	10 <sup>-5</sup> ó 1.31x10 <sup>-3</sup> 0.002 ó 0.007 0.00006 ó 0.007	<b>Category 5</b> (0.01 > A/D × exempt)
2.	Cs-137 Am/Be	1 1	0.036Ci 0.79Ci	0.036Ci 0.79Ci	3Ci 2Ci	0.012 0.40	<b>Category 4</b> (1 > A/D × 0.01)
3.	Co-60 Co-60	1 1	33.42Ci 266.41Ci	33.42Ci 266.41Ci	0.8Ci 0.8Ci	41.78 333.0	<b>Category 2</b> (1000 > A/D × 10)
4.	Co-60	1	1810.37Ci	1810.37Ci	0.8Ci	2262.96	<b>Category 1</b> (A/D × 1000)
5.	Cs-137	3					<b>Not Duly</b>

	Co-60	9					<b>Characterized</b>
	Ir-192	7					
	Co-57	1					
	Am241/Be	2					
	Cf-252	2					
	Fe-55	3					
	Am-241	2					
	U-233	1					
	Eu-152	1					
	Curium-244	1					
	Ra-226	34					
	Ra-226	2					
	Contaminated containers	9					
	Pcs of Rad. Materials	34					

**Sources listed in row 5 of the table above predate NNRA; their categorization will be provided in due course.**

**Annex E Inventory of radioactive Wastes**

**AJAOKUTA STEEL COMPANY LIMITED**

<b>S/N</b>	<b>Source</b>	<b>Qty</b>	<b>Activity (Ci)</b>	<b>D-Value (Ci)</b>	<b>Range of Category (A/D)</b>	<b>Category</b>
1	Cs-137	22	1.78-1.00	3.E+00 Ci	1 > A/D × 0.01	4
2		180	0.19-0.01	3.E+00 Ci		
3		1	0.01	3.E+00 Ci	0.01 > A/D, Exempt	5
4	Co-60	4	0.22-0.01	8.E-01 Ci	1 > A/D × 0.01	4
5	Co-60	20	0.01	8.E-01 Ci	0.01 > A/D, Exempt	5
6	Pu-239	5	0.35	2.E+00 Ci	1 > A/D × 0.01	4