NIGERIAN
NATIONAL
REPORT

2020

SEVENTH REVIEW MEETIMG 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 Seventh Review Meeting of the Joint Convention showing developments made since the last Review meeting. This report addresses the measures taken to implement each of the obligations of the Convention and 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.

In keeping to the objectives of the Joint Convention on the Safety of Spent Fuel Management and the safety of radioactive waste management, the Government of the Federal Republic of Nigeria is committed to achieving and maintaining a high level of safety in spent fuel and radioactive waste management, by strengthening national measures and international co-operation, including where appropriate, safety-related technical co-operation. The Government through the Nigerian Nuclear Regulatory Authority ensures that there are effective defenses against potential hazards during all stages of spent fuel and radioactive waste management so that individuals, society and the environment are protected from harmful effects of ionizing radiation, now and in the future, in a way that the needs and aspirations of the present generation are met without compromising the ability of future generations to meet their needs and aspirations. Furthermore, arrangements are made at the National level through National Emergency Management Agency and Nigerian the Nuclear Regulatory Authority that accidents with radiological consequences are prevented and their consequences are mitigated should they occur during any stage of spent fuel or radioactive waste management.

This Report further highlights safety issues in Nigeria's quest for proper management of radioactive waste and 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 of this Report 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 for 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 – 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 – General Safety Requirement

IRRS – Integrated Regulatory Review Services

LILW L/ILRW - Low and Intermediate Level Radioactive Waste

NAEC-Nigeria Atomic Energy Commission

NCRWM-National Committee on Radioactive Waste Management

NiBIRR-Nigeria Basic Ionizing Radiation Regulations 2003

NiRR-1- Nigeria's Research Reactor

NNRA-Nigerian Nuclear Regulatory Authority

NRWMPS - Nigerian Radioactive Waste Management Policy and Strategy

NRWMR – Nigeria Radioactive Waste Management Regulations, 2006

NSSRSR – Nigerian Safety and Security of Radioactive Sources Regulations, 2006

NTC-Nuclear Technological Centre

MPR – Ministry of Petroleum Resources

OPFRN – Office of the President Federal Republic of Nigeria

PSA - Project Supply Agreement

RWMO – Radioactive Waste Management Organization

RWSNFF-Radioactive Waste and Spent Nuclear Fuel Fund

RWTSF-Radioactive Waste Temporary Storage Facility

RWMF – Radioactive Waste Management Facility

SAFRAN-Safety Assessment Framework

SARIS – Self Assessment of Regulatory Infrastructure for Safety

SGF – Secretary to the Government of the Fderation

SRS – Sealed Radioactive Source

SHESTCO – Sheda Science and Technology Complex

SNF-Spent nuclear fuel**SSR** – 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

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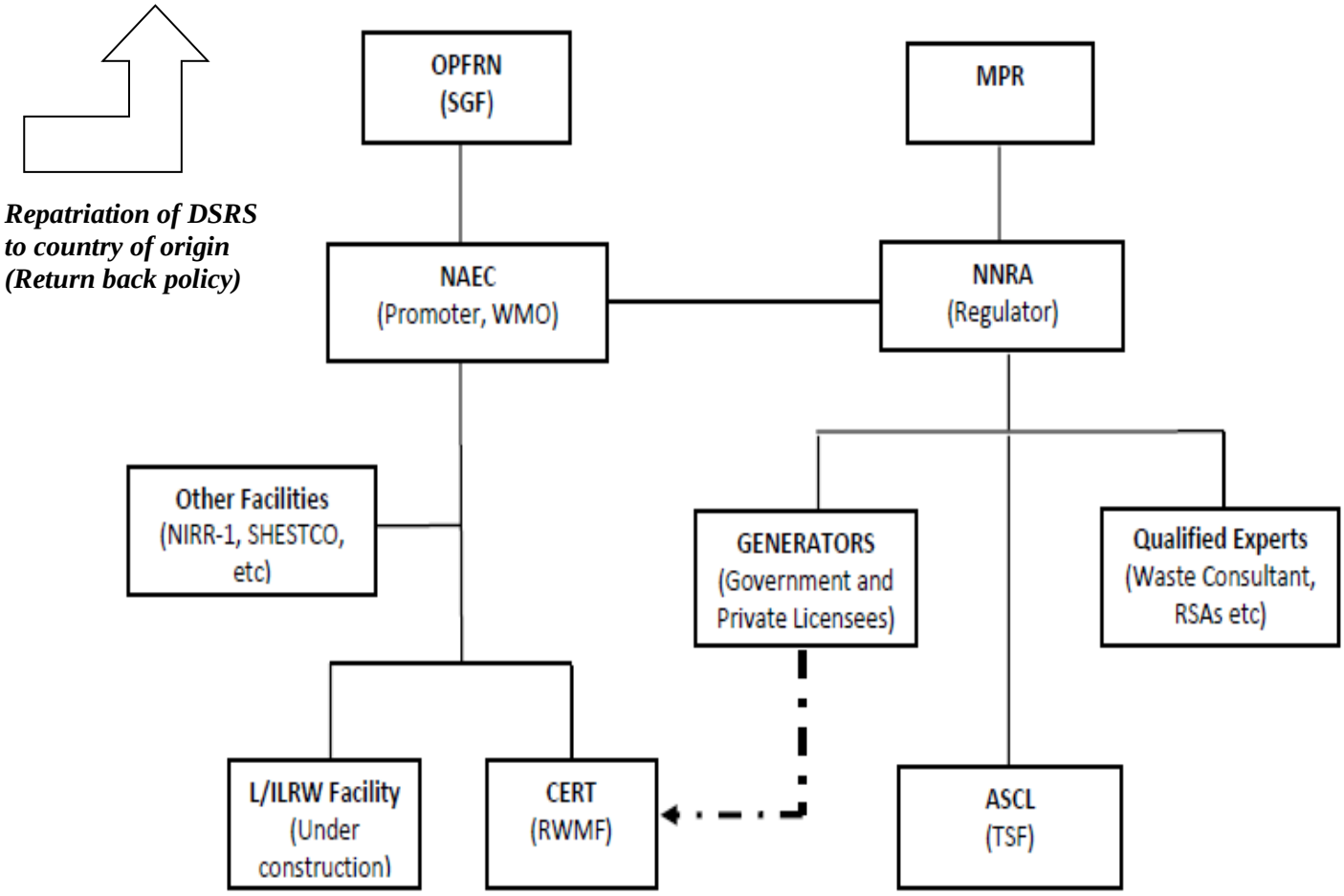


Fig. 1: Organogram for Radioactive Waste Management Programme in Nigeria

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

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 had 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 used in the country are imported mainly from the Group of Eight countries in Europe and USA and recently from South Africa, China and South Korea. The oil and gas industry is the largest importer and user of radioactive sources in the country. There are thousands of radioactive sources being used for various applications in nuclear well-logging, industrial radiography, nuclear gauging, and radio-tracing amongst others. These applications 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 substance 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) currently before the National Assembly (Parliament) before passage into law. The NSSS Bill took into account international conventions, treaties and internationally accepted best practices.

The Nigeria Atomic Energy Commission (NAEC) was established by the Nigeria Atomic Energy Commission Act No. 46 of 1976. It 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. 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 *31k*w 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 and increasing stakeholders' needs at local, national and regional levels.

B. POLICIES, PRACTICES AND STRATEGY

The Federal Government of Nigeria provides leadership and gives policy direction on all Radioactive Waste (RW) and Spent Nuclear Fuel (SNF) management issues. The Government has the responsibility to provide adequate resources for the effective implementation of policies, programmes and projects. It is also responsible for the creation of 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.

Nigeria considers SNFs to be valuable resource and priority should be given to return to suppliers' country. SNFs that cannot be returned will be in interim or long-term storage in licensed facility with expectation of deep geological disposal (Section 2). Disused Sealed Radioactive Sources (DSRS) shall be repatriated where possible and the License holders of facilities generating SNF and RW are responsible for the safe management and to adopt measures for minimizing the generation during the design, operation and decommissioning stages of such facilities. These policies have been established in the Nigeria Nuclear Fuel Cycle and Radioactive Waste Management Policy (Draft Policy) that had been developed and undergoing the necessary processes of approval.

The Draft Policy further specifies that:

i. Disposal is the final end-point for radioactive waste and disposal of radioactive waste and other radioactive materials such as NORM in dedicated facilities licensed by Nigerian Nuclear Regulatory Authority **(NNRA)** shall be considered as the only final end-point for safe and sustainable long-term management, unless such wastes or materials can be safely stored and placed in decay storage before being released.

ii. Radioactive waste shall not be imported or exported unless approved by the Nigerian Nuclear

Regulatory Authority **(NNRA)**.

iii. Priority shall be given to returning disused sealed radioactive sources to the suppliers' countries.

iv. All radioactive waste produced and stored at the premises of the generator shall be solely owned by the waste generators. Waste ownership shall only be transferred to the WMO when the waste generator has satisfied the waste acceptance criteria of the WMO and all orphan sources/waste recovered shall be owned by Government or its appointed agency.

v. The environmental remediation of radiologically contaminated legacy sites not owned by any other corporate person shall be carried out by the WMO.

vi. NORM waste generators (e.g. mining industries, oil and gas) shall prepare a strategy detailing arrangements for management of NORM waste during their operations for approval by NNRA in cooperation with DPR and/or other regulatory bodies prior to licensing their operations**.**

vii. License holders of installations generating radioactive waste or radioactive materials such as NORM shall be responsible for the safe management of such wastes or materials as long as the waste ownership has not been transferred to another entity such as the Waste Management Organization **(WMO).** The technical, financial and administrative management of such wastes shall be in compliance with the National Regulatory Framework and consistent with the provisions of the National Plan for Radioactive Waste Management.

The Draft 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 Draft 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 Draft 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 Draft Policy complies with all necessary international Treaties and Conventions and 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 Nigerian financial regulations

At present, there is a RW management facility at the Centre for Energy Research and Training (CERT) ABU Zaria developed for temporary storage of DSRS and retrieved orphan and legacy sources pending their repatriation, eventual containment, final storage or disposal.

Sealed radioactive sources imported into the country since the establishment of the NNRA are returned back, when no longer needed or spent to country of manufacture or supply in strict compliance with the license conditions for its import and use. The Sealed radioactive sources are captured in Regulatory Authority Information System (RAIS).
The NAEC is currently responsible for the implementation of waste management plans, the establishment and development of appropriate waste management facilities and processes until the Waste Management Organization is established;

A Waste Treatment and Storage Facility for treatment and temporary storage of low and intermediate level radioactive waste is being developed at the Nuclear Technology Centre (NTC) Sheda, Abuja to serve as a central collection station and processing of institutional wastes generated all over the country through applications of radio-nuclides in Research, Agriculture, Medicine and Industry, including wastes from Research Reactor.

Management of RW and SNF from power reactors is expected to be carried out at the NPP site. There is no infrastructure dedicated to the long-term waste management deployed in Nigeria as at present. However, for the purpose of long-term planning of radioactive waste management infrastructure development, the following have been considered:

- Research Reactor
  - A multipurpose research reactor is expected to be operational before or about 2025

- Power Reactors
  - The first 1200 MW Nuclear Power Plant is expected to be operational from 2025 to 2085
  - The fourth 1200 MW Nuclear Power Plant would be operational from about 2030 to 2090

Regulations 5 of NRWMR 2006 established requirements for the classification of radioactive waste in Nigeria. Radioactive wastes are classified according to the physical form and composition, and according to the radiological properties.

According to the radiological properties (half-life and activity concentration), there are four (4) categories of radioactive wastes, which include:

Category I:

Low level radioactive waste (e.g. the activity is less than 10 MBq), containing short lived radionuclides only (e.g. with half life less than 50 days) **t**hat will decay to clearance levels within one year after the time of its generation.

Category II:

Low and intermediate level radioactive waste, containing the radionuclides with half life <30 y and restricted long-lived radionuclide concentrations and that is not expected to decay to clearance levels within one year from the time of its generation (limitation of longer lived alpha emitting radionuclides to

400 Bq/g individual waste packages and to an overall average of 400 Bq/g per waste package).

Category III:

Low and intermediate level radioactive waste, containing the radionuclides with half life >30 y, and concentration of alpha emitters exceeding the limitations for Category II. This waste needs to be disposed of in deep geologic facilities only.

Category IV:

High level radioactive waste, with thermal power above 2 kW/m^3 and concentration of alpha emitters exceeding the limitations for Category III (e.g. spent-fuel from research reactors). This waste needs to be disposed of in deep geologic facilities only.

However, the Draft Nigeria Nuclear Fuel Cycle and Radioactive Waste Management Strategy (Draft Strategy), provides for the classification of radioactive waste based on the current IAEA classification scheme (Section 5.3.3 of Draft Strategy)

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 radioactive wastes and disused NF from operation of Nuclear Research Reactor. . The spent fuel referred to in this report will be generated from civilian applications only. No form of radioactive waste or spent fuel of Military origin has been declared in Nigeria; therefore, this report does not discuss this type of waste.

Nigeria considers waste containing NORM which does not originate from nuclear fuel cycle as radioactive waste, however, this report does not apply to this type of waste

D. NATIONAL RADIOACTIVE WASTE REGISTRY

Nuclear Program: Spent fuel management

Nigeria has one nuclear research reactor, the Nuclear Research Reactor (NIRR-1) at the Centre for Energy Research and Training (CERT), at Ahmadu Bello University, Zaria, Kaduna State. There are no spent nuclear fuels in our inventory

The NIRR-1 has nominal power of 31KW and had installed three hundred and forty seven (347) HEU fuel rods. There were also three (3) extra free fuel rods. A HEU to LEU conversion process was implemented to near completion in October 2018. The three hundred and forty seven (347) irradiated HEU fuel rods were discharge into a Skoda cask following the arrival of the LEU in October 2018. The 347 irradiated HEU fuel rods and three (3) fresh HEU rods had been exported back to China on 4th December 2018, in line with the exiting contract agreement.

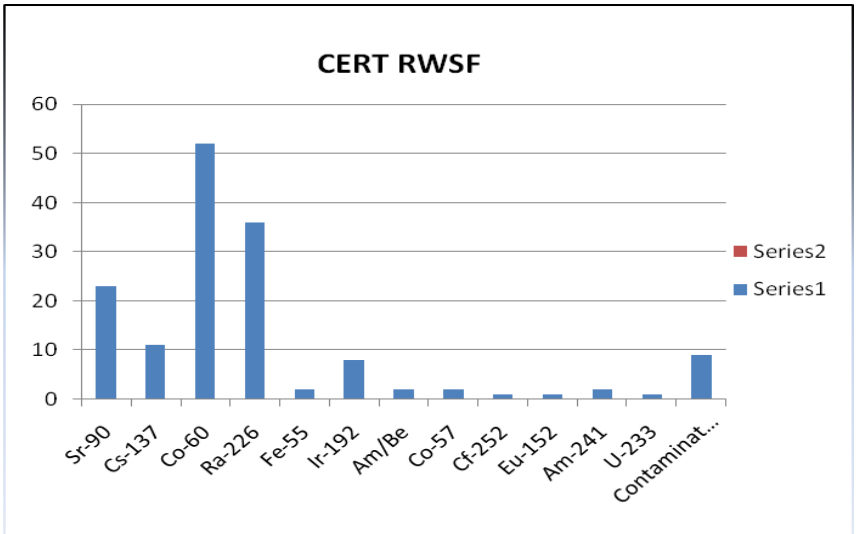
Radioactive Waste management

Nigeria has a radioactive waste management facility at the Center for Energy Research and Training (CERT), Ahmadu Bello University Zaria, Kaduna State, North-western Nigeria and a temporary radioactive source storage facility at Ajaokuta Steel Company (ASCL), Kogi State, North-central Nigeria.

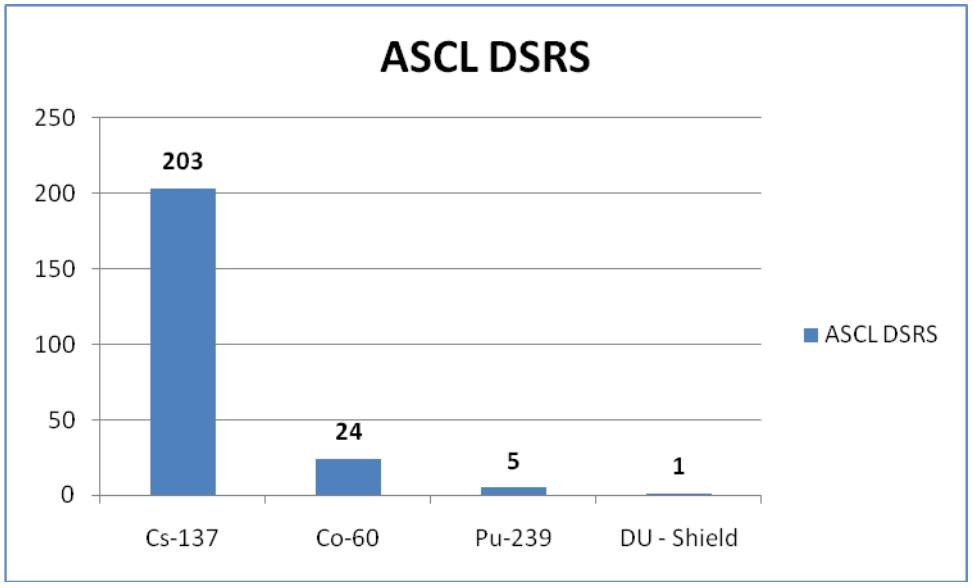
The CERT Zaria facility manages low level radioactive waste arising from the operation of NIRR-1 and other disused sources (legacy sources, secured orphan sources and calibration sources).

The waste from NIRR-1 is minimal and consists of de-ionized (spent ion exchange resins) liquid waste and solid radioactive waste such as used contaminated tissue papers, cotton wool and other irradiated samples. These radioactive wastes are kept in decay storage within the CERT RWM facility

The inventory of sources in CERT RWM facility consists of one hundred and fifty (150) radioactive sources including one hundred and thirty two (132) disused sources, nine (9) contaminated containers and nine (9) calibration sources. The aggregate activity of the nine (9) calibrations sources is less than 1 curie. The aggregate activity of forty two (42) disused sources with complete details of radiological properties is approximately eight hundred and thirty three curie (832.98 Ci) as at 20th November 2020 with the Co-60 sources contributing to over 90%. T



The facility at ASCL has in storage two hundred and thirty three legacy sources including Cs-137, Co-60, Pu-239 and DU- shield. Their cumulative or aggregate activity should be about????



E. LEGISLATIVE AND REGULATORY SYSTEM

The Nuclear Safety and Radiation Protection Act 19 of 1995 (Act) sets forth the commitment of the Nigerian Government to protection of people and the environment from harmful effects of ionizing radiation. The Act which established the NNRA, requires that facilities or activities, including radioactive waste management, involving exposure to ionizing radiation must be inspected and licensed by the NNRA

The NNRA is empowered by the Act to make and enforce regulations for implementation of the provisions of the Act. In the foregoing regard, the Nigerian Radioactive Waste Management Regulations (NRWMR) was developed and has been in force since 2006. The NRWMR and other relevant regulations provide requirements within which RW management activities have been safely carried out in Nigeria. However, the issues of SNF and RW management now and in the future cannot be sufficiently addressed by the present framework. The Draft Policy is expected to address these issues on NFC and RWM

The Draft Policy and Draft Strategy o were produced as an outcome of a National Stakeholders Workshop. The documents have undergone numerous reviews to incorporate current updates and to reflect all that Nigeria is doing in the entire nuclear fuel cycle.

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 contain requirements including responsibilities that are relevant to radioactive waste management and spent fuel;

- Nigeria Basic Ionizing Radiation Regulations 2003 (NiBIRR 2003)
- Nigerian Radioactive Waste Management Regulations 2006 (NRWMR, 2006)
- Nigerian Radiation Safety in NORM Regulations, 2008 (NRSNR, 2008)

- Nigerian Transportation of Radioactive Sources Regulations 2006
- Nigerian Safety and Security of Radioactive Sources Regulations 2006

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 0f 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 4th April,2007
b) Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (1986),
c) Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter as amended (1994).
d) The Convention on Nuclear Safety (CNS) ratified on 4th April,2007
e) Convention on Physical Protection of Nuclear Material acceded to on 4th April,2007
f) Amendment to the Convention on Physical Protection of Nuclear Material acceded to on 4th April,2007
g) Convention on Early Notification of Nuclear Accidents ratified on 10th August, 1990.
h) Convention on Assistance in the case of Nuclear and Radiological Accidents ratified on 10th 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 20th September, 2001.
j) Vienna Convention to the Civil Liability for Nuclear Damage acceded to on 4th April, 2007.
k) Revised Supplementary Agreement Concerning the Provision of Technical Assistance by the IAEA signed 13th 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

F. OTHER GENERAL SAFETY PROVISIONS

In compliance with Regulations 6 of the NRWMR 2006, the primary responsibility for the safe management of radioactive waste rests with the waste generator who is required to take all necessary actions to ensure the safety of radioactive waste unless the responsibility has been transferred to another person or organization as approved by the NNRA

The NNRA implements enforcement of compliance of the provisions of these Regulations and all other relevant requirements allocated to waste generators and the operators of Radioactive Waste Management Facilities as established under NRWMR 2006 and the implementation of the licensing process for generation and management of radioactive waste.

One of the responsibilities of Designated Radioactive Waste Management Facilities (CERT RWMF, etc) among its responsibilities in NRWMR 2006 is to discharge exempt waste and store conditioned radioactive waste, until a disposal facility is established and becomes operational and the waste has been disposed of, or the waste has been transported abroad for further processing and disposal.

However, in compliance with NRWMR 2006, no person or organization is allowed to dispose of any radioactive waste unless the disposal facility designed and constructed specifically for this purpose is available and licensed. The government is responsible for management of radioactive waste where the person that generates the waste is incapable of appropriate management of the waste either through bankruptcy, or revocation of licence, or non-existence of waste generator, or as may be appropriately determined and recovering of the costs incurred from those responsible, where they are identified.

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 Licensed holders still have the overall responsibilities for establishing and maintaining the necessary competence and provide adequate training and information to its employees. As part of condition for license, the waste generators and operator of waste management facilities are required to provide training program and evidence of contracting services of waste management consultants and Radiation Safety Advisers who have been licensed by the NNRA on the basis of their academic qualification and tangible work experience

The siting, design, construction, operation 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.

Licensees are required in Regulation 26 of NRWMR 2006 to 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. The quality assurance programme is submitted to the NNRA and its implementation is verified during regulatory oversight

All practices or activities involving ionizing radiation, including the management of radioactive waste are subject to the Nigerian Basic Ionizing Radiation Regulations (NiBIRR) 2003 (Regulation 2). NiBIRR 2003 established requirements that enable exposure to radiation doses and risks to be controlled to as low as reasonably achievable. In compliance with the provisions of NiBIRR, waste generators and RWMF

are required to have calibrated radiation monitors, engage the services of licensed dosimetry services providers and submit radiation dose monitoring records of its employees on quarterly basis as terms and conditions for license. A national dose monitoring registry had been established for effective management of the national dose records of radiation workers

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 RWTSF. License holders are required as condition of license and in compliance with Regulation 29 of NRWMR 2006 to have emergency plan and adequate equipment to respond or implement the plan and submit annual reports of emergency drills carried out. At national level, a draft National Emergency Response Plan has been developed by NEMA in collaboration with the NNRA. The implementation of this plan will enhance the national capacity to effectively respond to nuclear or radiological emergencies

There is no facility undergoing decommissioning. However, license holders who intend to decommission must notify the NNRA and obtain the appropriate license in compliance with Regulations 81 & 82 of NiBIRR 2003.

G. SAFETY OF SPENT FUEL MANAGEMENT

Nigeria does not have a Nuclear Power Plant, it has no spent fuel and thus has no spent fuel management facility. However, Nigeria has been successfully and safely operating a Nuclear Research Reactor (NIRR-1) since 2004. NIRR-1 is the first nuclear reactor in Nigeria.and 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.

The HEU to LEU conversion programme for NIRR-1 was completed in 2018 and the irradiated and fresh HEUs were successfully exported to China in December 2018. The irradiated fuels were contained in skoda and tuk casks which were licensed by the NNRA.

Spent Fuel is also expected from the Multipurpose Research Reactor to be developed at the Nuclear Technology Centre, Sheda and Nuclear Power Plants. The NiBIRR 2003 and NRWMR 2006 have been reviewed to take into consideration the IAEA GSR part 3, part 5 and SSR part 5 to ensure that the planned facilities will be sited, designed, constructed and operated in line with best international standards to effectively meet the obligations of the Joint Convention.

H. SAFETY OF RADIOACTIVE WASTE MANAGEMENT

The CERT RWMF and ASCL radioactive source storage facility are operated under the regulatory programme emplaced by the NNRA. The facilities are inspected annually to ensure they operated safely and securely in compliance with NiBIRR 2003, NRWMR 2006 and other relevant regulations. The structures put in place at these facilities have not changed since the last review meeting of 2018.

I. TRANSBOUNDARY MOVEMENT

Radioactive wastes are not imported into the country and the Nigerian Government encourages repatriation of disused sealed radioactive sources after use through export License issued by the NNRA. This applies to all forms of waste as defined in the Act.

The NNRA enforces the Nigerian Transport of Radioactive Sources 2006 (NTRSR), Nigerian Safety and Security of Radioactive Sources Regulations (NSSRSR) for import and export control measures. The NSSRSR was established based on the guidance of the IAEA Code of Conduct on the Safety and Security of Radioactive Sources and on the Supplementary Guidance for import and export. The condition for consent in the form of issuance of import license is on the basis that contractual agreement to accept the sources back by the country of origin when disused is submitted to the NNRA. The NTRSR complies with international standards including the IAEA safety standards for both international and inland movement of radioactive materials. The Regulation is presently at advanced stage of review to bring it up-to-date with the current IAEA Regulations for Safe Transport of Radioactive Materials (SSR Part 6)

J. DISUSED SEALED RADIOACTIVE SOURCES

The Nuclear Safety and Radiation Protection Act 19, 1995 (Act) established the basic relevant legal requirement for licensing and developing regulations for the management of radioactive waste including disused sealed sources. Section 40 of the Act further establishes that the general regulations for the transportation of dangerous goods by land, water and air apply to the transport of radioactive materials and waste.

Drawing powers from the Act, NiBIRR 2003, NSSRSR 2003, NRWMR 2006 and NTRSR 2003 were developed and they contain specific requirements for the management of disused sealed radioactive sources. Regulation 79 of NiBIRR 2003 requires applicants for import of radioactive sources to have with suppliers or manufacturer contractual agreement indicating the source will be accepted back when disused at country of origin and return the DSRS within six (6) months after its useful lifetime. Regulations 9 of the NRWMR 2006 further provides that owners of disused sources are responsible for returning it back to the country of origin in line with contract of accept back with supplier or manufacturer and where disused sources that cannot be returned back (Legacy sources) the NNRA is responsible for making the necessary arrangements for its transfer to a licensed designated waste management facility (e.g. CERT RWMF) for interim storage prior to permanent decision. The owner of disused sources when known and capable is responsible for bearing the cost of management at CERT RWMF.

At present, disused radioactive sources including legacy and secured orphan sources are in safe and secured licensed storage facilities in CERT and ASCL. Nigeria does not manufacture SRS and will not accept the importation of radioactive waste into the country. Regulation 11 of NRWMR 2006 established this requirement.

K. GENERAL EFFORTS TO IMPROVE SAFETY

Nigeria requested for preparatory Occupational Radiation Protection Appraisal Service (ORPAS) from the IAEA and was accepted on 16th May 2019. The first pre-ORPAS mission stakeholders meeting held

on 9th July 2019 and the pre-ORPAS mission on 5th – 7th August 2019, during which the IAEA independently inspected some facilities as to assess the status of occupational radiation protection in Nigeria. The ORPAS Mission was then planned for 16th – 20th March 2020 . However, the mission is yet to take place due to the prevailing COVID-19 pandemic

Nigeria has been making contributions to the Modeling and Data for Radiological Impact Assessments (MODARIA II) program organized by the IAEA. The MODARIA template consists of radiological impact assessment of radionuclide concentrations in air, soil, water and food. Nigerian researchers, together with the NNRA being the lead organization, have been involved in populating and updating the MODARIA database with data of exposures to people and the radiological impact to the environment.

As part of planned measures to improve safety, Nigeria is actively carrying out activities to strengthen its legislative and regulatory framework. These include:

- More strategic engagement with the National Assembly (Parliament) for timely passage of the NSSS bill which would provide more effective legal framework in support of SF and RW management. The present Act has significant gaps in this respect
- Development and revision of relevant guidance document for effective control NORM waste management particularly in the mining industries
- Sustained search and secure of orphan sources
- Sustained routine training and engagement with the news media on possible radiation risks associated with relevant facilities and activities and on the processes and decisions taken by government
- Publishing reports of technical regulatory activities including the Search and Secure of orphan sources
- Sustained inspection of the CERT RWMF and ASCL RSTSF to verify that programme and measures are maintained to ensure safety and security of the facilities.
- Sustained SRS return back policy to ensure that SRS are returned at the end of its useful lifetime
- Drafting and revision of relevant standards and guidance document
- Review of national energy policy which includes nuclear energy policy to take cognizance of the recent developments in the nuclear energy realm

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 RWMF ZARIA

S/N	Radionuclide	Qty	Activity Range (Ci) (23 – 11 – 2020)	Activity Aggregate (Ci) (23 – 11 – 2020)
1	Sr-90	23	0.00035 – 0.034	0.1155
2	Cs-137	8	0.00466 – 0.091	0.2058
3	Co-60	10	0.00002 – 712.63	831.773
4	Ir-192	1	0	0
4	Cs-137	3	Not Available	Not Available
5	Co-60	42	Not Available	Not Available
6	Ra-226	36	Not Available	Not Available
7	Fe-55	2	Not Available	Not Available
8	Ir-192	7	Not Available	Not Available
9	Am/Be	2	Not Available	Not Available
10	Cf-252	1	Not Available	Not Available
11	Am-241	2	Not Available	Not Available
12	U-233	1	Not Available	Not Available
13	Eu-152	1	Not Available	Not Available
14	Co-57	2	Not Available	Not Available
14	Contaminated Containers	9	Not Available	Not Available

Annex E Inventory of radioactive Wastes

AJAOKUTA STEEL COMPANY LIMITED

S/N	Source	Qty	Activity Range *(Ci)*
1	Cs-137	22	1.78-1.00
2		180	0.19-0.01
3		1	0.01
4	Co-60	4	0.22-0.01
5	Co-60	20	0.01
6	Pu-239	5	0.35