

Nuclear Security Regime in Ghana

Abstract

Uses of nuclear and other radioactive materials in peaceful applications in energy production, medicine, research and industry, to improve the daily lives of individuals makes these materials on the move and in high demand. On the other hand, the possible risk of using in terrorist purposes, by it falling into the wrong hands is a real and therefore growing concern to enhanced nuclear security globally. Ghana has since the early 1950s been using radioactive materials and associated facilities. It is an established fact that the responsibility of nuclear security rest on the state. Strengthening national regulatory frameworks for safety and security against threats from malicious acts involving nuclear or other radioactive materials in the country is important to ensure that the public as well as the environment is protected. Ghana has established national nuclear security regimes for the prevention of, detection of and response to criminal or intentional unauthorized acts involving or directed at nuclear material, other radioactive material, associated facilities and associated activities. The nuclear security regime is part of a Ghana's overall security regime. It covers nuclear material and other radioactive material, whether that material is under or out of regulatory control, as well as associated facilities and associated activities, throughout their lifetimes. The nuclear security regime of Ghana reflects the Ghana's responsibility to protect persons, property, society and the environment from the harmful consequences of a nuclear security event. The presentation will highlight on the legislative and regulatory framework and administrative systems and measures governing the nuclear security of nuclear material, other radioactive material, associated facilities and associated activities, the institutions and organizations in Ghana responsible for ensuring the implementation of the legislative and regulatory framework and administrative systems of nuclear security and nuclear security systems and nuclear security measures for the prevention of, detection of and response to nuclear security events.

1. Introduction

The potential threat of terrorism involving nuclear and other radioactive materials is a real and a possible danger to the industry in Ghana. Terrorist groups and criminals may be interested in obtaining and using such materials. The public health, economic, and political impacts of attacks using, or accidents involving, nuclear and other radioactive materials could be catastrophic if it occurs in Ghana or if it is discovered that the material originates from or is transited through Ghana. The Republic of Ghana has evaluated the threat of illicit trafficking of nuclear or radiological materials based on information provided by its competent authorities and from other sources

including the International Atomic Energy Agency and has determined that a national detection strategy is needed to effectively counter the threat. The illicit trafficking, as well as the increase in migration and the threat of terrorism has sparked a new interest in the in the world. The illicit incident data base (ITDB) indicate that unsecured nuclear and other radioactive material continues to be available and individuals and groups are prepared to engage in trafficking this material [1].

At present, illicit trafficking, theft, and unauthorised possession and movement of nuclear and other radioactive materials are a recurrent problem in Africa. Neighbouring States to Ghana have significant terrorist and criminal activities with border controls essentially non-existent. The likelihood of increased illegal activity involving nuclear materials and their precursors is real and a threat to Ghana. The increased use of radioactive sources in Ghana and in neighbouring countries increases the likelihood that these materials will also be illegally trafficked across Ghana's borders and potentially be used by adversaries to cause harm to Ghana and its citizens.

After the terrorist attack of the 9/11 on the world trade center in USA, the threat of use of nuclear and radiological material by terrorist groups concern was heightened globally. Multilateral efforts were intensified to prevent nuclear terrorism by ensuring a robust nuclear security regime, both at domestic and international levels in order to prevent the materials falling into the hands of the terrorist group to be used to malicious intent. The four Nuclear Security Summits (NSS) – Washington 2010, Seoul 2012, The Hague 2014, and Washington 2016 during Obama's administration made important progress in building the momentum to secure vulnerable nuclear materials so terror groups can't acquire them by creating awareness to the international community [2].

A robust nuclear security regime in Ghana is a pre-requisite if safe, secure and low-carbon nuclear power aspirations are to be pursued and its advantages shared between countries. National nuclear security regime comprise of legislative and regulatory framework, and the national organizations and administrative system responsible for implementing the framework. The regime also includes the nuclear security systems and measures for preventing, detecting and responding to nuclear security events. Nuclear security regime cannot be sustained merely by laws, regulations and equipment alone it has to be supported by effective planning and coordination involving competent authorities and other relevant stakeholders. Coordinated, regular evaluations of the regime's effectiveness are key, as is planning that ensures that human resources and technical and scientific capabilities are developed and sustained [3]. A nuclear security regime for radioactive material,

associated facilities and associated activities in Ghana covers the security throughout its lifecycle: supply, receipt, possession, storage, use, transfer, import, export, transport, maintenance and disposal.

1.1 Major facilities in Ghana

Non-power nuclear energy applications refer to the beneficial use of radiation sources of various types and activities in fields other than civilian commercial electricity generation using power plants. Since the early 1950s, Ghana has been at the forefront of acquiring and utilizing non-power nuclear energy technologies to drive human progress and to play a vital role in national and regional development. Today, radiation science and technology are widely used across multiple sectors of the Ghanaian economy, including industry, transport, medicine, agriculture and food, research, and teaching.

However, many of these peaceful non-powers nuclear energy use in Ghana are less well-known to the public. The purpose of this section is to highlight existing major non-power nuclear energy equipment, facilities, and laboratories that have far-reaching benefits in modern Ghana. The major facilities are the Ghana Research Reactor-1 Facility, Multi-purpose Gamma Irradiation Facility, External Beam Radiotherapy Centres, Brachytherapy Equipment, detection Instruments for Nuclear Security Application, and Radiological Imaging Centres.

For each equipment, laboratory or facility, a brief description of the technology is presented, followed by information about its status, then its intended use, and finally, the highlight of the practical impact of the technology on social and economic development of Ghana.

2. Legal and regulatory infrastructure

One objective of a global nuclear regulatory framework is to strengthen the transparency, openness, independence, technical competence and effectiveness of regulatory systems. Ghana has employed tools for effective nuclear security regime base of regulatory framework to prevent illicit trafficking of radioactive materials.

2.1 Overview of Nuclear Law

The national legal and regulatory framework is crucial to preventing, detecting and responding to illicit trafficking. In order to build effective regime, the IAEA provides, upon request, advice and assistance to its Member States on existing national legislation related to the safe and peaceful uses of nuclear energy. Member states can use the model laws as references in developing their national laws.

The Nuclear Regulatory Authority (NRA) is an effectively independent Regulatory Authority that was established by an Act of Parliament in August 2015 (Act 895, 2015). The mandate of the NRA is to ensure the peaceful application of IONIZING and NON-IONIZING radiation sources and devices in a safe and secure manner without limiting the benefits to mankind. Before the NRA was established, the Ghana Atomic Energy Commission (GAEC) was responsible for carrying out this Regulatory function through the Radiation Protection Board. The NRA is mainly to focus on the Regulatory Control of the use of ionizing and non-ionizing radiation by putting in place all the necessary regulations and guidance to help users of radiation and members of the public meet the regulatory requirements and to enforce these regulations. The object of these controls is to ensure that in the use of ionizing and non-ionizing radiation, humans (workers, the general public and patients) and the environment are not unduly affected.

2.1.1 The Scope of the Law:

- i. Regulations and management of activities and practices for the peaceful use of nuclear energy and radiation;
- ii. management of radioactive waste resulting from civilian applications in Ghana;
- iii. management of spent fuel resulting from the operation of civilian nuclear reactors in Ghana

2.1. 2 Functions of the Nuclear Regulatory Authority

The main functions of the NRA and its regulatory control programmes include but not limited to:

- i. Review and evaluation of the notification by applicants of their intention to undertake activities involving radiation
- ii. Authorization of practices involving ionizing and non-ionizing radiation sources and devices

- iii. Inspection of nuclear installations, premises where radiological sources and devices are used, against their records keeping, safety, safeguards and security measures
- iv. Enforcement on non-compliance issues.
- v. Review of applications for authorization, emergency and safety analysis reports
- vi. Development of regulations and guidance documents
- vii. Authorization of sites selected for construction and installation of nuclear and radiological facilities and devices
- viii. Authorization of design, re-design and modification of nuclear installation or a part of a nuclear installation
- ix. Ensure decommissioning of nuclear facilities and devices at the end of their licensed life time or whenever required.
- x. Ensure occupational radiation workers are provided with the requisite training
- xi. Support the coordination of all radiological and nuclear emergencies in Ghana in collaboration with stakeholders including other state Agencies
- xii. Authorize the import and export and ensure the control of radiation emitting devices and items
- xiii. Organize search and secure of materials out of regulatory control to bring such under regulatory control.
- xiv. Reporting to the International Atomic Energy Agency (IAEA) on Safeguards and non-proliferation issues as well as any other international legal instrument reporting obligation of Ghana
- xv. Ensure protection of the occupational workers and the public from undue radiation exposure
- xvi. Collaborate with stakeholders to develop national policies and regulations for the management of radiation related activities and practices
- xvii. Authorize institutions that conduct training for personnel of nuclear installations.
- xviii. Authorize the mining and processing of radioactive materials and processing of materials containing radioactive substances.
- xix. Inform and educate the public on radiation and nuclear matter

2.1.3 International instruments

Ghana has ratified or acceded to international treaties, conventions, and protocols related to non-proliferation.

Multilateral Treaties

- 1963 Partial Test Ban Treaty (PTBT)
- 1967 Outer Space Treaty
- 1968 Nuclear Non-Proliferation Treaty (NPT)
- 1971 Seabed Treaty
- Nuclear-Weapon-Free Zones (NWFZ)
- 1996 Comprehensive Nuclear Test Ban Treaty (CTBT)
- 2005 Convention on the Prevention of Nuclear Terrorism
- Treaty on the Prohibition of Nuclear Weapons (Nuclear Weapons Ban Treaty) (not yet entered into force). Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Seabed and the Ocean Floor and in the Subsoil thereof
- Missile Technology Control Regime (MTCR)
- Hague Code of Conduct against Ballistic Missile Proliferation

Ghana has ratified or acceded to international treaties, conventions and protocols related to nuclear safety and security as well as the civil liability regime.

Multilateral Treaties and Conventions

- 1963 Vienna Convention on the Civil Liability for Nuclear Damage*
- Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage (INFCIRC/566)*
- 1971 Convention Relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material
- 1972 Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter (London Convention)

- 1980 Convention on Physical Protection of Nuclear Materials (CPPNM), (INFCIRC/274)
- 2005 Amendment to the Convention on the Physical Protection of Nuclear Material (CPPNM), (INFCIRC/274/Rev.1/Mod.1)
- 1986 Convention on Early Notification of a Nuclear Accident (INFCIRC/335)
- 1986 Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (INFCIRC/336);
- 1994 Convention on Nuclear Safety (INFCIRC/449)
- 1997 Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management (the ‘Joint Convention’), INFCIRC/546
- 1997 Convention on Supplementary Compensation for Nuclear Damage (INFCIRC/567)

2.1.4 Regional Networks

- African Nuclear Weapon- Free Zone Treaty (Pelindaba Treaty)
- African Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology (AFRA)
- 1975 Treaty Of The Economic Community Of West African States (ECOWAS)
- 1993 Revised Treaty Of The Economic Community Of West African States (ECOWAS)¹
- Forum of Nuclear Regulatory Bodies in Africa (FNRBA)
- African Commission on Nuclear Energy (AFCONE)

2.1.5 UN Security Council

- UNSC Resolution 1373 (2001)
- UNSC Resolution 1540 (2004)

2.1.6 National Regulations

The Nuclear Regulatory Authority (NRA) of Ghana is expected to develop draft regulations with respect to all aspects of the use of nuclear materials and the operation of nuclear power plants in the country. By the end of 2019, the NRA was developing regulations and guidelines to ensure

the implementation of the provisions of NRA Act 895. The following national safety requirements, regulations, and associated guidelines were under development [4]:

- 1) Nuclear Safeguards
- 2) Siting of Nuclear Installations
- 3) Licensing of Nuclear Installations
- 4) Draft Requirements for Technical Services
- 5) Emergency Preparedness of Nuclear Installations
- 6) Nuclear security regulations
- 7) Operation of a Nuclear and Radioactive Waste Management Facility
- 8) Develop Requirements, Guidelines and Code of Practice for Establishing and Operating a Training Institution and Facility for personnel of a nuclear installation.
- 9) Safety Transport Regulation

3. Export and import Control.

As part of the nuclear regulatory control, an export- import authorization system of radioactive and nuclear materials is applied by NRA. This is another measure that contributes to the prevention and detection of illicit uses of radioactive materials [5]. Besides, the exportation of nuclear materials and related technology also requires a license granted by the “National Commission of Sensitive Exportations and War Materials”.

4. Detection strategy

A ‘criminal act’ or terrorist act is normally covered by criminal or punitive law in a State, whereas an ‘unauthorized act’ is typically the subject of administrative or civil law. In addition, criminal acts involving nuclear or other radioactive material may constitute offences related to acts of terrorism which, in some States, are subject to special legislation that may be of relevance in following the recommendations. Unauthorized acts with nuclear security implications could include both intentional and unintentional unauthorized acts as determined by the State. Examples of a criminal act or an unauthorized act with nuclear security implications could, if determined by the State, include: (i) the undertaking of an unauthorized activity involving radioactive material by an authorized person; (ii) the unauthorized possession of radioactive material by a person with the intent to commit a criminal or unauthorized act with such material, or to facilitate the commission of such acts; or (iii) the failure of an authorized person to maintain adequate control of radioactive

material, thereby making it accessible to persons intending to commit a criminal or an unauthorized act, using such material.

The National Detection Strategy for Ghana is based on a careful analysis of the threat posed to Ghana by the potential use or transport of nuclear and other radioactive material out of regulatory control. The focus of the strategy is twofold: (1) detection of illicit trafficking of these materials across border locations in Ghana, and (2) prevention of possible use or loss of those materials within Ghana. The strategy is based upon a national threat and risk assessment completed in February 2016 by a group of security experts from GAEC, Customs, National Security, Airport Authority, and Ghana Ports and Harbour Authority (GHAPOHA). The National Detection Strategy was also developed in cooperation with the International Atomic Energy Agency. The strategy is the consensus of all involved organizations. This document contains sensitive information and should be appropriately protected and distribution limited to only those persons with the need to know.

Based on the threat and risk assessment, a national detection strategy was developed and implementation will focus initial efforts on the following activities:

1. Promulgation of awareness of the threat as defined in this document
2. Provision of training to senior officials and front line officers in radiation detection techniques to include detection by information and by instrument
3. Provision of equipment to selected border locations

The implementation of these activities will be in accordance with a National Detection Strategy implementation plan. The phased approach of the plan provides Ghana with a carefully considered approach for implementing national detection activities in a sustainable manner that addresses the illicit trafficking threat as understood by the competent authorities. The dynamic nature of the threat also requires that the implementation of the strategy be re-evaluated on a recurring basis and changes made as necessary to maintain an effective, efficient, and sustainable national detection architecture.

5. Detection of Illicit Trafficking

Monitoring of gamma radiation is essential for detecting radioactive materials that are being illicitly moved. Neutron detection is necessary for detecting the illicit movement of nuclear

materials, particularly shielded materials. Both gamma and neutron monitoring allow non-invasive interrogation of flows of people, goods and transport vehicles crossing checkpoints. The time available for the detection of radioactive materials is necessarily short in this application. The task of detecting radioactive materials that are being illicitly trafficked has to be undertaken in a radiation environment that has natural and anthropogenic components, which will vary from place to place and from time to time. Any criterion (or 'investigation level') used to decide whether the radiation from any particular shipment indicates the presence of illicitly trafficked radioactive materials has to take this variable background into account. Some radiation sources or radionuclides are not subject to regulatory control. They may be excluded, the practices that produced them exempted, or they may be specifically cleared. The mechanisms and applications of exclusion, exemption and clearance derive from the Basic Safety Standards [6]. Exposures to radiation that are part of the natural human environment are mostly regarded as unavoidable, and it is usually not practicable to control them through regulation. Recognizing that such exposures are essentially not controllable, the Basic Safety Standards treats them as 'excluded' from the regulatory requirements. The NRA Act, Act 895 give the NRA the powers to determine exemption levels in Ghana. If radioactive materials in shipment or in transit or in use is a low radiation risk, the NRA may exempt the practice using such radioactive materials in the defined way from regulatory control. Smoke detectors and luminous dial watches are typical examples of the application of radionuclides which can be exempted. If it can be shown that the exposures from release of radioactive materials will be insignificant, a regulatory authority may clear them from regulatory control. Such clearance can apply both to materials that are being discarded as waste and to materials intended for further use or recycling. It is implicit to the concept of clearance that materials, once cleared, are subject to no further regulatory restriction or control. The investigation level of radiation signal that is selected for deciding that a monitored vehicle, passenger or cargo may be transporting radioactive material illicitly is a compromise. On the one hand, it is desired to detect any illicitly trafficked radioactive materials, e.g. sources in shielded containers which may be buried deeply in scrap metal or other non-radioactive goods. On the other hand, it is desired to avoid unnecessary 'nuisance' alarms, rejections and delays at border crossings. For radionuclides emitting gamma radiation, the Safety Guide recommends as an investigation level a dose rate, measured on the outside of a vehicle, that is within the range 0.1 to 0.5 mSv/h [7, 8].

In Ghana, the control of import and export is the mandate of the Ghana Revenue Authority, Customs Division. To minimize the risk of nuclear and other radioactive materials incidents, it is essential to have rigorous import and export controls in place to ensure that radiation sources entering the country are released only to authorized persons and only for authorized purposes. This activity is performed on behalf of the Nuclear Regulatory Authority by Customs by an established Memorandum of Understanding between the two parties. The purpose of the Memorandum of Understanding (MoU) is to state the roles and responsibilities of the Nuclear Regulatory Authority, and Ghana Revenue Authority, Customs Division in relation to the import, export and transit of radiation sources and to establish clear working guidelines on the actions to be taken by the respective parties to ensure protection against ionizing radiation and safety and security of radiation sources. Based on the Ghana detection strategy, training and detectors are provided to the Ghana Customs for detection of concealed radioactive materials. These radiation detectors may also be desirable to detect attempts by persons to smuggle radioactive substances into the country and to detect contaminated foodstuffs and other materials before their release to the public.

Over the years the GRA Customs division has been equipped with radiation detection instruments such as handheld equipment portable radiation detectors (PRDs) and radiation isotope identifiers (RIDs). Additionally, based on the national detection strategy, the need for more PRDs, RIDs, and Backpacks.

USDOE has also supplied to GRA Customs Division a mobile detection system (MDS) to aid in detection of materials out of regulatory control (MORC). The system comprises a detection van with gamma and neutron detectors, a Backpack, an RID, one PRD and a survey meter [9].

4.1 Response measures

Effective border control is a critical component in preventing and/or detecting the unauthorized transport of nuclear and other radioactive materials and devices. In general, nuclear detection capabilities are overlaid on existing capabilities for controlling entry of people, goods, and contraband at authorized land, maritime and airports, as well as between points of entries.

The goal of any response to inadvertent movement or illicit trafficking of radioactive material is to minimize possible health hazards, gain control over the radioactive material, and to investigate, gather evidence, and prosecute any offenders in the incident.

4.1.1 Response measures may include:

1. Making use of law enforcement and investigative assets to gather more information
2. If the information alert is about radiological material at borders, NRA shall be invited to verify the information on the nuclear and radiological materials and to ensure that they are all under regulatory control
3. Relocate architecture instruments, personnel, and other assets.
 - a) For example: Increasing border control activities
 - b) Adding instruments and personnel around targets
 - c) Increasing a security presence around domestic sources
4. Actively attempt to locate radioactive material by conducting a search of a particular area such as:
 - a) The area between points of entry
 - b) A venue for a major public event
 - c) A specific location
5. If NRA in consultaion with Customs believe that the information is credible and timely or believe that an event is imminent, they may choose to declare a nuclear security event and activate the response measures.

4.1.2 Role of Customs in responding to nuclear security events

Traditionally in Ghana, the work of Ghana Revenue Authority, Customs division have been revenue generation agencies through the collection of duties of imported comodities. Customs all over the world are now engaged in additional duties: (1) facilitation of international trade and (2) protection of society. These additional tasks may not be their core mandate and and require the GRA customs services to strike a balance between facilitation and effective control, which is managed through the application of risk assessment techniques.

Aside their core mandate, Customs services have always played a key role in preventing and detecting illicit movement of goods at borders before they leave or enter the country. This role falls into the category of 'protection of society', and it ranges from combating drugs smuggling to preventing illicit trafficking in nuclear and other radioactive materials.

In Ghana, the Customs services plays a vital role in designing and implementing

national detection strategy for combating smuggling activities by virtue of their legal, administrative and technical advantages.

Effectiveness of any detection and response infrastructure strongly depends upon the customs and other competent personnel involved. All personnel involved should:

1. Have access to all required information necessary to perform their duty.
2. Have have basic knowledge on how to identify radiation symbol and detect radiation with an instrument.
3. Be trustworthy in performing all their duties.
4. Have a basic understanding of the NRA authorization process to possess and use radiation.
5. Be familiar with
 - a) The form and content of authorizations issued by such authorities,
 - b) The kind of documentation applicable to authorized persons, organizations or activities, and
 - c) The means for verifying valid authorizations.
6. Know which governmental agencies have relevant expertise to serve as MEST to avoid confusion and if support is required.
7. Be trained to (especially the law enforcement personnel) in radiation radiation safety, security and safeguards issues.
 - a) Recognize the most obvious signs of false documentation
 - b) Implement the procedures for verifying the validity of authorizations

4.1.2 Role of NRA in responding to nuclear security events

Some of the roles and responsibilities of the Authority include;

1. The implementation of the detection and response measures
2. Serve as the MEST for detection and response measures.
3. Contribution to the development of the national detection strategy and national response plan;

4. Development of human resource required for nuclear security operations at the borders and within the country
5. Establishment of the sound management practices for operational preparedness.
6. Cooperation with the coordinating body (CUSTOMS) and other competent authorities,
7. Exchange of relevant information with other competent authorities
 - a) At national level, and
 - b) At International level.
8. Activation of necessary actions when nuclear security incident is reported.

6. Emergency response

ACT 517, 1996 established the National Disaster Management Organisation (NADMO). The NADMO is responsible for emergency preparedness and response for all potential emergency situations in Ghana. NADMO published its National Disaster Management Plan (NDMP) in 2010. The NDMP defines all-hazards emergency management system and includes nuclear and radiological emergencies. NADMO is the lead agency for all conventional emergencies in Ghana. ACT 895, 2015 established the Nuclear Regulatory Authority (NRA) and is the lead technical agency for nuclear/radiological emergencies in the country. Section 32 of the NRA Act 895, 2015, states that the NRA shall in collaboration with the agencies responsible for nuclear emergencies and disaster management develop and maintain a national emergency for responding to potential nuclear or radiological emergencies.

NADMO and GAEC developed the National Nuclear and Radiological Emergency Response Plan (NNRERP) to specifically address nuclear and radiological emergencies, and this has been approved by NADMO. The plan presents a general description of the roles and responsibilities of the ministries, other organizations and facilities involved in any given emergency response.

To accomplish the objectives of the NNRERP, the National Emergency Response Procedures in the event of a Nuclear or Radiological Accident (NERPNRA) document was developed for responders such as public information officers, radiological assessors, medical teams, law enforcement agencies and firefighters. It is an integrated compilation of detailed procedures and is intended to provide practical guidance to stakeholder organizations and institutions to enable them effectively respond to a radiological emergency.

For nuclear and radiological matters, NADMO has established a Technical Committee with broad representation. The NNRERP and NERP NRA do not fully cover emergency preparedness concerns of nuclear power plants, and therefore would need to be expanded. NADMO and its Technical Committee plan to address the needed expansion for the introduction of nuclear power together with a review of their existing plan against IAEA GSR Part 7.

NADMO is considering updating the current NNRERP to include response to nuclear security events. However, the National Security Council has also developed the National Chemical Biological Radiological and Nuclear (CBRN) Emergencies Response Plan (NCBRN-ERP) with the support of the European Commission, though the plan has not yet been tested.

The INIR team 2016 noted that there was potential for overlap and unclear responsibilities for nuclear security events involving nuclear or radiological material and was informed that the National Security Council will decide if they will set up a new secretariat for the NCBRN-ERP or make NADMO (which also reports to the National Security Council) responsible for its implementation. The National Security Council also plans to ensure the NCBRN-ERP and other plans including the NDMP and the NNRERP are consistent and that the interface between them is clear. In order to fulfil this task, the Security in Emergency Preparedness Committee ("the Committee") is constituted in terms of Section 12 of the Nuclear Regulatory Act, 2015 Act 895 ("the Act") as an adhoc committee of the Authority in respect of assisting in implementation of EPREV 2015 Recommendations on Security in Emergency Preparedness. The Committee has been formed to review the existing Emergency Preparedness Scheme in Ghana and assist with integration of nuclear security needs into the Scheme. The sub-Technical committee is also to Review and clarify as necessary interfaces between National Disaster Management Plan (NDMP), National Nuclear and Radiological Emergency Response Plan (NNRERP) and National Chemical, Biological, Radiological and Nuclear Emergencies Response Plan (NCBRN-ERP).

6. Integrated Nuclear Security Support Plan

The IAEA has developed Integrated Nuclear Security Support Plan (INSSP) to provide States, upon request, with a systematic and comprehensive framework for reviewing their nuclear security regimes and identifying areas where they need to be strengthened. The Plans also highlight any assistance needed to support the development of an effective and sustainable nuclear security

regime. Ghana had a review of the INSSP in 29 May to 1 June, 2018 and the Implementation Plan was drafted for the years 2018-2021.

7. Incident Trafficking Database

The ITDB was established in 1995 to help participating States and selected international organizations to combat illicit nuclear trafficking and strengthen nuclear security. It facilitates information exchange and provides material that can be used to analyse patterns and trends, thereby helping identify potential security threats and vulnerabilities. The ITDB is also an essential component of the information platform supporting the IAEA's Nuclear Security Plan 2018-2021. The scope of the information provided through the database is broad. States are encouraged to report a variety of incidents, including those – whether successful, unsuccessful or thwarted – involving the illegal trade and movement of nuclear or other radioactive material across national borders.

The ITDB information also covers incidents involving the unauthorized acquisition – for instance through theft, supply, possession, use, transfer or disposal (intentional or unintentional) of nuclear and other radioactive material, with or without crossing international borders. Additionally, the ITDB includes information on the loss of material and the discovery of uncontrolled material, as well as incidents involving the intentional offering for sale of benign material that is purported to be nuclear or otherwise radioactive (in other words, scams).

Information reported so far to the ITDB demonstrates that unsecured nuclear and other radioactive material continues to be available and individuals and groups are prepared to engage in trafficking this material. However, effective border control measures help to detect illicit trafficking, even though effective controls are not uniformly implemented at all international border points.

8. Education and Training

A staff training programme has been developed by the NRA with four (I-IV) levels as prescribed by the IAEA. Level I captures Basic Professional Training Course of the IAEA, Safeguards and Non-Proliferation and Nuclear Security modules. Level II addresses technical competencies in Nuclear Safety, Nuclear Security and Safeguards and Non-Proliferation while Level III addresses

the core functions of the NRA in inspections, review and assessment and development of regulatory tools. Leadership training is addressed at the fourth level. Also, training activities have been organized from 2016 with support from IAEA, International Nuclear Security (INS) of USDOE, Office of Radiological Security of USDOE and the United States Nuclear Regulatory Commission (USNRC).The NRA hosted training for officers of the Customs Division of Ghana Revenue Authority in March 2019. The training provided an avenue for distributing detection equipment to the officers who operate at various entry and exit points in Ghana. This training was to provide necessary education in combating the illicit trafficking of nuclear and radioactive material.

The School of Nuclear and Allied Sciences (SNAS) establishes modules on safety, security and safeguards as short courses. SNAS has included nuclear security in the Mphil programme in radiation protection. The nuclear security support centre is also used for training stakeholders. Ghana has also received support in the area of training from International Atomic Energy Agency (IAEA), Office of Radiological Security, International Nuclear Security, Nuclear Smuggling Detection Architecture and EU under a project 60.

Among the trainings conducted includes;

1. Front Line Officer training on radiation detection techniques in conjunction with the delivery of new equipment.
2. Train the trainer – support for instructors (general training) and for conducting FLO training to develop sustainable program – also line with NSSC activity
3. Support for SOP development
4. Training Team Leader Course – participation in 2018 international training event.
5. National Training Course, IAEA/NSNS Radiological Crime Scene Management Training from 21-24 November 2016)
6. Regional Training Course on Response to Nuclear Security Events – Methodology and Capabilities – July 2017.

9. Nuclear Security Support Centre (NSSC)

The Nuclear Security Support Centre was originally placed under the Nuclear Safety, Security and Safeguards Department of Radiation Protection Institute, Ghana Atomic Energy Commission. Since the establishment of the Nuclear Regulatory Authority, the

NSSC has been with the Nuclear Security Department of the NRA. The role of Nuclear Security Support Centre is to ensure nuclear security sustainability in the country. Its basic purpose is to provide a national focal point for passing ownership of nuclear security knowledge and associated technical skills to the competent authorities involved in nuclear security response.

The main mandates of NSSC include

1. Supporting and facilitating the development of sustainable human resources through the provision of a *National Nuclear Security Training Programme*;
2. Providing *Technical Support Services* for lifecycle of detection equipment management
3. Providing *Scientific Support Services* for the prevention, detection of, and response to nuclear security events.

The above roles indicate that the Centre has the potential to assist all stakeholders in education and training on nuclear security. The Centre is equipped with radiation detection equipment such as Back pack, radiation Isotope Identfinders, Polimasters, Training Portal Monitor as well as Neutron Search Detectors.

10. National Nuclear Security Committee

The National Security Council (NSC) is the coordinating body for security matters at the state level. The Nuclear Security Committee supports the National Security Council in coordinating nuclear security matters at the state level. The members of the Committee represent all relevant authorities involved in nuclear security. The Committee, which is chaired by the Director General of the NRA, meets periodically and operates under established procedures. The Committee coordinated the transport security arrangements for the GHARR-1 core conversion, including a table top exercise looking at routes and scenarios for the transport of nuclear material. The Committee was also involved in the investigations of several incidents involving radioactive sources, one of which related to an investigation jointly conducted with customs officials on what?. The following organizations are represented on the Nuclear Security Committee: Nuclear Security Coordinator as Chair, NRA as Vice-Chair, Ghana Armed Forces, Ghana Police Service, GAEC, Ghana Ports and Harbours Authority, Customs Division, Ghana Civil Aviation Authority, Ministry of Foreign Affairs, Ghana National Fire Service, National Disaster Management Organization, Ghana Airports Company Ltd., National Radioactive Waste Management Centre, Ghana

Immigration Service, Attorney Generals Department and Ministry of Justice, Information Services Department, Ministry of Finance and Economic Planning, Radiation Protection Institute.

The National Security Council through the CBRN National Committee has also developed the National Chemical Biological Radiological and Nuclear (CBRN) Emergencies Response Plan (NCBRN-ERP) with the support of the European Commission, though the plan has not yet been tested.

11. Inter-agency Cooperation

The Nuclear Regulatory Authority Act 2015 (Act 895) enjoins the NRA to collaborate with some key Agencies in the implementation of her mandate. In other to combat the illicit trafficking of nuclear and radioactive material, the NRA has partnership with the following agencies and in some cases Memoranda of Understanding have been signed or are being discussed. The Agencies are Ghana Ports and Harbours Authority (GPHA), Ghana Maritime Authority (GMA), Ghana Airports Company Limited (GACL), Ghana Civil Aviation Authority (GCAA), Customs Division of GRA, Ghana Atomic Energy Commission (GAEC) and the Small Arms and Light Weapons Commission. The NRA collaborates with various security agencies in the framework of the Nuclear Security Committee to develop infrastructure for nuclear security in Ghana. This collaboration enables effective coordination with frontline officers in the conduct of their duties in preventing the illicit transfer of nuclear and radioactive material from entering the borders of the country and within.

11.1. Communication between Agencies

The NRA is mandated to exchange information and cooperate with regulatory authorities of other countries and relevant international organisations on matters of nuclear safety, nuclear security and safeguards.

The NRA communicates with several international agencies through exchange of technical information ,technical cooperation and training programs in combating the illicit transfer of nuclear and radioactive material such as, the International Atomic Energy Agency (IAEA), International Nuclear Security (INS), Nuclear Smuggling Detection and Deterrence (NSDD) of the United States Department of Energy (USDOE), Global Initiative to Combat Nuclear Terrorism

(GICNT), International Criminal Police Organization. The NRA through the government of Ghana also has Bi-Lateral agreements with her Border States and other states in tracking, sharing relevant information and securing national borders from illicit transfer of nuclear and radioactive material.

12. Conclusion

In responding to illicit trafficking of radioactive materials there should be a collective response among stakeholders. This can be strengthened by:

- regular share and promptly disseminate, in accordance with the Convention on Physical Protection of Nuclear Material, information on nuclear theft and smuggling incidents;
- exchange information on significant incidents in this area, especially if sensitive material is involved, and establish appropriate national points of contact for this purpose;
- foster enhanced cooperation and coordination among our national intelligence, customs, and law enforcement agencies and cooperation with those other concerned countries in order to ensure prompt investigation and successful prosecution in cases of illicit nuclear trafficking;
- vigilantly discharge our national responsibility to ensure the effective storage, protection, control and accounting of nuclear material in our respective territories;
- exchange experience and advice among ourselves and make it available to others, and support efforts to provide appropriate assistance to ensure safe and effective nuclear material storage, protection, control and accounting;
- maintain effective national systems of export licensing and control, which are important to deter and prevent illicit trafficking, and encourage and assist other states to do the same;
- support efforts to define training requirements pertaining to detection of concealed nuclear material, radiation protection, safe handling and transportation of nuclear material and radiation protection, for law enforcement agencies (customs, police) in accordance with their respective tasks and closely coordinate relevant training activities in this area;
- support the exchange of scientific information and data to permit the identification of the origin, history, and route of seized illicit nuclear material;
- strengthen the effective application of national;

- encourage bilateral and other assistance and cooperation arrangements in the above areas and support their appropriate coordination to ensure that they are complementary and mutually reinforcing and to avoid needless duplication of efforts;
- adherence to the Nuclear Non-Proliferation Treaty which remains the fundamental basis for all international efforts to prevent the illicit spread of nuclear material, technology and expertise;
- contribute to the enhanced Treaty review process and implement the Principles and Objectives for Nuclear Non-Proliferation and Disarmament agreed at the 1995 Nuclear Non- Proliferation Treaty Review and Extension Conference; and

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