

Overview of strengthening the Nuclear Security Regimes for the Ghana Research Reactor-1 by the Ghana Atomic Energy Commission

The International Atomic Energy Agency (IAEA) through its publications had emphasised that the responsibility of nuclear security within a state rest entirely with the state in ensuring security of nuclear materials and other radioactive materials. In that regard, owners of nuclear facilities owns the state the responsibility of protecting such materials against theft, sabotage, unauthorized access and illegal transfer and other malicious acts. It is in this recognition that the Ghana Atomic Energy Commission (GAEC), owners of Ghana Research Reactor-1 (GHARR-1) over the years have been engaging the necessary international strategies in improving matters of nuclear security at the facility level.

GAEC was established by an Act of Parliament (Act 204) in 1965 with the mandate to be the sole authority in Ghana responsible for matters relating to peaceful uses of atomic energy and fulfilling the state's obligation on nuclear safety and security. For the purpose of nuclear regulation, it established the Radiation Protection Board (RPB) by Atomic Energy Amendment Law (PNDCL 308) in 1993 as a national nuclear regulatory authority. The PNDCL 308 Law prescribe powers and functions of the RPB which include mechanisms for the safety and security of nuclear and other radioactive materials. To further improve the regulatory system in Ghana, the RPB was modified into an independent Nuclear Regulatory Authority (NRA) by Act 895 of Parliament in 2015. Act 895 empowered NRA to conduct inspections to assess compliance with the security of nuclear and radioactive materials and associated facilities. These arrangements have strengthened the effectiveness in the nuclear security regulatory regimes in Ghana as the NRA is currently drafting the national legislations in that regard.

Guided by these regulatory processes, GAEC acquired GHARR-1 which is a 30-kW commercial version of the Chinese Miniature Neutron Source Reactor (MNSR) and belongs to the class of tank-in-pool type reactors in 1994. The core of GHARR-1 which was initially 90.2% uranium enriched is located 4.7 m under water close to the bottom of a watertight reactor vessel. The quantity of water in the vessel, serves the purpose of radiation shielding, moderation and as well as primary heat transfer medium. Currently, the high enriched core of GHARR-1 has been converted to 13% low uranium enriched fuel in 2017. By the core conversion, GAEC has showed a strong commitment in addressing global matters of non-proliferation concerns and also strengthening its nuclear security regimes at the facility level. The commitment to non-proliferation dates back to 1968 as GAEC signed the safeguards agreement in 1975, and the Additional Protocol Agreement in 2004.

For the commission to understand, gained international recognition and appreciate better matters of nuclear security at the facility level, over the years, has signed numerous international legal instruments which include: Convention on the Physical Protection of Nuclear Material (CPPNM); and Convention on Nuclear Safety (CNS). For the prevention of malicious acts by an adversary that could result in unacceptable radiological consequences, GAEC has in place a credible strategy which include: Physical protection, personnel security and emergency response plan to deal with such matters. Currently, the major security upgrades at GHARR-1 is based on three main basic physical protection systems of Prevention, Detection and Response.

Physical Barriers include: making the reactor hall resistant to force attack; outer border of the protected area has outside walls, bars on the glass windows, locked doors and locked gate; an access control turnstile is installed in the corridor leading to the reactor hall; a well-designed intruder detection system such as alarm sensor on the door, vibration sensors on the walls and detection sensors on top of the reactor are installed at GHARR-1 to provide early and reliable detection of any attempted intrusion; to improve verification capabilities, CCTV cameras or video motion detection to monitor the internal areas of the reactor hall, control room and the reactor hall corridor had been installed, the video data is stored and can always be played back. These systems are connected to the central alarm station (CAS) and monitored externally 2 km at GAEC police station which give signal of protected area violation by potential intruder. In addition, fresh fuel is located at high security area physically separated from the fuel in the reactor core.

Personnel security arrangements are in place at the facility to ensure honesty, reliability and trust worthiness of staff and others who have access to the facility. The objective of personnel security is to ensure unauthorized removal and sabotage in the facility regarding nuclear and radioactive materials. An emergency plan with an objective to effectively recover or mitigate consequences of sabotage is well documented in the GHARR-1 Safety Analysis Report. Finally, GAEC with support US Office of Radiological Security (ORS) is in the process

of implementing a “Site Security Plan” to boost security at its nuclear facilities.

Gender

Male

State

Ghana

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