



**NIGERIAN NUCLEAR
REGULATORY AUTHORITY**

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Strengthening Occupational Radiation Protection In Nigeria Through Effective Regulatory Oversight

Godwin Ekong, *Ph.D*
Nigerian Nuclear Regulatory Authority

2025 ISOE International Symposium Weihai, China, 22 to 24 October 2025.

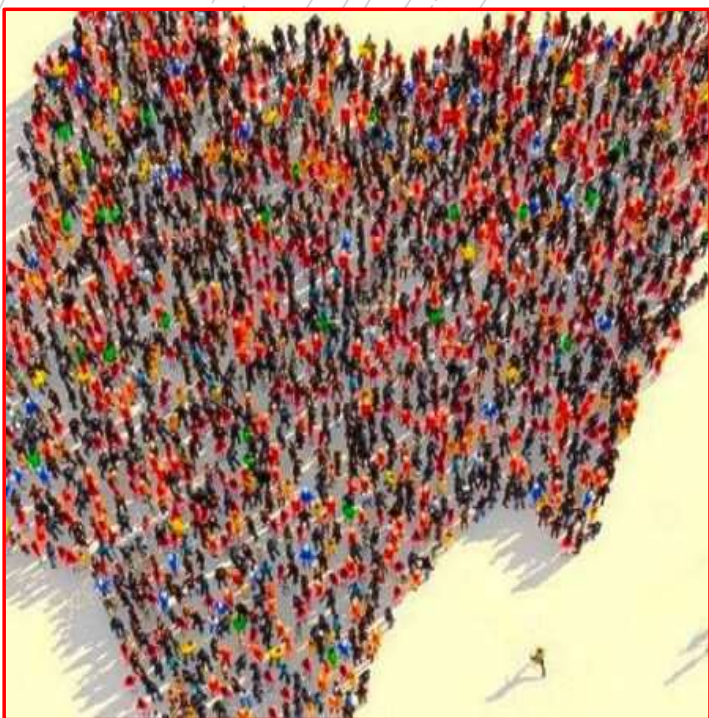


Content

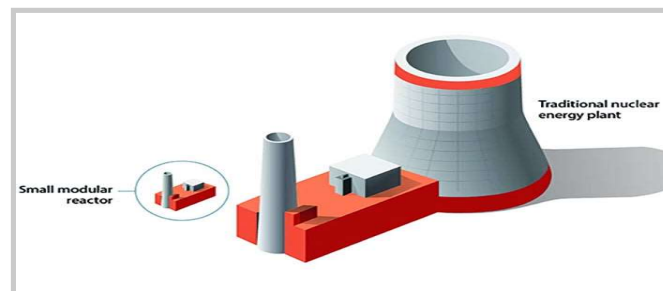
- **Introduction**
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- Capacity Building & Human Resource Development
for NPP**
- **ORP in Nigeria**
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Introduction



- ◆ Population: Over 220 million people at about 2.3% growth rate.
- ◆ 6th most populated country globally.
- ◆ Installed Grid generation: $\approx 14,000$ MW Available: < 6700 MW
- ◆ Considerable amount of “suppressed demand” is served through alternate sources of electricity supply such as diesel generators or solar mini grid.
- ◆ Nigeria is embarking on a nuclear power programme and has indicated its readiness for the peaceful application of nuclear energy for power generation.





Introduction - Nigeria And The International Instruments



Nigeria has assented to a number of international instruments covering nuclear safety, security and safeguards.

- **Signed the Nuclear Non-Proliferation Treaty (NPT) - 1968**
- **Voted in 1995 for the indefinite extension of the NPT**
- **Signed the Comprehensive Safeguards Agreement - 1988**
- **Signed the Convention on Early Notification of a Nuclear Accident in 1988**
- **Ratified the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency in 1990**

April 2007

- **Convention on Nuclear Safety**
- **Vienna Convention on Civil Liability for Nuclear Damage**
- **Convention on the Physical Protection of Nuclear Material**
- **Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management**
- **Amendment to the Convention on the Physical Protection of Nuclear Material**
- **Protocol Additional to the Agreement between the Federal Republic of Nigeria and the International Atomic Energy Agency for the Application of Safeguards**

Nigeria has established two **key organisations for implementing its NPP programs**



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Introduction - NPP Implementation Key Organizations



- Established by Act 46 of 1976 but was not activated, and became fully operational in July, 2006
- National focal agency responsible for the **promotion** of atomic energy and all matters relating to the peaceful use of atomic energy in Nigeria



- The Nigerian Nuclear Regulatory Authority is established by the Nuclear Safety and Radiation Protection Act, 19 of 1995 became operational in 2001
- The NNRA is an independent national **regulatory body** charged with the responsibility of Nuclear and radiological protection

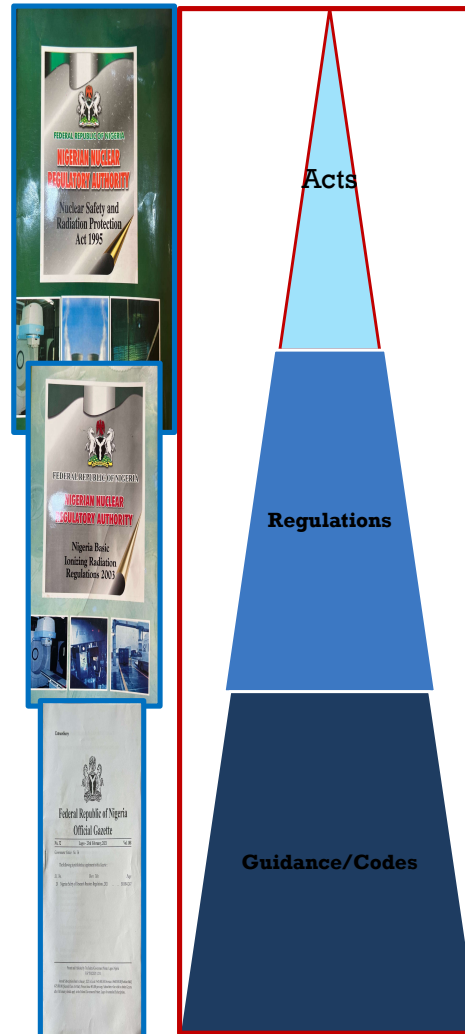


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Regulatory Framework

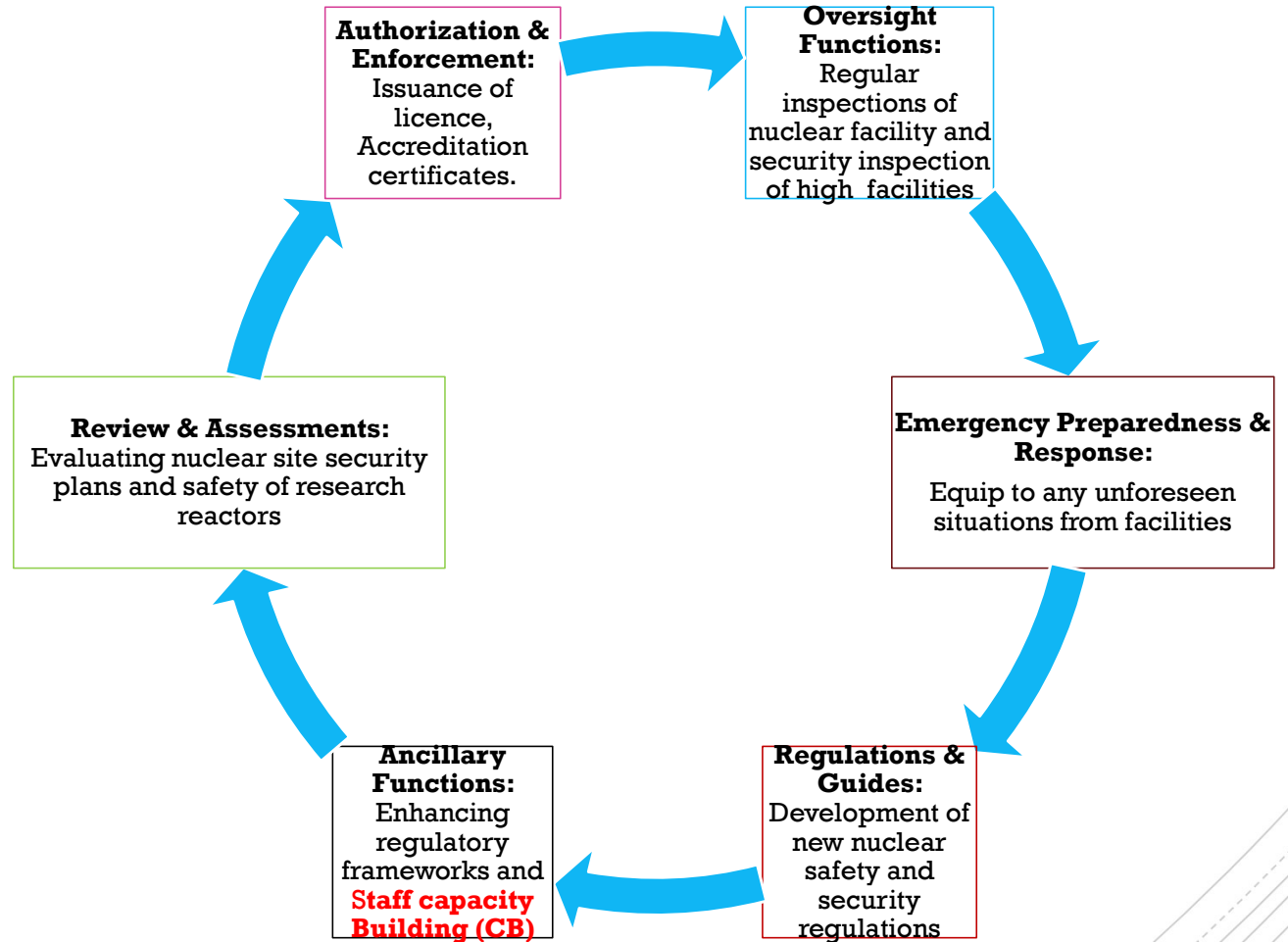


- Nuclear Safety and Radiation Protection Act, 19 of 1995
- The Act has been reviewed as the Nuclear Safety, Security and Safeguard (NSSS) Bill awaiting passage into law, cover all aspects of nuclear power plant regulations.
- NNRA developed and gazette 16 Regulations from 2003 to 2023.
- Nigeria Basic Ionizing Radiation Regulations (NiBIRR) 2023 tailored after GSR Part 3
- Several guidance documents which explains how the Regulations can be implemented through core regulatory activities



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Capacity Building (CB) & Human Resource Development (HRD) for NPP



The NNRA has a **CB and HRD Policy** which is to enhance competence of its work force in nuclear Technology by having Memorandum of Understandings with IAEA Member States and other Nuclear Bodies for:

- Training Programs - Post Graduate Studies, professional certifications
- On-the-Job-training
- Scientific Visits and Fellowship programs
 - *Siting and Design, Licences, Nuclear Security*
 - *Human Resource Development*
 - *Leadership and Management*
- These has translated into building current robust regulatory infrastructures for regulating the existing nuclear and radiological facilities in Nigeria
- Also, in preparation for licensing NPP which has begun with **site** evaluations

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Occupational Radiation Protection (ORP) in Nigeria

IAEA Safety Standards
for protecting people and the environment

Radiation Protection and
Safety of Radiation Sources:
International Basic
Safety Standards
INTERIM EDITION

General Safety Requirements Part 3
No. GSR Part 3 (Interim)



Radiation Protection of Occupational Exposures (OE) situations are provided in The GSR Part 1,3, The NSRP Act 19 of 1995, NiBIRR 2023 etc:

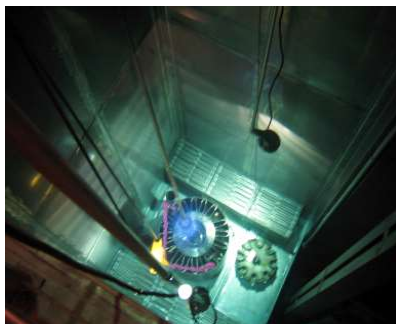
- Protect the health of all users, handlers and the public from the harmful effects of ionizing radiation
- Make provision for establishing and maintaining the following main registers and inventories:
 - Registers of sealed radioactive sources and radiation generators
 - Records of occupational doses – (National Dose Registry)
- Records of OE for each worker shall be maintained during and after the worker's working life, at least until the former worker attains or would have attained the age of 75 years, and for not less than 50 years after cessation of the work

This requires effective nuclear & radiation protection regulatory system for all ionizing radiation **activities**

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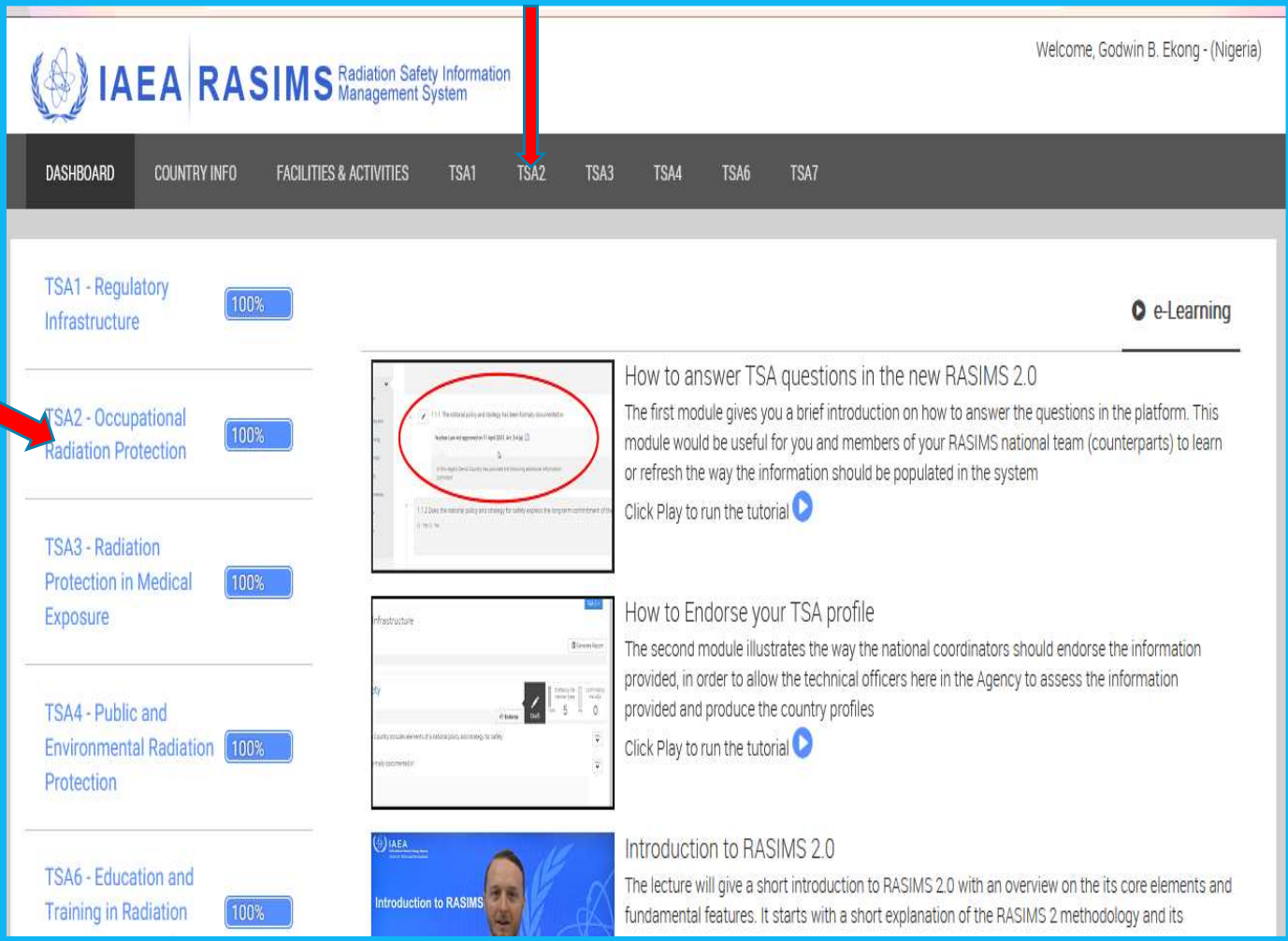


ORP in Nigeria - Sectors of OE to ionizing radiation



- Petroleum Industry
- Health Sector
- Manufacturing Sector
- Construction Industry
- Agriculture and Water Resources
- Education and Research
- Customs and Security Screening
- Mining / Aviation Sector; ETC

ORP in Nigeria – IAEA ORP Template/Structure



IAEA RASIMS Radiation Safety Information Management System

Welcome, Godwin B. Ekong - (Nigeria)

DASHBOARD | COUNTRY INFO | FACILITIES & ACTIVITIES | TSA1 | **TSA2** | TSA3 | TSA4 | TSA6 | TSA7

TSA1 - Regulatory Infrastructure 100%

TSA2 - Occupational Radiation Protection 100%

TSA3 - Radiation Protection in Medical Exposure 100%

TSA4 - Public and Environmental Radiation Protection 100%

TSA6 - Education and Training in Radiation 100%

[e-Learning](#)

How to answer TSA questions in the new RASIMS 2.0
 The first module gives you a brief introduction on how to answer the questions in the platform. This module would be useful for you and members of your RASIMS national team (counterparts) to learn or refresh the way the information should be populated in the system
 Click Play to run the tutorial

How to Endorse your TSA profile
 The second module illustrates the way the national coordinators should endorse the information provided, in order to allow the technical officers here in the Agency to assess the information provided and produce the country profiles
 Click Play to run the tutorial

Introduction to RASIMS 2.0
 The lecture will give a short introduction to RASIMS 2.0 with an overview on the its core elements and fundamental features. It starts with a short explanation of the RASIMS 2 methodology and its



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REGULATOR
NNRA

TECHNICAL SERVICES
SSDL
RSA
CALIBRATION
MAINTENANCE

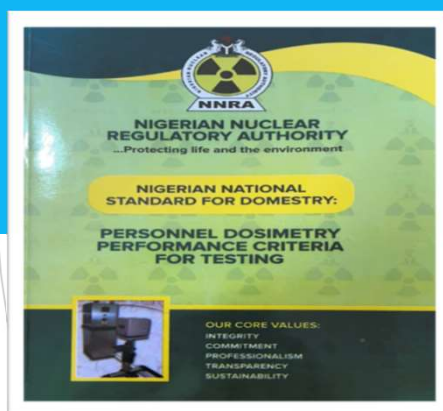
END USER
RESEARCH REACTOR
WELL LOGGING
INDUSTRIAL RADIOGRAPHY
NUCLEAR GAUGES
RADIOTHERAPY
DIAGNOSTIC RADIOLOGY
NUCLEAR MEDICINE

DSP

ORP in Nigeria - The Structure



ORP in Nigeria – Proficiency Test / Validation



Intercomparison/Type Testing exercise is to establish standard for dosimetry system

- Assess Response, Reproducibility, Repeatability, Linearity etc
- Procedures are:
 - performed by irradiating dosimeters in single energy photon (Cs-137) and X ray fields (ISO N and series qualities, and different irradiation angles), in mixed quality fields, simulating real workplaces, and in pulsed X ray fields.
 - The DSPs prepared/annealed their dosimeters and sent to the NIRPR
 - The NIRPR exposed the cards with different ranges of known doses;
 - The exposed cards with blind doses were sent back to the DSPs for readings;
 - The cards with blind doses are read, and compared with the measured doses within the tolerance/acceptable limit of $\pm 30\%$

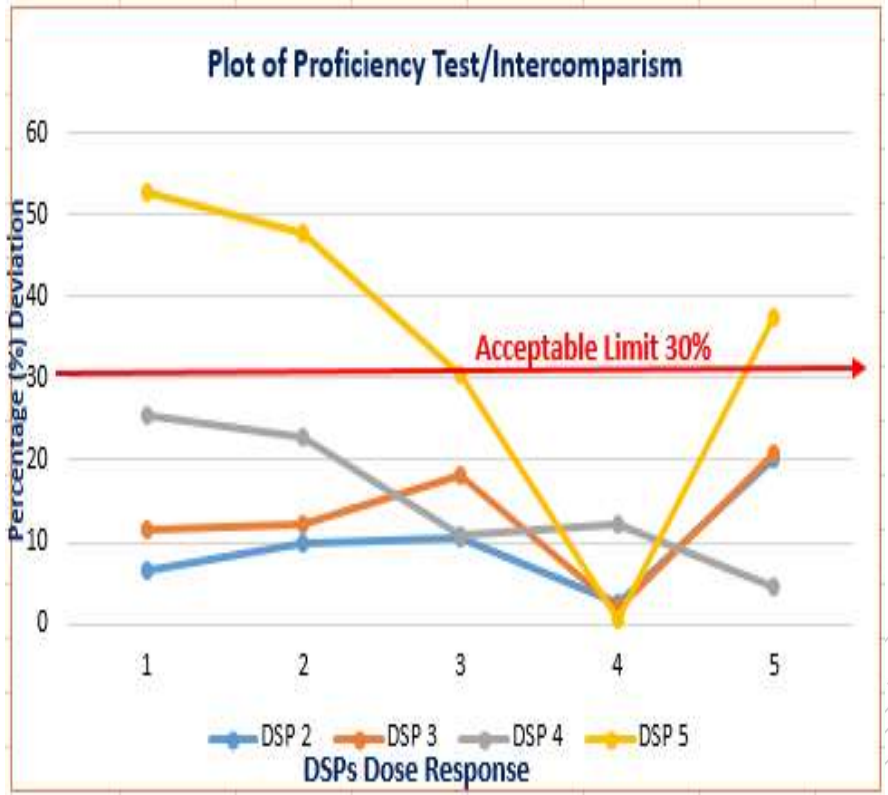


ORP in Nigeria – Validation /Proficiency Test



SUMMARY OF DEEP DOSE INTERCOMPARISON ASSESSMENT OF ACCREDITED DOSIMETRY SERVICE PROVIDERS 2025

FACILITY STANDARD DOSE (mSv)	DSP1		DSP2		DSP3		DSP4		DSP5		DSP6		DSP7		DSP8	
	Measured dose (mSv)	±30% deviation	Measured dose (mSv)	±30% deviation	Measured dose (mSv)	±30% deviation	Measured dose (mSv)	±30% deviation	Measured dose (mSv)	±30% deviation	Measured dose (mSv)	±30% deviation	Measured dose (mSv)	±30% deviation	Measured dose (mSv)	±30% deviation
6.0	3.164	47.27	6.393	6.55	5.303	11.61	4.468	25.54	2.840	52.67	0.463	92.28	2.458	145.75	28.478	374.63
3.0	3.600	19.98	3.293	9.75	2.637	12.10	2.321	22.65	1.568	47.75	0.208	93.06	1.875	275.00	14.840	394.67
1.5	1.191	20.62	1.658	10.55	1.227	18.18	1.340	10.67	1.043	30.44	0.125	91.68	4.095	104.75	7.825	421.67
0.8	5.040	529.96	0.780	2.47	0.784	2.00	0.702	12.31	0.805	0.63	0.781	2.35	2.445	344.50	4.478	459.69
0.4	2.593	548.25	0.481	20.25	0.483	20.81	0.418	4.56	0.550	37.50	0.442	10.59			2.638	559.38



Exercise Across All The Accredited DSPs Using OSL And TLD Badges

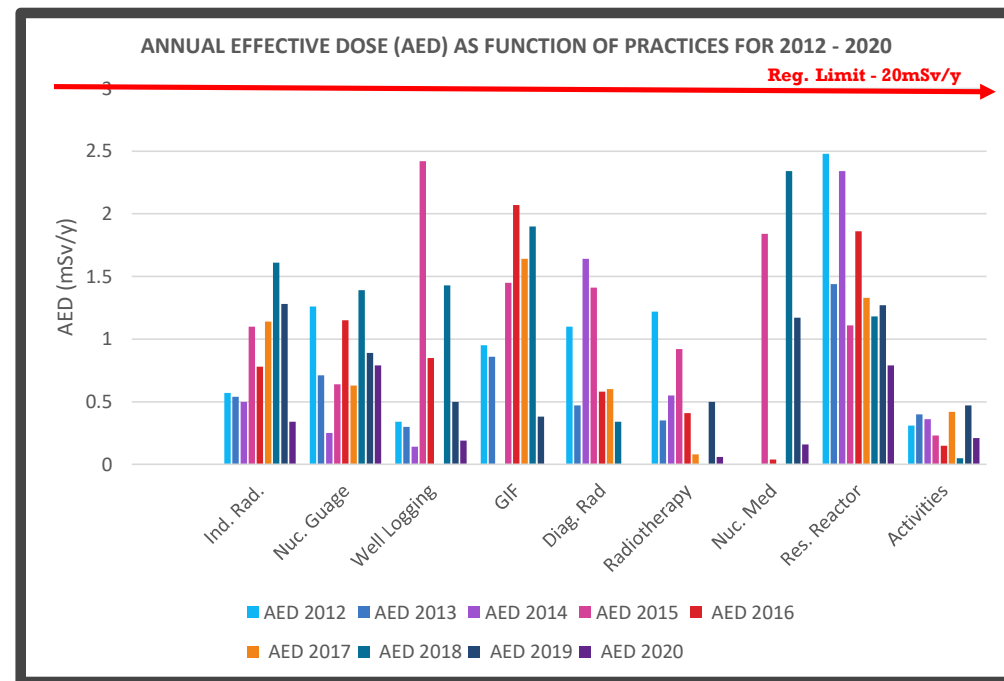
- **Deep dose exposure** with a **standard low dose of 0.4 mSv**, the ranged was (4.56 to 559.38) mSv while **standard high dose of 6.0 mSv** ranged of dose recorded was (6.55 to 374.63) mSv.
- **Shallow dose exposure** with **standard low dose of 0.4 mSv**, ranged (2.31 to 528.13) mSv while exposure **standard high dose of 6.0 mSv** ranged of dose (5.40 to 362.04) mSv



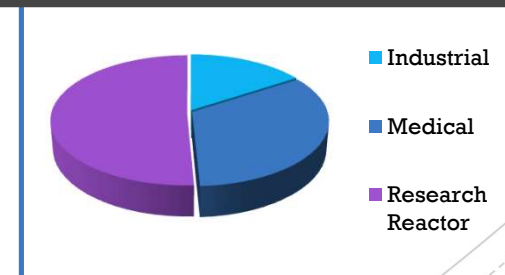
ORP in Nigeria - Dose Assessment



PRACTICES /YEAR (mSv)	AED 2012	AED 2013	AED 2014	AED 2015	AED 2016	AED 2017	AED 2018	AED2019	AED 2020
Ind. Rad.	0.57	0.54	0.5	1.1	0.78	1.14	1.61	1.28	0.34
Nuc. Guage	1.26	0.71	0.25	0.64	1.15	0.63	1.39	0.89	0.79
Well Logging	0.34	0.3	0.14	2.42	0.85	Nil	1.43	0.5	0.19
GIF	0.95	0.86	Nil	1.45	2.07	1.64	1.9	0.38	Nil
Diag. Rad	1.1	0.47	1.64	1.41	0.58	0.6	0.34	Nil	0.17
Radiotherapy	1.22	0.35	0.55	0.92	0.41	0.08	Nil	0.5	0.06
Nuc. Med	Nil	Nil	Nil	1.84	0.04	Nil	2.34	1.17	0.16
Res. Reactor	2.48	1.44	2.34	1.11	1.86	1.33	1.18	1.27	0.79
Activities	0.31	0.4	0.36	0.23	0.15	0.42	0.05	0.47	0.21
Range	0.31-2.48	0.3-1.44	0.14-2.34	0.23-2.42	0.04-2.07	0.08-1.64	0.05-2.34	0.38-1.28	0.06-0.79
Average AED	1.03	0.63	0.64	1.24	0.88	0.65	1.14	0.72	0.30

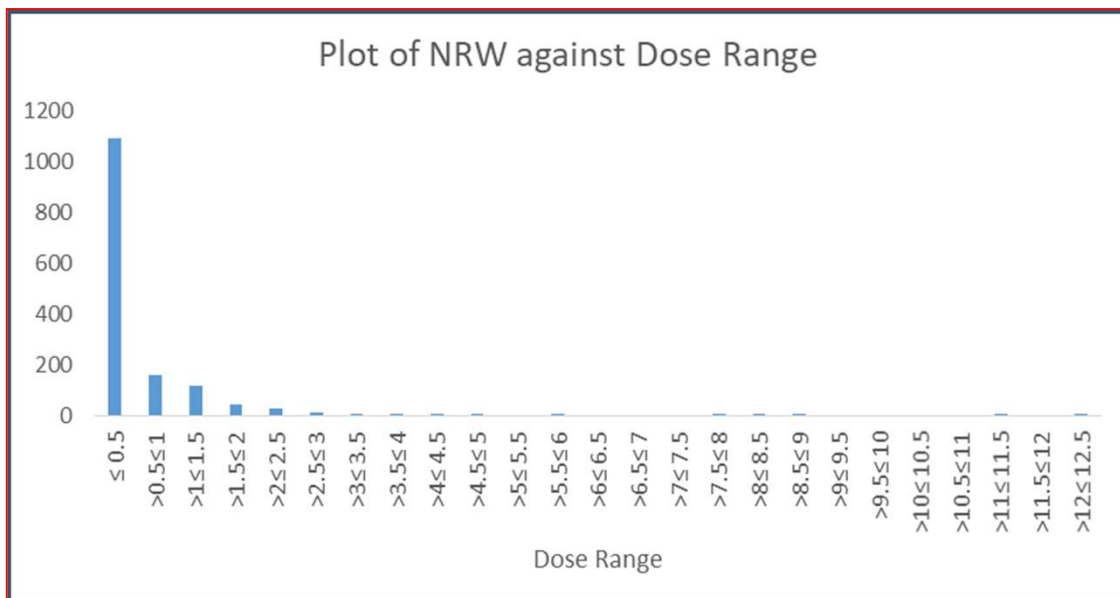


Average Effective dose for all occupational groups of 1475 occupational workers





ORP in Nigeria - Dose Assessment



Average dose distribution for all occupational groups of 1475 NRW

Contributions of dose assessment were also presented in Occupational Radiation Protection Conference & published in UNSCEAR Report of 2020/2021

United Nations Scientific Committee on the Effects of Atomic Radiation

SOURCES, EFFECTS AND RISKS OF IONIZING RADIATION
UNSCEAR 2020/2021 Report

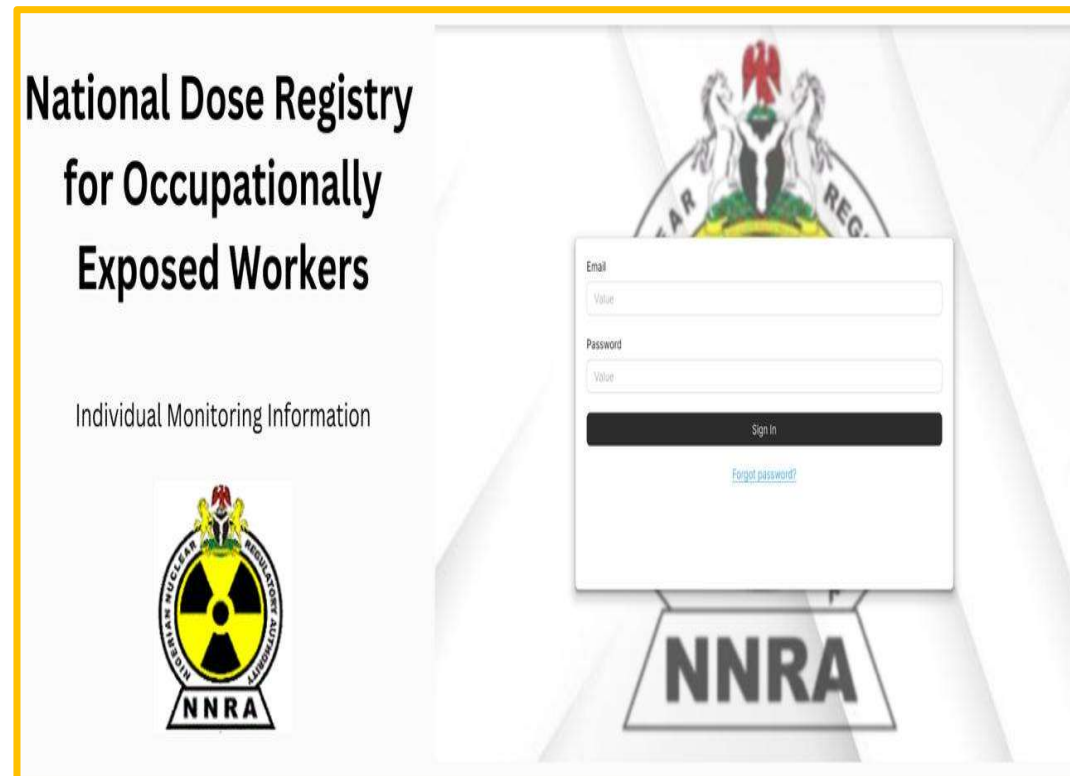
Volume IV
SCIENTIFIC ANNEX D:
Evaluation of occupational exposure to ionizing radiation

Country code*	Country name	National contact person(s)	National expert(s)
KEN	Kenya	A.O. Koteng	
KWT	Kuwait	E. Alfares	
LBN	Lebanon	M. Roumie	C. Rikb
LTU	Lithuania	J. Zilbas	A. Jakutis, A. Urbonienė
LUX	Luxembourg	N. Herpes	
MDG	Madagascar	T. Harony	M. Ralavelo, B. Randriamantsoa
MUS	Mauritius	F.A. Ollie	J. Christou
MEX	Mexico	J. Aguirre Gómez	F. Ortega
NER	Niger	L. Kane	D. Adisa, T. Lavalé, S.O. Muhammedu
NER	Nigeria	EC, MB, GB, Ekong	EC, Ebeke, MC, Ekong, V. Onyiah, Samba
NOR	Norway	A. Liv Rudjord	G.U. Fosterv, M. Kompend
PAK	Pakistan	R. Ali Khan	
PHL	Philippines	K. Romalosa	M. Cabrera, T. Masrid
POL	Poland	D. Kuszczyński	Z. Buzanowska, J. Miłowicz-Miko, T. Płoszczyński, M. Wysocka, K. Ziemowicz, M. Zrymiński
KOR	Republic of Korea	J.K. Lee	J.H. Kim, K.I. Lim
RUS	Russian Federation	S. Kiselev	A. Tsvetanov, V. Ushakov

UNited Nations



Modifications



The online NDR was developed by National Institute for Radiological Protection (NIRP), Center for Disease Control and Prevention, Chinese.

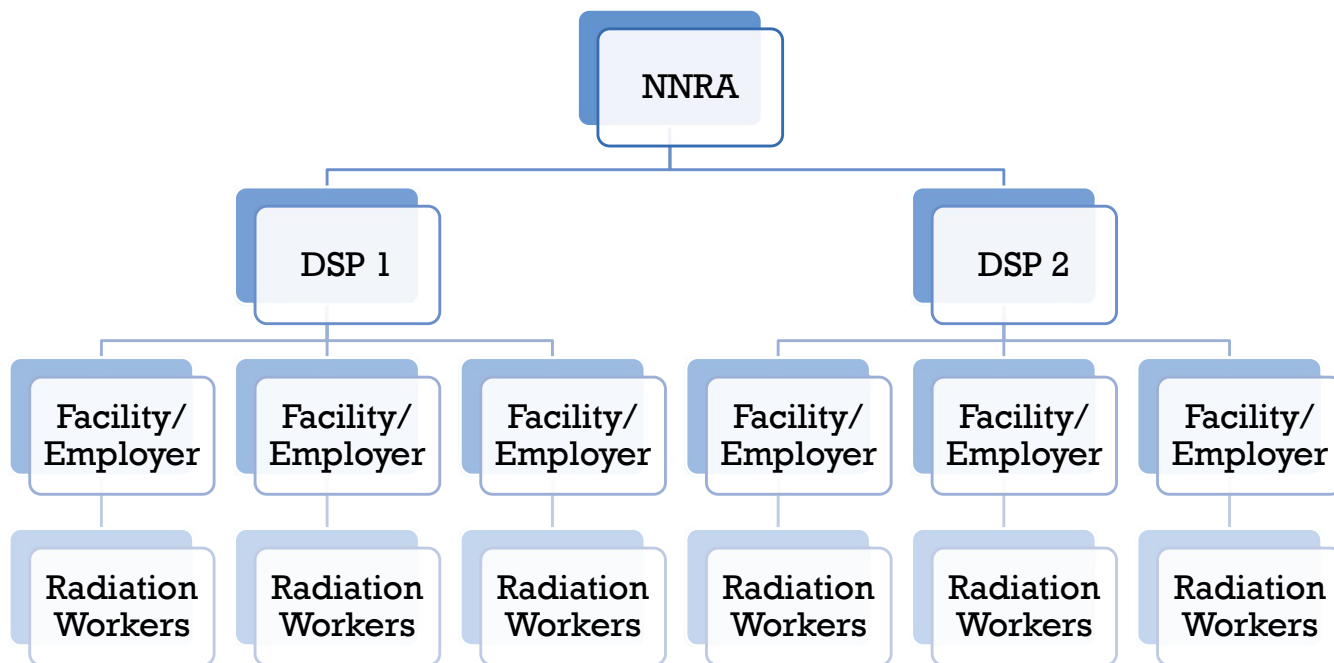
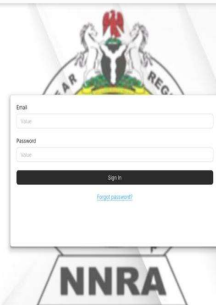
Installation and Training was conducted by NIRP via IAEA Expert Mission (EM) that took place on 9-13 December 2024, final modification 4th September 2025



ISOE - NDR Web Based

National Dose Registry
for Occupationally
Exposed Workers

Individual Monitoring Information



- NNRA – Desk Officers, Hardware (System Installation) and Software (Database Programs) & System of main database and application servers
- Web based networked with DSP across the country.



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ISOE - NDR Web Based



National Dose Registry for Occupationally Exposed Workers

Individual Monitoring Information



National Dose Registry for Occupationally Exposed Workers (Web-Based)

Individual Monitoring Information

Welcome | Add New E...

Note : Fields marked with * are required

- * Employer
- * Address
- * Postal Code
- * Contact Person
- * Telephone Number
- * Mobilephone Number
- Sectors
- * Organization Code
- * Monitoring Type -Choice-

Save | Reset

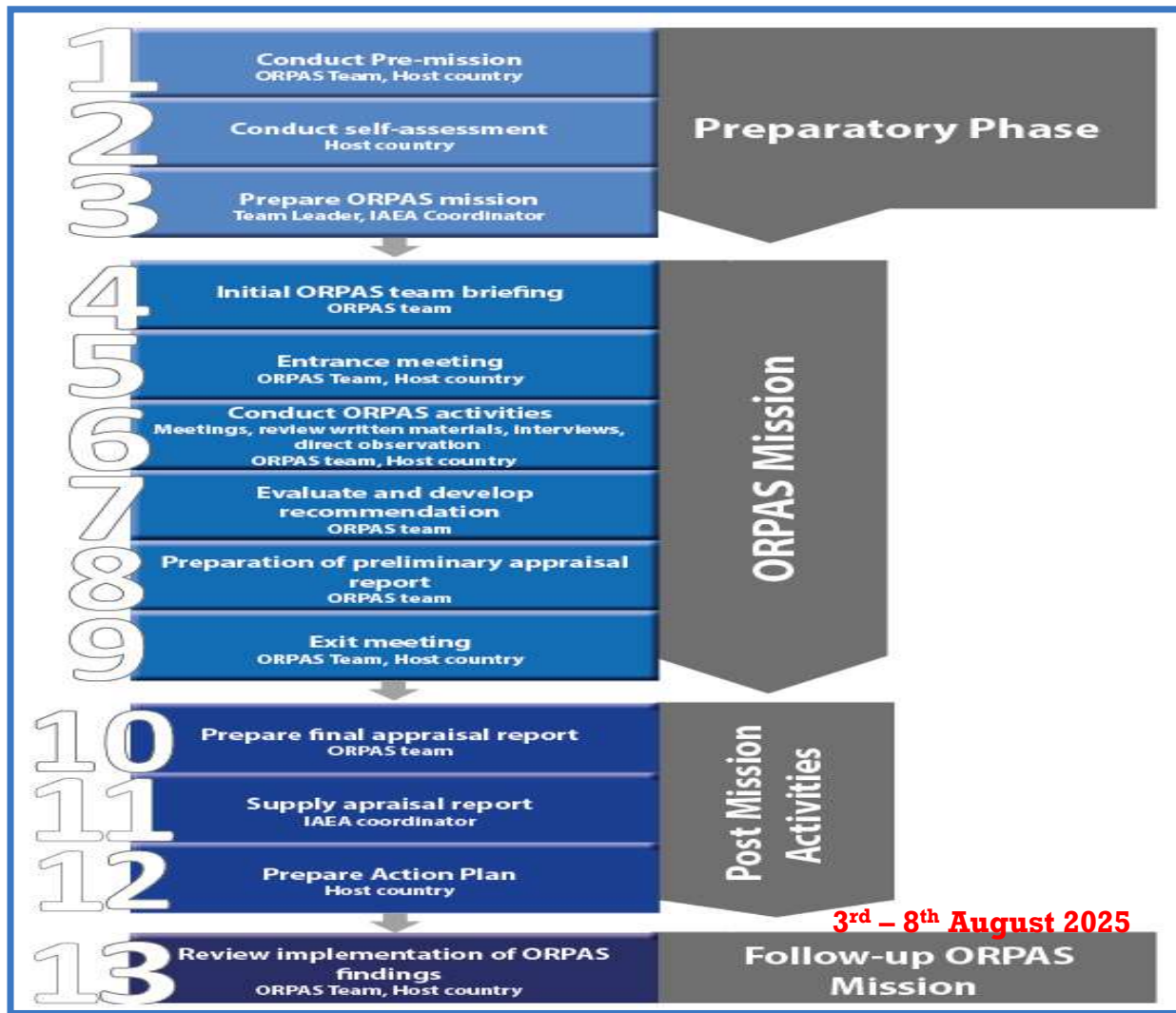
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Occupational Radiation Protection Appraisal Service mission to Nigeria

Occupational Radiation Protection Appraisal Service mission to Nigeria



3rd – 8th August 2025



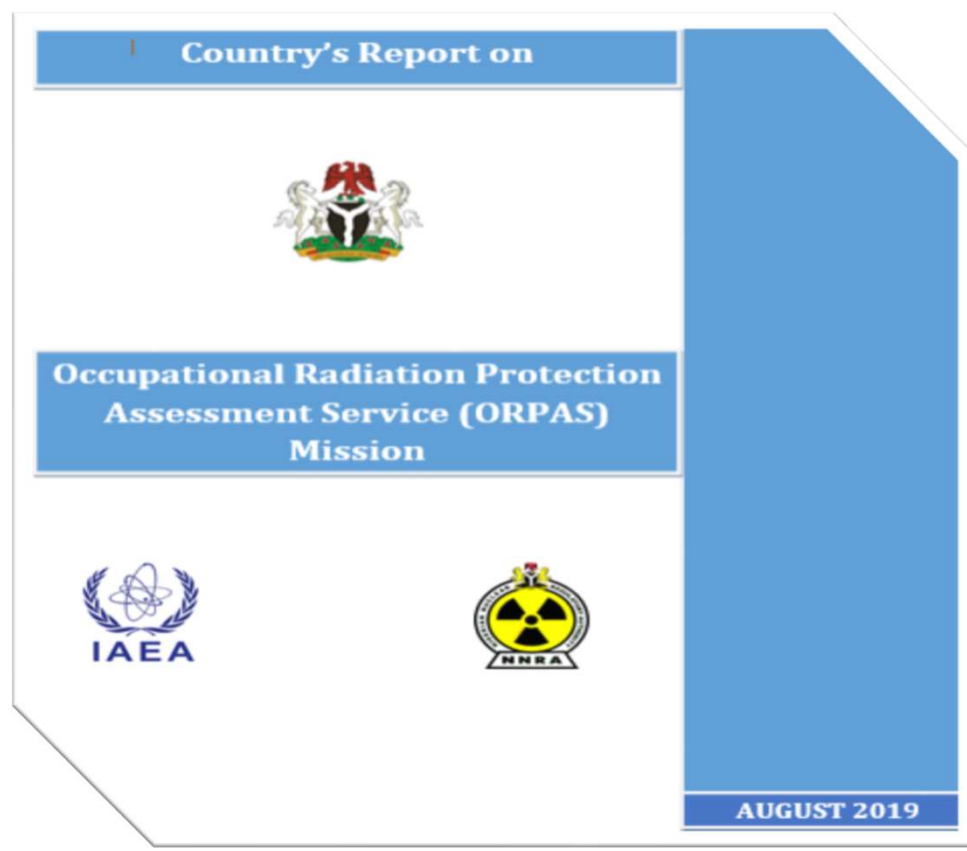
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ORPAS mission to Nigeria - Report/Publication

- ORPAS Country's Report was prepared and submitted to the IAEA for approval, declassification and publication



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Conclusion

- The NNRA is developing a nuclear regulatory infrastructure to enable Nigeria meet her international obligations and actualize the introduction of nuclear energy into her energy mix;
- The NNRA understands that important of ISOE by maintaining NDR as specified by the IAEA General Safety Requirements Part 1
- The NNRA will continue to improve ORP through ISOE, to ensure Records of occupational exposure for each worker is maintained during and after the worker's working life, at least until the former worker attains or would have attained the age of 75 years.

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Appreciation

- The IAEA for its full support on the ORP in Nigeria, organising this 2025 ISOE International Symposium, and funding for the trip
- The Department of International Cooperation, Ministry of Ecology and Environment of the People's Republic of China for being a great host
- The DG/CEO – Dr. Yau Idris and the Management of NNRA on behalf of the Nigerian Government for their timely release to attend this Programme

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Thank You For Listening

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