



AFRICAN ALARA NETWORK  
**Newsletter**

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From the desk of  
**AFAN Chair**

**W**elcome to AFAN newsletter!  
 In this issue, we will cover the latest updates and developments in the field of radiation safety and radon monitoring in Africa.



Radiation protection is crucial in ensuring the safety and well-being of workers and the general public who may be exposed to ionizing radiation in various settings such as medical facilities, nuclear power plants, and industrial environments.

Optimizing radiation protection practices involves implementing strategies to minimize exposure to radiation while maximizing the benefits of radiation use.

In this newsletter, we will explore:

- ◆ Best practices for reducing radiation exposure.
- ◆ Ways of Regulatory Effectiveness of Occupational Radiation Protection.
- ◆ Strategies in Radon Monitoring.

We will also highlight on experiences gained in radiation protection and radon monitoring. Stay tuned for more updates and insights on radiation optimization.

**Thank you for subscribing to our newsletter!**

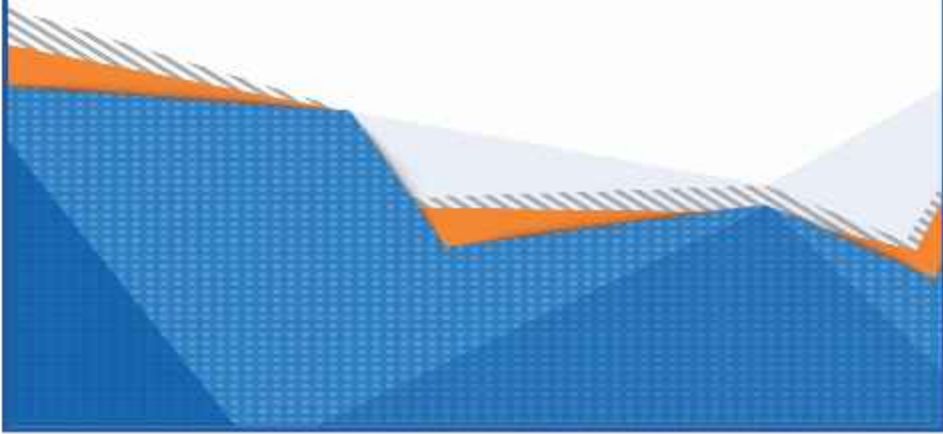


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**Special points of interest**

- Radiation Protection in Botswana.
- Regulatory Effectiveness of Occupational Radiation Protection in Nigeria.
- Radon Monitoring - Ghana's experience
- Occupational Exposure Control Events





## About African Alara Network (AFAN)

### History

#### Objectives of AFAN

- ⇒ To share and exchange information, experience and expertise for promoting the implementation of the ALARA principle for the management of occupational exposure in all situations, in the participating countries.
- ⇒ To enhance and develop skills and competences in occupational radiation protection for the different stakeholders concerned, in particular through proposals for appropriate training programmes.
- ⇒ To contribute to the harmonization of radiation protection policies and practices, particularly concerning ALARA, both at regulatory and operational levels across the region.



On the 5<sup>th</sup> of December 2017, the African edition of the ALARA network was formally created at the side event of the IAEA/ILO Joint Regional Workshop on Occupational Radiation Protection in Antananarivo, Madagascar. The ALARA network is an important initiative for promoting radiation protection optimization in the Member States. It was agreed upon to refer to this new network as AFRICAN ALARA NETWORK (AFAN). The creation of AFAN is the outcome of the Regional Coordination Meeting of the IAEA Regional Technical Cooperation Project RAF9057 that took place in Dakar, Senegal in February 2017. During this coordination meeting it was decided to create an ALARA network in the African region to share ideas and exchange information on occupational radiation protection.

Prior to the formation of the network, the Working Group Meeting to Establish the African Regional ALARA Network was held in Vienna from 10 to 12 October 2017. A team composed of eight experts from the Member States in the African region and one from France was constituted as a working group with the objective to identify the challenges on radiation protection optimization and to draft the Terms and Conditions for the Network. A draft version of the Terms and Conditions was circulated to member states for their input, in both English and French language.

*“Currently, the African ALARA Network has over 25 Member States.”*







### Regulatory Framework for Occupational Exposure

The NNRA periodically evaluates annual average effective exposure doses received by the occupationally exposed workers in various practices in Nigeria. The aim of this assessment is to ensure that for occupational workers prone to exposure, the likelihood of exposure and the magnitude of exposure are kept as As Low As Reasonably Achievable (ALARA), thereby preventing deterministic effects and reducing the probability of stochastic effects. Furthermore, the evaluation was imperative in achieving recommended dose limitation principle are not exceeded for radiation workers of various occupational categories in Nigeria.

To ensure the dose limits are not exceeded and in line with IAEA safety standard, the NNRA through its regulatory requirements and extant laws has recommended dose limits of occupational exposures to radiation workers which stipulates 20 mSv/y (averaged over a period of 5 consecutive years). The regulations requires that employers of radiation workers engage the services of an accredited Dosimetry Service Provider (DSP) who monitors, assess and report radiation doses to workers and submits quarterly and annual reports to the NNRA.

## Strengthening Regulatory Effectiveness of Occupational Radiation Protection in Nigeria

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The Nigerian Nuclear Regulatory Authority (NNRA), established by the Nuclear Safety and Radiation Protection Act 19 of 1995, but became operational in 2001, and its currently headed by Dr. Yau Idris as the Director General/ CEO of the organization. The NNRA is charged with the mandate of nuclear safety and radiological protection regulation in Nigeria, to ensure protection of life, health, property and the environment from the harmful effects of ionizing radiation, while allowing beneficial practices involving exposure to ionizing radiation.

Individuals working in both radiological and nuclear facilities in Nigeria are often exposed to sources of ionizing radiation resulting in some level of occupational dose, which depending on amount of incurred doses has likelihood for radiological hazards. However, having an effective radiation protection in place enhances dose reduction to the barest minimum. Occupational exposure refers to exposure to workers incurred in the course of

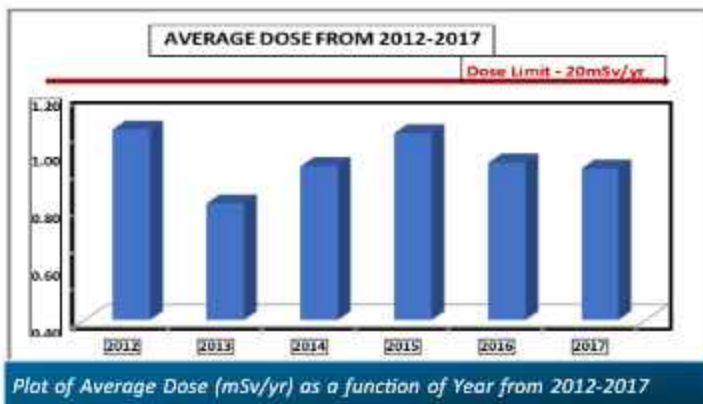
their work with ionizing radiation, according to the IAEA safety standards. The United Nations Scientific Committee on the Effects of Atomic Radiation, has outlined techniques of occupational dose assessment which entails categorizing type of exposures and radiation environment employed.

Radiation workers in facilities such as fuel cycle facilities, diagnostic radiology, nuclear medicine, industrial radiography, and nuclear power plants etc, can be exposed to radiation both internal and external dose in varying amounts of radiation, depending on their jobs and sources with involved. The human body interacts with radiation particles either internally or externally and thus resulting in biological damaging effect. It is pertinent to note that these radiation particles ionize living cells of the body either directly or indirectly thereby breaking chemical bonds of DNA biological molecule. The resulting effect can probably lead to impairment, permanent alteration and death of the cell.

### Occupational Dose Assessment

Employers of radiation workers engage the services of an accredited DSP who monitors and report doses of radiation workers to the NNRA in quarterly and summary report in annual basis. Different dosimeter products like calibrated TLDs, OSLs, Instadose, were used to monitor and report doses. A yearly Quality Assurance Proficiency Test is carried out by Secondary Standard Dosimetry Laboratory (SSDL) to ascertain the reproducibility, linearity etc of dosimeter used for dose reporting by the DSPs.

The annual average effective doses (AED) collation for Hp[10] and Hp[0.07] of several occupational categories like Industrial Uses, Medical Uses, Education and Research and other Activities and practices were carried out between 2012 to 2017. A total of 6424 occupational workers were accessed in the period under review, and only 932 workers had AED values above Minimum Detectable Limit (MDL) of 0.03 mSv whereas 5492 worker fell below this MDL. Summarily, these doses were all below regulatory limits of 20 mSv/yr as seen in the figure below, which indicates a strong regulatory framework as instituted by the NNRA.







# Strengthening Regulatory Effectiveness of Occupational Radiation Protection in Nigeria

## IAEA Independent Appraisal Mission

In a bid to ensure that the NNRA always operates in line with international safety standards, it made a request for an Occupational Radiation Protection Service (ORPAS) missions to appraise its occupational radiation protection system. The ORPAS is one of several independent appraisal missions available to IAEA member countries, aimed at strengthening radiation protection programs to improve legal, regulatory and technical infrastructure related to occupational radiation protection.

Upon invitation from the Government of Nigeria, the first IAEA ORPAS mission to Nigeria took place from 10-15 July 2022, and was hosted by NNRA in the capital Abuja. The ORPAS team comprised international experts from four African countries — Botswana, Tanzania, Ghana, Morocco — as well as one IAEA staff (Picture below). Accordingly, the organizations participated in the ORPAS mission were: the NNRA, two dosimetry service providers (Radiation Safety Technology (RST), and National Hospital Abuja), one Secondary Standard Dosimetry Laboratory, Operators including, two non-destructive testing companies and two hospitals.



ORPAS Mission Experts to Nigeria in NNRA

The ORPAS mission underscored that the Nigeria has a good management system for radiation protection, which nurtures a solid safety culture in protecting employers of ionizing radiation facilities who might become exposed to radiation in their occupation. The findings also demonstrates Nigeria's strong commitment to strengthening the occupational radiation protection infrastructure in line with international safety standards in line with the mandate that establishes the NNRA.

According to the ORPAS Guidelines, a good practice recognizes an outstanding arrangement, programme or performance superior to those generally observed elsewhere and worthy of attention by others as a model in the general drive for excellence. Some of these good practices were identified during the mission and are listed below:

- ◆ Publication of annual report on the activities of NNRA. This provides feedback to the stakeholders thus leading to public trust and hence a motivation to improving compliance to regulatory requirements;
- ◆ The national dose registry is available and operational, and is used to confirm the compliance of licensees or registrants with the regulatory requirements;
- ◆ The Government of Nigeria has an established programme for education, training, qualification and competence in protection and safety;
- ◆ Some operators are formally accredited or certified by recognized standard bodies.

Recommendations from ORPAS team were also proposed for improving radiation protection of workers according to the IAEA Safety Standards, as touching the Regulatory Body, Operators and Technical Service Providers for their entire operations to be in line with GSR Part 3 and GSG-7.

## CONCLUSION

Nigeria has established an effective regulatory system through the NNRA for regulating the use of ionizing radiation that may lead to occupational exposure. The NNRA has periodically evaluates annual average effective exposure doses received by the occupationally exposed workers in various practices in Nigeria and were found to be below regulatory limits which indicates adequate regulatory framework as instituted by the NNRA. The IAEA independent appraisal mission ORPAS conducted showed Nigeria's strong commitment in strengthening the occupational radiation protection infrastructure in line with international safety standards.