A Critical Analysis of Kenya's Regulatory Readiness for Nuclear Energy as an Alternative Source of Energy

Submitted in partial fulfillment of the requirements of the Bachelor of Laws Degree, Strathmore University Law School

By

Einadine Mumji Sinyo

089752

Prepared under the supervision of

Mr. Mohamed Ruwange

February 2019

Word count (12,536)

Declaration

I, **Einadine Mumji Sinyo**, do hereby declare that this research is my original work and that to the best of my knowledge and belief, it has not been previously, in its entirety or in part, been submitted to any other university for a degree or diploma. Other works cited or referred to are accordingly acknowledged.

Signed: .....

Date: .....

This dissertation has been submitted for examination with my approval as University Supervisor.

Signed: .....

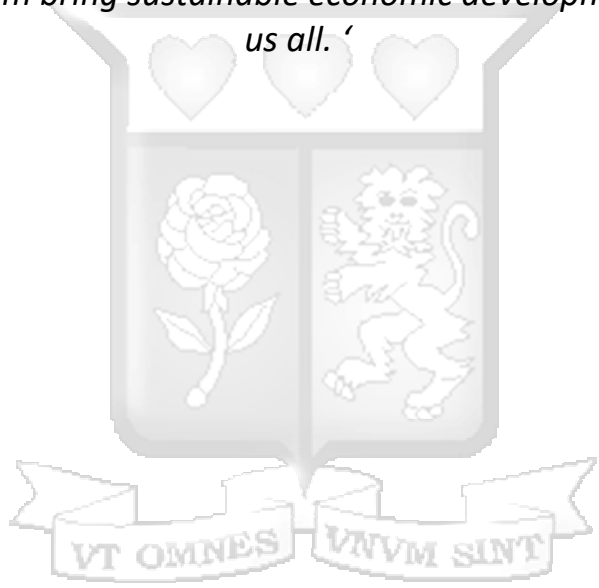
Date: ……

Mr. Mohamed Ruwange

TABLE OF CONTENTS

DEDICATION

'To the current and future generations of the Citizens of Kenya- may the Nuclear Energy Power Program bring sustainable economic development to the benefit of us all. '



ACKNOWLEDGEMENTS

I wish to thank my God whom I serve for carrying me throughout this entire process with His mighty hand gently guiding me. I am grateful to Him for His mercy and His Grace for He has sustained me and proven Himself mighty in my life. His faithfulness has enabled the inception and the completion of this research paper.

I am sincerely thankful for my mother, who has encouraged me and offered a lot of insight and guidance in the writing of this paper. Her wisdom has played a considerable role in the direction of this paper.

Lastly, I wish to express my sincere gratitude to my able supervisor Mr. Mohamed Ruwange for his guidance and patience throughout the writing of this paper. His input has played a major role in making this research paper a success.

ABSTRACT

The Government of Kenya particularly the Ministry of Energy has provided for the generation of electricity using Nuclear Energy in the Draft National Energy Policy of 2014 and the International Atomic Energy Agency has approved Kenya's Nuclear Energy Power Program application. This is proof that the process of actualising nuclear energy as an alternative source of power in Kenya is already underway. The process of implementing a nuclear energy power program in an entrant country is a lengthy, expensive and sensitive process that should involve all the stakeholders of the country particularly the citizens. Currently, there is no evidence that the public was initially involved in the decision to pursue nuclear energy as a viable source of energy in the country. Even so, the benefits of implementing a nuclear energy power program must outweigh the corresponding risks such that there is a major improvement in the economy of the country towards a sustainable future. The purpose of this research therefore, is to analyse the current regulatory framework on Energy in Kenya with the purpose of determining whether the laws can adequately regulate the utilisation of nuclear energy in order to facilitate the goals of the government towards a reliable and sustainable source of power in the country. This research has been conducted with reference to the available primary sources of information as all the requisite primary information is accessible in books, international instruments, legal conference papers and published journals. In order to accurately gauge the position of Kenya as an entrant country in the region of Africa, a comparative analysis has been undertaken with South Africa which is advanced in the production of nuclear energy power.

List of abbreviations

IAEA- The International Atomic Energy Agency

List of Legal Instruments

The International Atomic Energy Agency Handbook on Nuclear Law, 2003

The International Atomic Energy Agency Handbook on Nuclear Law: Implementing Legislation, 2010

Statute of the IAEA (1957)

IAEA Fundamental Safety Principles, 2006

IAEA Defence in Depth in Nuclear Safety, 1996

IAEA Commissioning for Nuclear Power Plants, 2014

IAEA Stakeholder Involvement Throughout the Life Cycle of Nuclear Facilities, 2011

IAEA Milestones in the Development of a National Infrastructure for Nuclear Power, 2015

IAEA Building a National Position for a New Nuclear Power Programme, 2016

The Constitution of Kenya (2010)

The Energy Act (Act No.12 of 2006)

The Radiation Protection Act (CAP 243)

The Prevention of Terrorism Act (No. 30 of 2012)

The National Environmental Management Co-ordination Act (No.8 of 1999)

The Constitution of South Africa (1996)

The Nuclear Energy Act (No.46 of 1999) of South Africa

The National Regulator Act (No.47 of 1999) of South Africa

The Non-Proliferation of Weapons of Mass Destruction Act (No.87 0f 1993) of South Africa

CHAPTER 1: INTRODUCTION

1.1 Background

Kenya as a state is vested in exploring economic, sustainable and renewable energy sources in order to enable it to meets its socio-economic and development needs. The energy demand in the country has been gradually increasing and in the Development of Kenya's Power Sector 2015-2020 Report, it is projected by Power Africa that the energy demand in the year 2020 will be double what the demand was in the year 2015.[1] Hence, facilitating the pressing need for the country to invest in alternative energy sources such as Nuclear Energy.

Historically, the scientific research that led to the development of Nuclear Energy had no focus or relation to militia interests but rather towards the addition of knowledge to the scientific community.[2] Later on, nuclear energy was used to create the atomic bomb which was a weapon capable of unprecedented mass destruction.[3] In August 1945 the United States of America launched an attack against Japan and bombed Hiroshima and Nagasaki causing the death of millions of civilians.[4] Because of the sheer tragedy and devastation witnessed by the bombings, there was a need for the regulation of nuclear energy in the international sphere hence the development of International Nuclear Law. There was also a shift in the international community from the military use of Nuclear Energy to its peaceful application in a civil manner as a viable and secure source of energy. This shift was a necessary adjustment especially for the developed countries because nuclear energy when well utilised is the most effective energy source to generate tremendous amounts of power in an economic and sustainable manner. The Government of Kenya is therefore justified in pursuing nuclear energy as an alternative source of power to meet the country's increasing energy demands. Even so, the legal framework of the country must be capable of regulating and supporting nuclear energy as a source of power in the country.

---

[1] https://www.usaid.gov/sites/default/files/documents/1860/Kenya_Power_Sector_report.pdf on 28 October 2018.
[2] Anderson H, 'The legacy of Fermi and Szilard' *Bulletin of Atomic Scientists, Vol 30 Issue 7* (1974) 56.
[3], Heilbron J, *The Oxford Companion to the History of Modern Science*, Oxford University Press, New York, 2003, 487.
[4] Armaroli N, Balzani V, *Energy for a sustainable world: From the Oil Age to a Sun-Powered Future*, Wiley-VCH Verlag & Co, Weinheim, 2011, 150.

Kenya's National Energy Laws must be informed by International Nuclear Law and be in conformance with IAEA stipulations and guidelines on nuclear energy in order to successfully regulate nuclear power.

1.2 Statement of the Problem

The Legal Framework in Kenya that would support the nuclear energy industry consists mainly of the Energy Act No.12 of 2006, the Radiation Protection Act Cap 243 and the Environmental Management and Co-Ordination Act No.8 of 1999. The main Act that would regulate the Nuclear Energy Power Program would be the Energy Act No.12 of 2006 as this was an act of Parliament that amended and consolidated all the laws relating to Energy.

Section 2 of the Act does indeed provide for nuclear power as a source of Energy.[5] However, at the time of the drafting and the commencement of the Energy Act on 7th July 2007, Nuclear Energy was not a viable source of power in Kenya. The Act consolidated all the existing laws on Energy at that time and since nuclear energy was not a source of power in Kenya, it begets the question of whether there was at that time any existing law that could have regulated nuclear energy which would in turn inform the Energy Act making it sufficiently capable of regulating the utilisation of Nuclear Energy.

The same goes for the Radiation Protection Act Cap 243 and the Environmental Management and Co-Ordination Act No.8 of 1999, at the time of their commencement nuclear energy power was not a topic of deliberation and concern. A proper legal regulatory framework for nuclear energy ought to consist of legal norms and principles created to regulate the conduct of artificial and natural persons who are engaged in activities that involve fissionable materials, ionising radiation and exposure to natural sources of radiation.[6] The problem therefore, is to determine whether laws made without the foresight of nuclear power as a source of energy can meet the criteria of what nuclear law must entail in order to successfully regulate nuclear energy.

[5] Section 2, *The Energy Act* (Act No.12 of 2006)
[6] Stoiber C, Baer A, Pelzer N, *Handbook on Nuclear Law*, IAEA, Vienna, 2003, 4.

1.3 Hypothesis

The following hypotheses are tested in this study:

a) The existing legislation on Energy in Kenya does not meet the threshold laid out by the IAEA on the Nuclear Law standards essential to a proper nuclear energy regulatory framework.[7]
b) The current regulatory framework on Energy in Kenya cannot support and regulate nuclear power as a source of energy in Kenya.

1.4 Research Questions

The following constitute the research questions employed in the study:

a) What are the core principles of Nuclear Law and does the current regulatory framework on Energy in Kenya conform to these principles?

b) What is the place of International Nuclear Instruments and International Nuclear Law in the development of Nuclear Law in Kenya?

c) What are the challenges to the successful legislation of a nuclear energy regulatory system in Kenya?

1.5 Statement of Objectives

The objectives of this study are:

a) To identify whether the current regulatory framework on Energy in Kenya is in conformity with the existing international standards laid out by the IAEA.
b) To examine the existing legal framework on Energy in order to determine if the current energy laws can successfully support and regulate the utilisation of nuclear power as a source of energy in Kenya.

[7] Baer A, Stoiber C, Pelzer N, *Handbook on Nuclear Law*, IAEA, Vienna, 2003, 11.

c) To examine the nuclear energy regulatory framework of entrant and established countries and recommend feasible approaches that Kenya should take in establishing a nuclear regulatory framework.
d) To explore the possibilities of the refinement of the current regulatory framework on Energy by proposing amendments to the same with the view of incorporating international nuclear law.

1.6 Justification of the Study

The Government of Kenya is set to establish a nuclear energy power system in the country for the provision of steady dependable electricity. This is evidenced by the establishment of the Kenya Nuclear Electricity Board whose mandate is to promote the development of the nuclear energy power program in the country. The function of the board is to:[8]

- Facilitate the development of nuclear energy in Kenya.
- Lead in the discussion surrounding the development of a comprehensive nuclear energy regulatory framework in collaboration with the appropriate governmental agencies.
- Ensure that there is public awareness and education on the nuclear energy power program.
- Ensure that the sites identified for the construction of the nuclear energy power plant are appropriately located.
- Facilitate the development of human resource in the field of nuclear energy as pertains to training and placement of workers to manage the nuclear energy power program.
- Undertake nuclear energy related research and establish a nuclear science and technology library and information center.

Because of such progressive steps, it is immutable that the success of such a monumental undertaking depends on the legislative framework.

[8] http://www.nuclear.co.ke/index.php/about-us/about-us

That said, this study which analyses the effectiveness of the current energy laws with the view of improving them, in order to successfully regulate the proposed nuclear energy industry is justified. Furthermore, with a successful regulatory framework, the Government will effectively meet its objective in the provision of stable power which will in turn benefit households, industries, businesses and other units in need of reliable and sustainable power.

Additionally, this paper carries out an investigation on the place of International Nuclear Law in Kenya's domestic law and it analyses how international nuclear law should be integrated within the national legal framework. With this information legislators will be able to effectively incorporate international nuclear law principles into domestic law during the drafting of laws. This paper also seeks to address the gap that exists in the current energy laws as relates to nuclear law and therefore it will add to the existing legal knowledge information that will benefit the lawyers and professionals interested in the subject matter. This study is thereby justified.

1.7 Scope and Limitations of the Study

The topic of Nuclear Energy is one that has been discussed widely in the academic sector particularly in the scientific field and its scope is very broad. This study however, limits the scope of the topic to a specific country which is Kenya and furthermore the topic is researched, analysed and discussed from a legal perspective focusing on issues tied to the law rather than on scientific technical issues. Prior research studies in the topic are largely scientific and it is difficult to separate the technical aspects of nuclear energy from nuclear law completely.

1.8 Chapter Breakdown

Chapter 1: Introduction

This chapter offers a brief introduction into the research paper. It consists of a background to the study, a statement of the problem, hypothesis and the significance of the study clearly outlined. Additionally, the introduction has the objectives of the study laid out.

Chapter 2: Conceptualising the Principles of Nuclear Law

This Chapter outlines and analyses the components and principles of nuclear law as brought out by the IAEA. It also analyses the international obligations and duties of entrant states particularly Kenya in the utilisation of nuclear energy and these obligations are extracted from international treaties and covenants in the area of nuclear energy.

Chapter 3: Nuclear Energy Law in Kenya

This Chapter undertakes a comparison between the current energy laws in Kenya and the principles brought out by the IAEA as necessary components to an effective nuclear energy power regulatory framework in order to determine whether the current energy laws sufficiently meet the criteria of what nuclear law must entail.

Chapter 4: Comparative Analysis with South Africa

This Chapter building upon the discussion and the findings in Chapter 3, undertakes a comparative analysis with the nuclear energy regulatory system of South Africa.

The comparison is with South Africa because it is the only country in Africa with a commercial nuclear power plant and the structure of South African Laws is very similar to Kenyan Laws. Since South Africa has incorporated international nuclear law successfully into its national law it follows that perhaps Kenya can effectively do the same by borrowing from the lessons in South Africa.

Chapter 5: Conclusion and Recommendations

The final Chapter consists of recommendations based on the findings in the study and a conclusion to the research paper.

CHAPTER TWO: CONCEPTUALISING THE PRINCIPLES OF NUCLEAR LAW

2.1 Definition of Nuclear Law

Generally, Nuclear Law consists of special legal rules created to regulate and control the activities and conduct of states, organisations and individuals who are involved and engaged in activities that relate to fissionable materials and other activities involving ionising radiation as well as exposure to natural sources of radiation.[9] Nuclear energy by virtue of its nature poses special environmental, health, safety and proliferation risks that are a major concern globally. Even so, nuclear energy has significant benefits in terms of clean, affordable and sustainable energy. It has by far and in comparison the lowest negative impact on the environment, as the utilisation of nuclear energy does not release carbon dioxide or methane into the environment; gases that are closely linked to the greenhouse effect.[10] However, though the costs for setting set up a nuclear power plant are relatively high the running costs are low such that there is the provision of powerful energy in a steady and efficient manner.[11] Therefore, Nuclear Law is regulatory in the sense that it balances the risks against the benefits.[12] In instances where the risks outweigh the benefits, nuclear law comes in to prohibit such activity. Hence, the focus of nuclear law is the protection of society in order to facilitate the realisation and actualisation of nuclear energy benefits.

2.2 The Concept of Nuclear Law

Nuclear Law has a national component, which entails statutes, regulations and non-mandatory guidance documents. It also has an international component, which entails legally binding treaties and other such international legal instruments within the scope of Nuclear Safety, Security, Safeguards and Liability for nuclear damage.[13]

---

[9] http://www.nuclearsafety.gc.ca/eng/pdfs/Presentations/VP/2017/20170713-lisa-thiele-WNU-Summer-Institute-eng.pdf on 18 December 2018.
[10] Taylor M, 'Greenhouse gases and the nuclear fuel cycle: What emissions?' *IAEA Bulletin* (1997), 1.
[11] http://large.stanford.edu/courses/2016/ph241/thomas1/ on 18 December 2018.
[12] http://www.nuclearsafety.gc.ca/eng/pdfs/Presentations/VP/2017/20170713-lisa-thiele-WNU-Summer-Institute-eng.pdf on 18 December 2018.
[13] Cherf A, 'International Framework for nuclear safety', Regional Workshop on Nuclear Law for African Member States (Group 1), Arusha, 13 March 2017, 4.

Nuclear Safety aims to ensure the protection of individuals, society and the environment from the harmful effects caused by ionising radiation.[14]

Nuclear Security on the other hand, entails preventing and detecting harmful activity such as theft and sabotage, unauthorised access, illegal transfer and any other such malicious actions involving nuclear material and radioactive substances.[15] Consequently, nuclear security involves an active and speedy response to the malicious and dangerous activity ensuring the enforcement of sanctions on the individual or group at fault.

Since the first atomic explosion in the trinity test of Hiroshima and Nagasaki in 1945, diplomatic response called for 'effective safeguards' as early as the same year during the Three Nation Declaration.[16] In 1946, the first United Nations resolution addressed the problems raised by the discovery of atomic energy and such forums informed the IAEA Statue which entered into force on 29th July 1957. Article III of the IAEA statute authorises the institution to establish and administer safeguards.[17] Article XII contains the basic safeguard provisions, which are not self-executing.[18] This means that the safeguards are not imposed on states. There has to be an agreement between the state and the IAEA in order to create a relationship within which the state is bound by the agreement to follow the safeguards as laid out. Generally, safeguards are technical means that facilitate the verification of States legally binding undertakings to not use nuclear material or facilities to develop and facilitate the manufacture or development of nuclear weapons or other nuclear explosive devices.[19] It is imperative to note that safeguard agreements with the IAEA are international treaties and membership in the IAEA is not mandatory to initiate Safeguard Agreements between States and the IAEA.[20]

[14] Cherf A, 'International Framework for nuclear safety', Regional Workshop on Nuclear Law for African Member States (Group 1), Arusha, 13 March 2017, 6.
[15] Paniagua F, 'International Framework for Nuclear Security', Regional Workshop on Nuclear Law for African Member States (Group 1), Arusha, 13 March 2017, 2.
[16] http://www.un.org/en/sc/documents/resolutions/1946.shtml on 19 December 2018
[17] Article III(A)(5), *Statute of the IAEA* (1957)
[18] Article XII, *Statute of the IAEA* (1957)
[19] Carmona M, 'International Framework for nuclear safety', Regional Workshop on Nuclear Law for African Member States (Group 1), Arusha, 13 March 2017, 10.
[20] Carmona M , 'International Framework for nuclear safety', Regional Workshop on Nuclear Law for African Member States (Group 1), Arusha, 13 March 2017, 11.

The objective of Nuclear Liability is to ensure that there are well established and clearly laid out minimum general standards of legal and financial protection from damage incurred during the peaceful utilisation of nuclear energy.[21] This is achievable through the harmonisation of national law rules on civil liability for nuclear damage and international nuclear liability instruments addressing the same issue. Thus, an effective nuclear liability framework in a State should provide for expeditious and adequate compensation in nuclear liability issues as well as ensure certainty in commercial agreements involving nuclear energy.[22]

2.3 The Principles of Nuclear Law

There are fundamental principles and concepts in Nuclear Law**.** They bring out the defining characteristics of Nuclear Law and they are essential in that they provide the basis upon which Nuclear Regulatory frameworks are founded. Additionally, the principles are important because:[23]

- They provide guidance that is applicable and relevant in an infinite number of circumstances and variations.
- They have the capacity to cope with rapid changes and innovations in the Nuclear Energy Sector.
- They facilitate the prevention of a mechanical box-ticking approach in Nuclear Energy activities or the use of legal loopholes and grey areas to avoid compliance with rules and guidelines.
- They encourage responsibility and the exercise of sound reasoning and professional judgment in nuclear matters.

[21] Cherf A, 'International Framework for nuclear safety', Regional Workshop on Nuclear Law for African Member States (Group 1), Arusha, 13 March 2017, 2.
[22] Cherf A, 'International Framework for nuclear safety', Regional Workshop on Nuclear Law for African Member States (Group 1), Arusha, 13 March 2017, 2.
[23] https://www.icaew.com/technical/ethics/ethics-in-business/general-ethics/principles-versus-rules-debate on 18 December 2018.

The following are the Nuclear Law Principles that make up the foundation of all nuclear energy rules and regulations:

2.3.1 The Safety Principle

Legally, safety refers to the freedom and protection from injury, danger or loss to personal property whether deliberately or accidentally.[24] Undoubtedly, safety is the central component to ensure the efficient utilisation of Nuclear Energy and the proper application of ionising radiation.[25]

The fundamental objective of the safety principle is the protection of people and the environment from the negative and harming effects of fissionable material and ionising radiation.[26] In order to facilitate and achieve the said objective, measures should be put in place to:[27]

1. Ensure that people are safe from the harmful effects of radiation by virtue of exposure and controlling the release of radioactive substances and fissionable material to the environment.
2. Curb the feasibility of incidents that may lead to nuclear mishaps.
3. Effectively alleviate the consequences of such incidents should they occur.

The IAEA set out the Fundamental Safety Provisions after the consolidation and consideration of the previously published Safety Fundamentals to form a set of ten new nuclear safety principles, which make up the basis for the establishment of nuclear safety requirements.[28] The principles are outlined as follows:

[24] https://thelawdictionary.org/safety/ on 18 December 2018.
[25] Stoiber C, Baer A, Pelzer N, *Handbook on Nuclear Law*, IAEA, Vienna, 2003, 5.
[26] IAEA, *Fundamental Safety Principles*, IAEA, Austria, 2006, 4.
[27] IAEA, *Fundamental Safety Principles*, IAEA, Austria, 2006, 5.
[28] IAEA, *Fundamental Safety Principles*, IAEA, Austria, 2006, Preface.

- **Nuclear Safety Responsibility**

Nuclear safety responsibility rests in the state, individuals or organisations in charge of the facilities and the scope of activities that result in radiation risks.[29] In order to ensure that such authority is borne responsibly, there must be clearly set out safety objectives and requirements that have either been established or approved of by the relevant regulatory body.

- **The Role of the Government**

It is of vital importance under Nuclear Security that a proper regulatory and governmental framework on safety is established and adequately sustained within states.[30] An independent regulatory body must be established to facilitate all nuclear safety concerns and issues and it must have sufficient legal authority with the competence to manage the technical and legal aspects of nuclear energy. Additionally, the regulator should have sufficient financial and human resources to enable it to meet its mandate.

- **Authority in Nuclear Safety**

It is imperative that the leadership and management in nuclear safety activities is clearly established and outlined. The presence of such leadership should be sustained in organisations and bodies that are concerned with the activities and facilities that cause radiation risk.[31] The promotion of a safety culture is also part of the mandate of the authority.

- **Justification by Benefit**

It is important that the facilities and the activities surrounding nuclear energy that result in radiation risks yield an overall benefit.[32] It is indispensable that the benefits outweigh the radiation risks that will occur by virtue of said activities. This is an indispensable consideration because states like Kenya ready to embark on a nuclear energy power program must ensure that the overall risk borne is significantly less that the resulting benefits.

- **The Optimisation of Protection**

In order to provide and ensure the highest level of safety achievable it is paramount that protection is optimised.

[29] IAEA, *Fundamental Safety Principles*, IAEA, Austria, 2006, 6.
[30] IAEA, *Fundamental Safety Principles*, IAEA, Austria, 2006, 7.
[31] IAEA, *Fundamental Safety Principles*, IAEA, Austria, 2006, 8.
[32] IAEA, *Fundamental Safety Principles*, IAEA, Austria, 2006, 10.

Safety measures and regulations should provide the highest level of safety achievable without unduly limiting the utilisation of the nuclear facilities and activities.[33] Protection should be optimised such that radiation risks are kept as low as reasonably possible.

- **The Protection of the Individual from Risk**

Adequate and effective measures should be in place to control radiation risks in order to ensure that no person bears an unacceptable risk of harm. The optimisation of protection principle aforementioned does not in and of itself guarantee the protection of people from bearing unacceptable harm or risk of harm. Therefore, it is crucial that there is a limitation of the risks to individuals through the control of doses and radiation risks within specified limits.[34]

- **The Safety of Present and Future Generations**

It is mandatory that the environment and all people are protected from the risks associated with radiation and this includes the future generation of both people and the environment. Radiation risks generally persist for a long time and they may very well transcend generations and national borders. To view nuclear safety as only entailing and relating to the protection of people in the present is a myopic point of view, because the scope of nuclear safety is much wider including the protection and the preservation of the environment and future generations.[35]

- **The Prevention of Accidents**

It is absolutely necessary that all reasonable efforts be made in the face of nuclear accidents or in any other incidents involving radiation to prevent, manage and control such occurrences[36]. A key method of preventing and mitigating accidents involving radiation is through 'Defence in depth'. Defence in depth consists of a hierarchical deployment of different levels of equipment and procedures such that the effectiveness of physical barriers like those placed between radioactive materials and nuclear power plant workers are maintained.[37]

[33] IAEA, *Fundamental Safety Principles*, IAEA, Austria, 2006, 10.
[34] IAEA, *Fundamental Safety Principles*, IAEA, Austria, 2006, 11.
[35] IAEA, *Fundamental Safety Principles*, IAEA, Austria, 2006, 12.
[36] IAEA, *Fundamental Safety Principles*, IAEA, Austria, 2006, 13.
[37] IAEA, *Defence in Depth in Nuclear Safety*, IAEA, Vienna, 1996, 4.

Additionally, the implementation of defence in depth is through design and operation such that there is a graded protection well placed against all manner of nuclear and radioactive accidents taking into account issues such as human error and equipment failures.

- **Emergency Preparedness and Response**

It is paramount that arrangements are put in place to ensure preparedness in emergencies and that there is quick response mechanisms to effectively handle nuclear and radiation accidents. In the development of emergency and quick response arrangements, consideration must be given to all the foreseeable events.[38]

- **The Reduction of Existing or Unregulated Radiation Risks**

It is vital that the protective actions to reduce existing or unregulated radiation risks are justified and optimised. The protective measures and actions will only be justified if the projected benefits outweigh the radiation risks and the harmful effects associated with the protective actions and methods.[39]

2.3.2 The Responsibility Principle

A comprehensive nuclear law regulatory framework ought to provide guidance on issues such as the scope of the law, the establishment of the regulatory authority, authorisations for licenses and permits as well as outlining the responsibilities of licensees, operators and users.[40] It is a fundamental principle that the operators or the licensee as regards nuclear energy power plants must first bear the burden of ensuring that all activities and facilities meet the applicable safety, security and environmental protection requirements.[41]

Since the nuclear energy sector involves many players such as architect-engineering firms, construction companies, operators of nuclear installations and regulatory bodies it is highly critical that the burden of responsibility is assigned to the party that bears the primary responsibility in the first instance and the people involved are the operators and the licensee. This is not to postulate that the other actors and players are devoid of responsibility.

[38] IAEA, *Fundamental Safety Principles*, IAEA, Austria, 2006, 15.
[39] IAEA, *Fundamental Safety Principles*, IAEA, Austria, 2006, 15.
[40] Stoiber C, Baer A, Pelzer N, *Handbook on Nuclear Law*, IAEA, Vienna, 2003, 17.
[41] Stoiber C, Baer A, Pelzer N, *Handbook on Nuclear Law*, IAEA, Vienna, 2003, 7.

However, the nuclear issues pertaining to responsibility and liability are rather complicated in the sense that there is an intersection of international law and national law, such that assigning responsibility to the other actors particularly the foreign actors who have not bound themselves to the national nuclear regulatory framework of the state is difficult.

Consequently, the liability and the responsibilities of the other actors in the field is best decided on a case-by-case basis.

2.3.3 The Permission Principle

Authorisation and prohibition are crucial terms in the nuclear energy sector because in law, activities that have not yet been expressly and specifically prohibited by the law are practically 'legal' in the sense that any individual may carry out such activities without prior official authorisation.[42] It implies that the activity is so low in risk that it is below regulatory concern. Since such activities are not clearly and directly prohibited, to assign legal responsibility or liability over the said actions will amount to human rights violations no matter how grave the action is. This is because of the concept of 'no punishment without law' referring to the principle that one ought not to be charged for a criminal offence that was not a crime at the time of the commission.[43]

In order to avoid such issues and scenarios especially in nuclear energy matters, it is imperative that a proper nuclear regulatory framework is in place to ensure that all nuclear energy activities and facilities must and can only be conducted with official authorisation by the state. This is specifically important because of the special risks of nuclear energy technology. The law must be clear on the identification of activities and facilities that require authorisation and those that do not. Permission is also very critical and paramount to a successful nuclear power plant program because it has practical and legal implications for third parties such that the State is enabled to hold foreign actors responsible and liable for their actions.

[42] Stoiber C, Baer A, Pelzer N, *Handbook on Nuclear Law*, IAEA, Vienna, 2003, 7.
[43] https://www.equalityhumanrights.com/en/human-rights-act/article-7-no-punishment-without-law on 18 December 2018.

2.3.4 The Continuous Control Principle

The continuous control principle refers to the mandatory continuous action by the regulator to monitor all nuclear activities and facilities in order to ensure and certify that said activities are conducted in a safe and secure manner in accordance with the terms of the authorisation given after the permission was granted by the state.[44] It thereby follows that regulatory inspectors must be granted access to the sites and the premises where nuclear activities and facilities are carried out.

For decommissioned facilities, it is critical that the relinquishment of regulatory control is subject to review and an assessment of all factors is carried out in order to ensure public health, safety and environmental protection.[45] The decommissioning of a nuclear power plant refers to the process by which nuclear power plants are discontinued from service and once the process, which takes around a hundred years is complete, the state terminates the operating licenses issued.[46]

2.3.5 The Compensation Principle

By virtue of the volatile nature of nuclear energy, it is impossible as is the case with all sources of energy, to completely eradicate the special risks that nuclear power presents. It is important that preventive and precautionary measures are put in place. Nevertheless, such measures do not exclude the potential of damage that can be caused through the actualisation of risks. The utilisation of nuclear energy poses the risk of causing significant damage to people, property and to the environment. Subsequently, states are mandated to set up and provide adequate and timely compensation measures within the law such that liability claims are properly processed in the event of a nuclear accident.[47]

---

[44] Stoiber C, Baer A, Pelzer N, *Handbook on Nuclear Law*, IAEA, Vienna, 2003, 8.
[45] Stiober C, 'Elements of National Law and Decommissioning', IAEA Regional Workshop on Legal and Regulatory Aspects of Decommissioning of Research Reactors, Manila , June 2006, 12.
[46] https://www.nei.org/advocacy/make-regulations-smarter/decommissioning on 18 December 2018.
[47] Stoiber C, Baer A, Pelzer N, *Handbook on Nuclear Law*, IAEA, Vienna, 2003, 8.

2.3.6 The Sustainable Development Principle

The principle of sustainable development refers to development that enables society to meet the needs of the present without compromising the ability of future generations to meet their needs.[48] This is particularly relevant to the nuclear energy sector because the negative effects of fissile material and sources of ionising radiation on the environment persist for a very long time even well into the distant future. Undoubtedly, it is difficult to apply the principle to nuclear issues such that the protection of the future generation is completely guaranteed.

This is exacerbated by the fact that it is unclear what the proper measures are to adequately cater for and protect future generations in the remote and unpredictable future. Even so, the IAEA proposes an approach that urges the current generation to do all that which is possible to ensure long term nuclear safety without foreclosing the options available to the future generations.[49]

2.3.7 The Compliance Principle

As has been stated earlier, nuclear energy involves risks of radiological contamination. Such risks and other issues relating to nuclear energy transcend national territorial boundaries. Regionally and globally, there are multilateral and bilateral instruments that make up the International Law of nuclear energy. These instruments are very important because it is mandatory that national nuclear law reflects the obligations contained within the international nuclear energy instruments adhered to by the state.[50] The instruments give rise to the obligation and the duty of the state to fully comply. Furthermore, the compliance principle is important because it serves as a necessary control measure to ensure that the use of nuclear energy in a state does not cause harm to any other state.

[48] Bruntland Commission, *Report of the World Commission on Environment and Development: Our Common Future*, Oxford University Press, 1987, 16.
[49] Stoiber C, Baer A, Pelzer N, *Handbook on Nuclear Law*, IAEA, Vienna, 2003, 9.
[50] Stoiber C, Baer A, Pelzer N, *Handbook on Nuclear Law*, IAEA, Vienna, 2003, 9.

2.3.8 The Independence Principle

It is of critical importance in Nuclear Law that an independent regulatory body is established to facilitate accountability and to ensure that safety measures are followed.

The regulator's decisions on nuclear energy matters should not be subject to interference from entities and actors involved in developing or the promoting nuclear energy. Given the significant risks associated with nuclear energy, all the interests touching on nuclear safety must be deferred to the regulators independent and expert judgment.[51]

2.3.9 The Transparency Principle

Historically, nuclear energy was utilised in military programs originating in the Second World War for government purposes.

Thus, that period was characterised by the concealment of information relating to nuclear materials and technology as such information was considered sensitive and it was not privy to public scrutiny. However, the development of peaceful uses for nuclear energy has brought in its wake a necessary and crucial transparency system in nuclear related issues. This is because public understanding and confidence as well as participation is crucial in the peaceful uses of nuclear energy such that individuals, the public, legislatures and other interested parties are provided with accurate and detailed information concerning the risks and benefits of the said utilisation for economic and social development.[52] Further, transparency facilitates accountability, which is critical to the nuclear energy sector.

2.3.10 The International Co-operation Principle

The international co-operation principle addresses the need for close relationships between the users of nuclear techniques, the regulators of nuclear activities as well as counterparts in other states and relevant international organisations.[53]

[51] Stoiber C, Baer A, Pelzer N, *Handbook on Nuclear Law*, IAEA, Vienna, 2003, 9.
[52] Stoiber C, Baer A, Pelzer N, *Handbook on Nuclear Law*, IAEA, Vienna, 2003, 10.
[53] Stoiber C, Baer A, Pelzer N, *Handbook on Nuclear Law*, IAEA, Vienna, 2003, 10.

This co-operation will facilitate harmonised policies and actions that are ultimately beneficial to the nuclear energy field. In addition, the security risks that are posed by terrorists and other criminal elements involving nuclear material are best handled and addressed successfully through international cooperation. The multinational character of the nuclear energy sector requires a cooperative approach to commerce and regulation.

Therefore, national nuclear law should facilitate and encourage the relevant actors to participate in international cooperative activities in order to enhance nuclear safety and security.[54]

[54] Stiober C, 'Elements of National Law and Decommissioning', IAEA Regional Workshop on Legal and Regulatory Aspects of Decommissioning of Research Reactors, Manila , June 2006, 18.

CHAPTER THREE: NUCLEAR ENERGY LAW IN KENYA

3.1 Introduction

Having adequately addressed the core components and principles of nuclear law in the preceding chapter, an analysis of the Energy Regulatory Framework in Kenya needs to be undertaken so as to determine whether the existing energy laws meet the criteria of International Nuclear Law. It is crucial that the analysis be done, as it is against this legal background that Kenya as an entrant country has sought to facilitate the implementation of a nuclear energy power plant program. Undisputedly, the current legal framework has both a direct and an indirect influence on the successful actualisation and development of the nuclear energy power plant program in Kenya.

3.2 The Legal Framework in Kenya with aspects of Nuclear Law

The Constitution of Kenya (2010)

The 2010 Constitution of Kenya is the supreme law of the country binding upon all the citizens and authority and it declares itself as such.[55] Article 2(4) provides that all laws inconsistent with the constitution are void to the extent of their inconsistency and all actions or omissions in contravention of the Constitution are invalid.[56] This is particularly important to this paper as it brings out the fact that all the laws of the land must be consistent with the constitution. Therefore, the domestic Nuclear Law of the country must be consistent and in line with the Constitution otherwise it will be invalid and of no use in its application within the state.

The general rules of international law automatically form a part of Kenyan law.[57] This establishes the fact that the rules and principles that make up International Nuclear Law as set out by the International Atomic Energy Agency form a part of Kenyan Law as the internationally accepted general rules of Nuclear Law.

[55] Article 2(1),*Constitution of Kenya* (2010)
[56] Article 2(4), *Constitution of Kenya* (2010)
[57] Article 2(5), *Constitution of Kenya* (2010)

All treaties and conventions ratified by Kenya form part of the law of the state under the constitution.[58] Kenya has ratified a number of conventions relating to Nuclear Energy such as the Convention on the Physical Protection of Nuclear Material. This means that the provisions of the convention form a part of the law in Kenya by virtue of ratification.

The constitution is the foundation upon which all the laws are made and there are rights set out therein that are important in the context of the nuclear energy power program. It directly impacts the development of the nuclear energy power program in the country not technically but fundamentally.

Article 62(2) provides that all minerals and mineral oils belong to the State and this is crucial because nuclear energy is produced from uranium and thorium ore deposits which are present in the country hence facilitating the push for nuclear energy as an alternative reliable source of energy.[59] By virtue of the principles of land policy, the State is to manage the uranium and thorium ore deposits and the land upon which it rests in a transparent, sustainable and productive manner.[60]

Article 66 provides that where the state regulates the use of any land such as the land upon which uranium deposits lie, it must regulate the said piece of land in the interest of defence, public safety, public morality, public health and proper land use planning all of which are tied to nuclear security, nuclear liability and nuclear safety.[61]

Another relevant and crucial provision to nuclear energy in the constitution is Article 42 which entrenches the right to a clean and healthy environment. This includes the protection of the environment for present and future generations in accordance with the Nuclear Safety Principle aforementioned. This provision is important because of the serious health risks and environmental issues that can arise due to fissile material and ionising radiation. Thus, the state must ensure the safety and protection of public health as well as the protection of the environment from the harmful effects of radiation.

---

[58] Article 2(6), *Constitution of Kenya* (2010)
[59] https://www.businessdailyafrica.com/economy/Government-in-4000MW-nuclear-energy-plan/3946234-141tx04/index.html on 8 January 2019.
[60] Article 60(1), *Constitution of Kenya* (2010)
[61] Article 66, *Constitution of Kenya* (2010)

The Radiation Protection Act CAP. 243

The Radiation Protection Act sets out an interpretation of terms that are relevant to nuclear energy. It defines ionising radiation as consisting of gamma rays, alpha and beta particles, high speed electrons, protons, neutrons or any other such particles that in their passage through matter are directly or indirectly capable of producing ions.[62]It also defines radioactive material as any material or substance that emits ionising radiation and it defines a radiation source as any irradiating device or radioactive material.[63] The Radiation Protection Board is established by the act and it is made up of public officers, a person from the National Council for Science and Technology, an officer from the Kenya Defence Forces, National Intelligence Service, National Police Service, Kenya Revenue Authority and last but not least no more than two people having special knowledge in the safe handling of radiation sources.[64] The functions of the Board include:[65]

- Advising the Minister on matters relating to radiation protection and radioactive waste disposal.
- Implementing the provisions and regulations of the Act.
- Granting or refusing to grant to grant licenses issued under the Act. The board is also in charge of license extension applications.
- To keep a register of all the owners of radiating devices, radioactive materials and all other sources of ionising radiation imported or manufactured in the country. Similarly, a register is to be kept of the identified locations specifically licensed to dispose of radioactive material.

The third part of the Act focuses on the control and use of radiation sources. It prohibits the manufacture, possession, utilisation, sale, importation and exportation of any irradiating device or radioactive material except under a license issued by the board.[66]

[62] Section 2, *Radiation Protection Act* (CAP 243)
[63] Section 2, *Radiation Protection Act* (CAP 243)
[64] Section5, *Radiation Protection Act* (CAP 243)
[65] Section 7, *Radiation Protection Act* (CAP 243)
[66] Section 8, *Radiation Protection Act* (CAP 243)

Section 9 prohibits the application of ionising radiation to people for the purposes of diagnosis or the treatment of a disease unless the application is by the prescription of a medical or dental practitioner registered under the Medical Practitioners and Dentist Act Cap 253.[67] Part IV of the Act provides that any individual who owns, acquires, purchases, manufactures, exports, sells, stores, uses and deals in any kind of irradiating device or radioactive material or any other such sources of ionising radiation must apply to the board in the prescribed form for a license or for its renewal upon expiry. [68] It is upon the licensee to ensure that the exposure to ionising radiation resulting directly or indirectly from their operations is kept as low as reasonably practical below the prescribed limits.[69] This is somewhat in conformity with the Nuclear Responsibility Principle which provides that operators and licensees of nuclear installations bear the primary responsibility in ensuring the safety and security of nuclear energy power plants.

The Energy Act 2017

Recently, in March 2019 the President of Kenya assented to the Energy Bill of 2017 which repeals the Energy Act No.12 of 2006 and it establishes the Nuclear Power and Energy Agency.[70] The function of the Agency amongst others is to:[71]

- Be the nuclear energy program implementing organisation.
- Promote the development of nuclear electricity generation in the country.
- Carry out the relevant research, development and facilitate the dissemination of inforation in the nuclear power sector.
- Make provision for training and development in the energy and petroleum sector ensuring research and technological development.
- Establish facilities for the collection and dissemination of information relating to research, development and innovation in the energy sector.
- Advise the Cabinet Secretary on research in energy technology.

The Agency is the lead institution in the Energy sector with its mandate reaching across all forms of energy.

[67] Section 9, *Radiation Protection Act* (CAP 243)
[68] Section 11 *Radiation Protection Act* (CAP 243)
[69] Section 12, *Radiation Protection Act* (CAP 243)
[70] Section 54, *Energy Act* (2017)
[71] Section 56, *Energy Act* (2017).

The other existing institutions and parastatals such as the Kenya Power have been relegated to the role of service providers only. The Agency is expected to champion the success of nuclear energy in the energy sector as well as to collaborate with the existing institutions. Its success in the fulfillment of its role and the challenges arising out of its wide mandate is yet to be seen.

The Environmental Management Co-ordination Act No.8 of 1999.

The Act establishes the National Environmental Management Authority.[72] The general function of the authority is the supervision and co-ordination of all environmental matters and it is the principle instrument of the Government in facilitating the implementation of environmental policies.[73]

In Section 91, the Cabinet Secretary is to determine the standard criteria for the classification of hazardous waste including radioactive waste and any other reactive wastes on the recommendation of the Authority.[74]

Furthermore, with the recommendation of the Authority the Cabinet Secretary is mandated to:[75]

- Set out the standards for the acceptable levels of ionising radiation and other radiation in the environment.
- Set out the procedure and criteria for measuring ionising radiation and other radiation.

The National Environmental Management Authority is tasked with the following functions in relation to radiation standards:[76]

- Inspection of any area, premises, vehicle, vessel, boat or carrier of any description that the Authority has sufficient cause to believe that there is radioactive material or radiation sources stored, transported, used or disposed of.

[72] Section 7, *National Environmental Management Co-ordination Act* (No.8 of 1999)
[73] Section 9, *National Environmental Management Co-ordination Act* (No.8 of 1999)
[74] Section 91, *National Environmental Management Co-ordination Act* (No.8 of 1999)
[75] Section 104(1), *National Environmental Management Co-ordination Act* (No.8 of 1999)
[76] Section 104(2), *National Environmental Management Co-ordination Act* (No.8 of 1999)

- Examination of any person where there is reasonable cause to believe that the person is contaminated with radioactive material or is in unlawful possession of an ionising radiation source.
- Conduct an ionising radiation monitoring programme and advice on ionising radiation control protection measures in collaboration with the Radiation Protection Board.
- Keep a register of all radioactive substances imported into Kenya.
- Keep records of the released radioactive contaminants into the environment.
- Ensure that records of baseline data on environmental radiation are well kept.
- Do everything necessary to ensure the monitoring and control of pollution from radiation.

Section 141 sets out that for a person to fail to manage hazardous wastes, materials, chemicals and radioactive substances in accordance with the Act, the person will be guilty of an offence and upon conviction liable to pay a fine of an amount greater or equal to two million Kenya shillings and less than or equal to four million Kenya shillings or to imprisonment for a period of not less than two years or both.[77]

The Second Schedule of the Act specifically enlists nuclear reactors and nuclear power plants as projects that require the submission of an Environmental Impact Assessment study report thus requiring the approval of the authority before the commencement of such projects.[78]

The Prevention of Terrorism Act No.30 of 2012.

The Act defines a terrorist act as any action or threat of action which:[79]

- Endangers life and incorporates violence against people.
- Creates serious health risks and it jeopardises the safety of the public or a section of the public.
- Causes serious damage to property and involves the use of firearms or explosives.
- Prejudices national security or public safety.

[77] Section 141, *National Environmental Management Co-ordination* Act (No.8 of 1999)
[78] Section 14, *Second Schedule*, *National Environmental Management Co-ordination Act* (No.8 of 1999)
[79] Section 2, *Prevention of Terrorism Act* (No. 30 of 2012)

- Entails a release of dangerous, hazardous, toxic or radioactive substances as well as microbial and other biological agents or toxins into the environment.

Such actions are carried out with the purpose to intimidate and cause fear to the public. They also aim to compel or intimidate the Government to act in a certain way and to destabilise the religious, political, constitutional, economic and social institutions of the country.[80] It further defines a weapon as any firearm, explosive, chemical, biological, nuclear or any other such lethal device.[81]

The Prevention of Terrorism Act is crucial and significant to Kenya as an entrant country in the generation of nuclear energy power because it strongly relates to Nuclear Security. It provides a potential framework for combating and preventing the use of nuclear material in the facilitation of terrorist activities.

3.3 Critical International Nuclear Law requirements lacking in the Legal Framework in Kenya based on the IAEA Nuclear Law Handbook on Implementing Legislation

The Kenyan legal framework is lacking an exclusive Nuclear Law regime that must manifest the following components:

A Nuclear Energy Regulatory Body

It is essential to the successful implementation of the nuclear energy power plant program in Kenya that a competent and skilled regulatory body is established to monitor and regulate the nuclear energy sector. The functions of a nuclear energy regulatory body must entail and include the following:[82]

- The establishment of a legal framework for the protection of the society and the environment from the adverse effects of ionising radiation.
- To facilitate the issuing, amendment and suspension or revocation of licenses for the carrying out of activities involving ionising radiation.

[80] Section 2, *Prevention of Terrorism Act* (No. 30 of 2012)
[81] Section 2, *Prevention of Terrorism Act* (No. 30 of 2012)
[82] Tonhauser W, Cherf A, Stoiber C, *Handbook on Nuclear Law: Implementing Legislation*, IAEA, Vienna, 2010, 31.

- To oversee the commissioning process including the preparations for commissioning as set in the commissioning programme by the operator. The commissioning process refers to the ascertainment that the constructed nuclear power plant meets the design and safety requirements as set out in the license.[83]
- The setting out of the various types of ionising radiation exposure excluded from the scope of application of nuclear law.
- To establish and maintain a national register of radiating sources and of persons authorised to conduct nuclear activities and practices.
- To facilitate co-operation between the State and the International Atomic Energy Agency in the application of safeguards according to the Safeguards Agreement.
- To establish and implement an adequate control system for the exportation and importation of nuclear and other radioactive materials through co-operation with the relevant government bodies.
- The establishment and maintenance of a state system of controlling and accounting for nuclear material and other radioactive material.
- The establishment of regulations and measures to ensure the security of radioactive material having provisions for the detection, prevention and response to malicious actions involving nuclear material.
- Co-operation with governmental and non-governmental bodies having competence in crucial areas such as environmental protection, health and safety, security and the transportation of dangerous or hazardous material.

Provisions on the transportation of radioactive material.

The IAEA provides guidance on the safe transportation of radioactive material as is its mandate. This serves to facilitate a uniform standard in the transportation of radioactive material between states which in turn serves to enhance nuclear security and safety.

[83] IAEA, 'Commissioning for Nuclear Power Plants', *IAEA Safety Standards Series No.SSG-28* (2014) 4.

The IAEA regularly publishes comprehensive Regulations for the Safe Transport of Radioactive Material and it is crucial that national legislation translates the provisions which provide a high level of uniformity internationally into national law.[84]

Provisions on mining and processing of radioactive material.

States that carry out mining and milling activities usually have a comprehensive legal framework on the mining of minerals. Thus, any state intending to facilitate the mining or milling of thorium and uranium ores must have a legislative framework taking into account the special nature of radiological materials.[85]The legal framework must provide for the protection of the miners and other workers, the public and the environment from the radiation hazards that arise from such mining and processing operations. The law must also be clear on the process of decommissioning or the closing of a mine and processing facility.

Provisions on the Physical Protection of nuclear material and Nuclear Security

In the most basic form, national nuclear security laws must consist of the following elements:

- A well laid out regime for the physical protection of nuclear and other radioactive materials.
- Clearly laid out criminal offences for violations of national nuclear legislation with stringent penalties.
- Provisions regarding the authorisation, inspection and enforcement measures relating to nuclear material and facilities.
- Well laid out measures for the prevention and the detection of theft or other such unauthorised acquisition, illicit trafficking and sabotage of nuclear material and other radioactive material.

[84] Tonhauser W, Cherf A, Stoiber C, *Handbook on Nuclear Law: Implementing Legislation,* IAEA, Vienna, 2010, 87.
[85] Tonhauser W, Cherf A, Stoiber C, *Handbook on Nuclear Law: Implementing Legislation*, IAEA, Vienna, 2010, 83.

- National arrangements made for the implementation of international cooperation in the protection of radioactive material, recovery of lost or stolen nuclear material and the process of dealing with offenders.

Provisions on Emergency Preparedness and Response

The response process to nuclear and radiological emergencies and accidents is a complex undertaking involving many players at local and national level and since such accidents have the potential to sub verse boundaries, it often involves foreign players as well. In the first instance, it is the mandate of the regulatory body to respond to such incidents however the response of the body is within the context of a national legal framework with an established legal system on emergency situations.

Therefore, it is crucial that the national nuclear law emergency provisions be adequate in the sense that they are in conformance with the nuclear international instruments addressing emergency situations and accidents such as the Convention on Early Notification of a Nuclear Accident.[86]

Provisions on the safety of nuclear facilities and the decommissioning process

Nuclear facilities carry out numerous activities within the nuclear fuel cycle. Typically, the facilities have nuclear power reactors, uranium and thorium mines and mills, test reactors, nuclear fuel fabrication plants, enrichment and reprocessing plants as well as spent fuel storage facilities.[87]

Such a large concentration of fissionable materials in nuclear facilities poses significant safety, security and health risks to the society as well as to the environment. Thereby it follows that the law must have a comprehensive and adequate framework for the regulation and control of nuclear power facilities and the associated radioactive material. The law must include the following:[88]

[86] Tonhauser W, Cherf A, Stoiber C, *Handbook on Nuclear Law: Implementing Legislation*, IAEA, Vienna, 2010, 79.

[88] Tonhauser W, Cherf A, Stoiber C, *Handbook on Nuclear Law: Implementing Legislation*, IAEA, Vienna, 2010, 60.

- Provisions on the selection of nuclear power plant sites clearly setting out the site survey process.
- Strict requirements that all entities and interested parties must first obtain authorisation through a license from the established regulatory body.
- Provisions on the assessment process of the sites by the regulatory body from the pre-construction stage to the initial operation and finally to the commencement of full power operation.
- A provision assigning the primary responsibility for nuclear safety and security to the authorised party.
- Provisions facilitating the procedure for the participation of the public.
- Enabling provisions to facilitate the appeal process for license applicants challenging licensing decisions that are deemed unfavorable.

Decommissioning refers to the technical and administrative measures taken to enable the clearance of the nuclear facility from all or most of the state's regulatory requirements.[89]

The law must clearly outline the role of the regulatory body charged with the decommissioning process. This is important since that regulatory body sets out the regulatory requirements and procedures for the monitoring and control of all the stages of the decommissioning process which usually takes a lengthy period of time. The law must also codify the basic structure and contents of the decommissioning plan, outline the basic responsibilities of the operator in the process and clearly set out the financial arrangements for the decommissioning process.[90]

[89] Tonhauser W, Cherf A, Stoiber C, *Handbook on Nuclear Law: Implementing Legislation*, IAEA, 2010, 70.

CHAPTER FOUR: COMPARATIVE ANALYSIS WITH SOUTH AFRICA

4.1 Introduction

The Republic of South Africa has been selected for the comparative analysis of this paper because it is an African country that has successfully incorporated International Nuclear Law into its National Legal framework. Africa as a continent has only two commercially operating nuclear power reactors known as Koeberg 1 and Koeberg 2 and both of them are situated in South Africa.[91] The Koeberg Nuclear Power Station is located 30 kilometers north of Cape Town near Melkbosstrand on the west coast of South Africa and it is the nuclear power station where the nuclear power reactors are operated. The nuclear energy sector in South Africa is adequately flourishing as nuclear power accounts for 5% of the country's electricity.[92] That said, Kenya having identified nuclear energy as a sustainable source of energy with the aim of increasing the total output of the generated electrical energy in the country, has much to learn and borrow from South Africa's progress in the field. Furthermore, the Legal Framework in South Africa and the structure of the Kenyan Legal Framework are quite similar such that as South Africa has effectively incorporated International Nuclear Law into the domestic framework so can the same be achieved in the Kenyan context. It is therefore proper to analyse the South African Nuclear Legal Framework in order to inform the Legal Framework in Kenya.

4.2 The Nuclear Energy History of South Africa

South Africa has a significantly large presence of low grade uranium ores and this jump started the nuclear energy power program in the country in the early 1940s.[93] The main purpose for the establishment of nuclear infrastructure was to enable the exportation of the uranium ore to the Allied Forces of World War II.[94]

---

[91] https://www.sahistory.org.za/place/koeburg-nuclear-power-station on 24 January 2019.
[92] http://www.world-nuclear.org/information-library/country-profiles/countries-o-s/south-africa.aspx on 24 January 2019.
[93] Brynard H, Ainslie L, Merwe P, *Uranium in South Africa*, Atomic Energy of South Africa Limited, 1987, 5.
[94] Brynard H, Ainslie L, Merwe P, *Uranium in South Africa*, Atomic Energy of South Africa Limited, 1987, 5.

The era that followed witnessed the importation of tonnes of uranium oxide from South Africa to the United States of America.[95] Following the collapse of the apartheid regime, the nuclear policy of South Africa changed and developed in conformance to international nuclear standards. The apartheid regime had carried out actions inconsistent with international nuclear law policies such as creating 8 nuclear type bombs and the nuclear law of the country at the time was inadequate and insufficient to meet international standards and obligations.[96] Thus, after the fall of the apartheid government South Africa got a new constitution in 1996 which is the legal foundation upon which the laws are based and the National Nuclear Law was altered to conform to International Standards.[97]

4.3 The Nuclear Legal Regime in South Africa

The Legal Nuclear Framework in South Africa is comprised of international nuclear law treaties and conventions and the domestic nuclear law which is the focus of the comparative analysis.

Domestic Nuclear Law

Nuclear Energy Act No.46 of 1999

The Nuclear Energy Act of South Africa has a comprehensive list of definitions for terms related to the generation of nuclear energy such as 'Safeguards Agreement' which refers to the Safeguard Agreement that was entered into by the Republic of South Africa and the International Atomic Agency on 16th September 1991 in relation to the application of safeguards and in conformance to the Nuclear Non-Proliferation Treaty acceded to on 10th July 1991.[98]

[96] https://www.atomicheritage.org/history/south-african-nuclear-program on 21 January 2019.
[97] Section 2, *Constitution of South Africa* (1996)
[98] Section 1, *Nuclear Energy Act*, (No.46 of 1999)

The Nuclear Energy Corporation of South Africa is established by the Act and it has the powers to:[99]undertake and promote the development of nuclear technology and nuclear research, facilitate the production and disposal of uranium hexafluoride with facilitation of disposal mechanisms, acquire nuclear fuel and facilitate its safe disposal, import and export nuclear material and nuclear equipment, facilitate the transportation of all nuclear material including radioactive material and radioactive waste, with the approval of the Minister of Energy and Mining sell or otherwise avail: patents, licenses and concessions regarding information and technological processes developed by the corporation and its subsidiaries to any person and last but not least with the approval of the Minister, develop transfer and exploit nuclear technology in collaboration with any party within or outside the territory of the State.

Kenya has established the Nuclear Power and Energy Agency in the 2017 Energy Act and as a state corporation it has a mandate similar to the Nuclear Energy Corporation of South Africa as pertains to the promotion of nuclear research and the development of nuclear technology. Both institutions facilitate the nuclear activities of the government within state territory in the furtherance of state interests. However, the mandate of the Agency in Kenya is very broad as it covers the entire energy sector and it is not limited to the nuclear energy power program. Because of the special and volatile nature of nuclear energy, Kenya as a state should endeavor to limit the mandate of the Agency to nuclear energy power issues strictly in order to ensure and facilitate proper authority and management in the sector.

The Act provides that any person interested in the acquisition, possession or the carrying out of certain activities pertaining to nuclear material and nuclear equipment must first acquire the written authorisation of the Minister of Energy and Mining in South Africa.[100] The same principle applies to the exportation of nuclear material and nuclear equipment.

In Kenya, the power and mandate of the Cabinet Secretary of Energy and the Cabinet Secretary of Mining as relates to nuclear energy has not been established. It is important that the role of the Energy Ministry and the Mining Ministry is clearly outlined since nuclear energy has an inevitable connection with both ministries.

[99] Section 14, *Nuclear Energy Act*, (No.46 of 1999)
[100] Section 34, *Nuclear Energy Act*, (No.46 of 1999)

The National Nuclear Regulator Act No. 47 of 1999.

The National Nuclear Regulator Act No.47 of 1999 of South Africa is an act that importantly establishes a National Nuclear Regulator to regulate the nuclear activities of the country and it also provides for nuclear safety standards and regulatory practices to ensure the protection of people and the environment.

The first thing the Act does is to establish the National Nuclear Regulator as a juristic person comprising of a chief executive officer, a board and other staff members.[101]

The object and function of the Regulator is to:[102]

- Ensure the protection of the citizens, property and the environment from all forms of nuclear damage through the establishment of safety standards and proper regulatory practices.
- Exercise regulatory control to ensure safety in the siting, design, construction, operation, decontamination and decommissioning of nuclear installations.
- Exercise regulatory control to ensure safety of vessels propelled by nuclear power or vessels having radioactive material on board through the granting of nuclear authorisations.
- Facilitate the implementation of a system of compliance and inspections as well as ensure the fulfillment of nuclear safety international obligations.
- Facilitate nuclear emergency planning provisions.
- Grant and amend nuclear authorisations.
- Advice the Minister of Minerals and Energy on all matters associated with nuclear damage or such nuclear related activities.
- Facilitate the safe transportation of radioactive material.
- Prepare and submit to the Minister of Minerals and Energy an annual report on the health and safety of workers, the public and the environment.

[101] Section 3, *National Regulator Act*, (No.47 of 1999)
[102] Section 5, *National Regulator Act*, (No.47 of 1999)

The Act further provides that any person intending to carry out nuclear installations must first acquire a nuclear installation licence and any person intending to sojourn into the country with a nuclear power propelled vessel or having a vessel transporting radioactive material on board must acquire a nuclear vessel licence from the Regulatory Board.[103]

South Africa has effectively provided for a Nuclear Energy Regulator whose mandate is strictly tied to nuclear concerns and issues. In Kenya, the Radiation Protection Board has a mandate that is not specifically tied down to nuclear issues as it focuses more on medical ionising radiation than it does on the special concerns of Nuclear energy. Since nuclear energy was not anticipated at the time of its formation, the current Radiation Protection Board should have its mandate widened to cater for nuclear energy authorisations and matters or a new regulatory body should be established to deal with the specific and special issues regarding the monitoring and continuous control of the nuclear power program.

Liability in nuclear energy matters is crucial and Section 29 of the Act establishes that holders of nuclear installation licenses are to provide financial security based on the potential consequences of a nuclear accident and where nuclear damage occurs the financial security is to be increased or decreased so as to impute liability on the holder of the nuclear installation license.[104] Nuclear damage is a strict liability issue of uttermost importance and liability is imputed to the holder of the nuclear installation license regardless and irrespective of the absence of intent and negligence on the part of the holder. This is commendable as it directly adheres to the Nuclear Responsibility Principle as previously outlined.

In Kenya, liability for nuclear damage has been dangerously overlooked as the bare minimum 1963 Vienna Convention on Civil Liability for Nuclear Damage is yet to be ratified by the country. Provisions on responsibility for nuclear damage are of uttermost importance as they enable the state to hold foreign operators and licensees liable for any damage occasioned. It is an IAEA requirement and standard that in the occurrence of nuclear damage there must be a well-established system for compensation and liability. Kenya should have a well laid out regulatory framework with provisions for compensation, liability and responsibility for nuclear damage.

[103] Section 21, *National Regulator Act*, (No.47 of 1999)

Emergency planning is a critical, crucial and necessary part of a well-established nuclear energy power plant program. In South Africa, the regulator directs the holders of nuclear authorisations to enter into agreements with the relevant municipalities and provincial authorities to establish emergency plans and to cover the costs for the establishment, implementation and management of the emergency plan.[105] Should nuclear accidents occur, the holder of the nuclear authorisations is to implement the emergency plan effectively and speedily for the protection of the people and the environment.

In Kenya, there is yet to be established an Emergency Plan as relates to nuclear energy. Borrowing from South Africa, it would be commendable if the state adopted a system where there is a unified approach involving state authorities and the foreign holders of nuclear authorisations through agreements and contracts that hold the licensees and operators legally accountable. Such agreements also ensure their participation in emergency issues as they will be legally bound by law ultimately enabling the practical protection of the people and the environment.

Section 43 of the Act provides for the right to appeal and it outlines that any person adversely affected by a decision of an inspector, may appeal to the chief executive officer. It further provides that any person aggrieved by the decision of the chief executive officer may appeal to the board and if aggrieved by the decision of the board they may appeal to the Minister against the board's decision. The final step in the appeal process as set out in the Act is an appeal lodged in the High Court by any person adversely affected by the decision of the Minister.[106]

In conclusion, the right to appeal is an essential freedom in any democratic process as it facilitates access to justice through the right to be heard. Kenya should establish a well laid out framework for appeals in the nuclear energy sector as strict liability issues are only tied to nuclear damage.

[105] Section 38, *National Regulator Act*, (No.47 of 1999)
[106] Section 46, *National Regulator Act*, (No.47 of 1999)

The Non-Proliferation of Weapons of Mass Destruction Act No. 87 of 1993

The Republic of South Africa has promulgated this act to provide for control over weapons of mass destruction and to establish the South African Council for Non-Proliferation of Weapons of Mass Destruction which is mandated to control, manage and oversee all matters relating to the proliferation of such weapons in the Republic of South Africa.[107] Weapons of mass destruction are defined as any weapons designed to kill, harm or infect people, animals or plants through the effects of a nuclear explosion or the toxic properties of chemical or biological warfare that includes a delivery system exclusively designed to deliver such weapons.[108] The Minister of Trade and Industry in conjunction with any Minister whose ministry relates to non-proliferation is mandated to determine general policy that ought to be followed with the aim of:

- Instituting measures and initiatives to prevent the proliferation and development of weapons of mass destruction.
- Imposing a prohibition on all nuclear explosions and tests.
- Discouraging other states from proceeding with nuclear explosions and tests.
- Imposing a prohibition on the development, production, acquisition and transportation of any weapons of mass destruction.

In the generation of nuclear energy, the legal framework in South Africa adequately provides for Nuclear Security and the authority is tasked with facilitating and ensuring that nuclear material is not used to facilitate destruction to the environment and to the citizens of the country. Kenya is yet to identify a specific body or Ministry tasked with the mandate of ensuring that nuclear material is not used to facilitate terror activities within the state. In illustration of the challenge in Kenya, the Kenya Nuclear Electricity Board is established under the Ministry of Energy whereas the Radiation Protection Board is established under the Ministry of Health. It is important and critical that such identification is made because the presence of nuclear material in the country essentially facilitates a national security risk that can only be countered with a well-established system of authority clearly set out to prevent terror activities.

[107] Section 4, *Non-Proliferation of Weapons of Mass Destruction Act* (No.87 0f 1993)
[108] Section 1, *Non-Proliferation of Weapons of Mass Destruction Act* (No.87 0f 1993)

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

Kenya has taken major steps towards actualising a nuclear energy power program in the country. However, the legal framework in Kenya is incapable of regulating and supporting nuclear energy as an alternative source of energy in the country. The Government must take steps and measures to strengthen and improve the wholistic capacity of the country to successfully set up and operate a nuclear energy power plant. The following recommendations will serve to assist and enable the government to successfully implement the nuclear energy power program in the country.

5.1.2 Government Commitment to the Nuclear Energy Power Program.

In order to successfully institute a nuclear energy power program in the country, the Government of Kenya must be committed to the project because nuclear energy demands absolute seriousness by virtue of its nature and the immense risks associated with it a laissez faire approach is assurance of a failed project. There is an essential difference between offering support to a nuclear power program that merely considers nuclear energy as a viable source of power in the country and actually committing to build and operate a nuclear energy generating plant with all the corresponding facilities. It is critical that the Government first demonstrates full national support for the nuclear energy power program with a proper formal commitment before any national consensus is reached on the matter.[109] In order to facilitate this, there ought to be an Executive Summary prepared by the Minister of Energy clearly outlining and explaining the reasons for the decision to pursue nuclear energy as the answer to the increasing energy demands of the country. The summary must also outline and explain the role of the nuclear energy power program in facilitating the development of the country and with the signature of the Minister it can be presented to Parliament and to the President of the Republic of Kenya as an initial step in showing commitment to a nuclear energy power program in the country. This will also show that the nuclear energy power program aligns to the national government agenda.

[109] IAEA, 'Building a National Position for a New Nuclear Power Programme' *IAEA Nuclear Energy Series No. NG-T-3.14* (2016), 11.

The public support of other Ministries and governmental organisations is essential to presenting a united front in the pursuit of the nuclear energy power program as the project will require support, resources and funding from all the sectors of the country. The Government's commitment to the project is also important because it ensures regional trust in the East African community. It shows the international and regional community that the motive of the government in pursuing nuclear installations is to establish a safe, secure and competent development of nuclear power without any armament objectives.

5.1.3 Stakeholder Involvement in the Nuclear Energy Power Program

The successful actualisation of a nuclear energy power program in a country is affected to some extent by stakeholder involvement in the sector. Stakeholder involvement is important in enabling the identification of the human and institutional landscape against which the nuclear power program is to be implemented. It also provides crucial information on the various relationships between the different stakeholders and information on the issues that are of primary concern to the stakeholders in the nuclear energy discussion.[110] In order to ensure the acceptance of the nuclear energy power program the government ought to:[111]

- Identify and categorise the different stakeholders.
- Facilitate the sharing of knowledge and crucial information to the stakeholders and properly explaining to them the benefits of nuclear power.
- Identify and develop various tools and channels of communication.
- Ensure that good relationships are forged and maintained with the various stakeholders.
- Declare and make it known to the stakeholders that nuclear power is to be introduced to the country with full adherence to international obligations.
- Demonstrate the benefits of the nuclear energy power program to the local rural areas as well as to the urban environment.

[110] IAEA, 'Stakeholder Involvement Throughout the Life Cycle of Nuclear Facilities' *IAEA Nuclear Energy Series No.NG-T-1.4* (2011) 3.
[111] IAEA, 'Stakeholder Involvement Throughout the Life Cycle of Nuclear Facilities' *IAEA Nuclear Energy Series No.NG-T-1.4* (2011) 4-15.

- Prepare and disseminate information explaining clearly the key areas of International Nuclear Law such as Nuclear Security, Nuclear Safety, Safeguards, Emergency Preparation and the Decommissioning process.
- Explain and make publicly available information relating to the cost of instituting a nuclear energy power program and the expected value for money in the project.
- Establish nuclear energy public information centers and demonstrate clearly the radiation protection and physical protection measures.
- Maintain clear and open communications to ensure transparency and accountability in the nuclear energy discussions so as to garner stakeholder confidence.

The stakeholders in the proposed nuclear energy power program consist of internal stakeholders, external stakeholders and international Stakeholders. The government must have a clear strategic plan in establishing a stakeholder engagement process that is to run effectively throughout the entire nuclear energy power program from inception to its actual operation.

The Internal Stakeholders consist of: The General Public, Academics, Medical and Health Professionals, The Media, The Local Communities, Local Investors and Land Owners, Government Authorities, Spiritual or Religious Organisations.

External Stakeholders consist of: Neighbouring countries and Non-Governmental Organisations.

International Stakeholders consist of: The Operator Organisation, Vendors and Suppliers of nuclear material and infrastructure and International Organisations.

The categorisation of the stakeholders is important because every stakeholder has different interests and it will enable the government to prioritise the stakeholder interests in order of relevance. Categorisation also enables the government to plan and initiate the level of involvement of the different stakeholders in the nuclear energy program.

5.1.4 Establishment of a Proper Legal Regulatory Framework

Before a nuclear energy power program is successfully actualised within a country the relevant legislation must first be in place to support the nuclear energy sector. Without it the entire nuclear energy power program is predestined to fail. Legislation is important and it is mandatory because it facilitates the implementation of nuclear international treaties and conventions as well as giving effect to any Safeguards Agreement with the IAEA. The establishment of a legal framework must come before the process of nuclear installations. This is because it is the law that guides and controls all the transactions, contracts and agreements relating to nuclear energy such that the domestic nuclear legal framework directly reflects the nuclear position of the government both regionally and internationally to stakeholders and investors alike. If Kenya is to have a nuclear energy presence in the country by 2030 then it follows that the nuclear legal framework must speedily be enacted in the country so as to facilitate the process of nuclear installations. Parliament must establish a legal framework to effectively regulate the following areas and provide for:[112]

- Restructuring of the national energy policy, economic and commercial considerations in order to incorporate nuclear energy considerations.
- The amendment of the existing legislation to support nuclear energy such as The National Transport and Safety Authorities Act No.33 of 2012 and the Mining Act 2016 to facilitate the safe handling and secure transportation of nuclear material and radiating substances and to provide for the protection of miners during the mining and handing of radioactive minerals respectively.
- The establishment of effective and independent nuclear regulatory authorities.
- The establishment of an efficient system of licensing, inspection and enforcement covering all the subject areas of nuclear law such as radioactive material management and radioactive waste disposal.
- Nuclear Foreign Investments including the roles of the foreign organisations, vendors, suppliers and ownership over intellectual property such as developments of nuclear technological processes.

[112] IAEA, 'Milestones in the Development of a National Infrastructure for Nuclear Power' *Nuclear Energy Series No. NG-G-3.1* (2015) 30-36.

- The obligations and duties of the National government, county government and the various stakeholders.
- The ownership of nuclear material as well as the management and monitoring of nuclear fuel cycle issues.
- The development of human resources to ensure the continuity of the nuclear energy power program once operation begins in the country.
- The commitment to utilise nuclear power exclusively for peaceful purposes.
- The expansion of the mandate of the National Environmental Management Authority to include the protection of the environmental concerns surrounding nuclear energy with adequate training.
- Nuclear Safety, such that nuclear facilities, nuclear materials and any other sources of ionising radiation are handled and operated safely through proper systems of regulatory control ensuring the protection of people and the environment.
- Nuclear Security, such that security rules are well established for nuclear facilities and nuclear material, security threats are well outlined and defined, the security process and procedure of handling nuclear material during transportation is well laid out and the security of sensitive information is efficiently covered.
- Nuclear Safeguards, such that undertakings are well addressed to prevent the usage of nuclear material for military purposes and the proliferation of nuclear weapons.
- Liability for nuclear damage, such that the law covers compensation of damages caused by nuclear accidents and incidents including countermeasures to mitigate radiation harm and recover the environment to a pre-accidental status.
- Criminalisation, such that criminal conduct in relation to nuclear material is well outlined and stringent penalties are laid out.
- Import and Export controls in relation to the handling of nuclear material.
- The decommissioning process and the identification of the party charged or tasked with carrying out the process throughout the hundred year period.

The relevant legislation should be drafted by a team of lawyers and experts in the nuclear energy field with comprehensive discussion involving the stakeholders.

5.1.5 Ratify Key International Conventions and Treaties

Kenya as a member of the IAEA since 1965 has signed and ratified several conventions relating to nuclear energy and this serves to ensure the effective administration and control of the utilisation of nuclear energy among states. The following treaties and conventions have been signed and ratified by Kenya:

a) The Convention on the Physical Protection of Nuclear Material.
b) The International Convention for the Suppression of Acts of Nuclear Terrorism (Nuclear Terrorism Convention).
c) The Treaty on Non-Proliferation of Nuclear Weapons.
d) The Comprehensive Nuclear Test Ban Treaty.
e) The African Nuclear Weapon-Free-Zone (Pelindaba) Treaty.
f) The 2005 Amendment to the Convention on the Physical Protection of Nuclear Material.
g) The 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping Of Wastes and Other Matter of 29 December, 1972.
h) The Partial Ban Treaty 1963.
i) The Small Quantities Protocol.

Even though Kenya has ratified or signed a good number of nuclear conventions and treaties, there are still other very important international conventions yet to be signed or ratified and they must be ratified in order to ensure the success of the nuclear energy power program. For the state to adequately and accurately fulfill its international obligations and ensure that the domestic legal nuclear framework in Kenya has a proper foundation the following key international instruments must be ratified:

a) The Convention on Nuclear Safety.
b) The Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency.
c) The Convention on Early Notification of a Nuclear Accident.
d) The Convention on Supplementary Compensation for Nuclear Damage.
e) The Joint Convention on the Safety of Spent Fuel and on the Safety of Radioactive Waste Management.

f) The 1963 Vienna Convention on Civil Liability for Nuclear Damage
g) The 1997 Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage.
h) The Convention relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material.

5.1.6 Establish an Independent Regulatory Body

It is important that an independent nuclear regulatory body with the competence to effectively deal with the specifics and requirements of nuclear energy is legally established because the current Radiation Protection Board is not equipped to handle the special ionising radiation issues surrounding nuclear energy. The regulatory body must be sufficiently equipped to carry out its mandate with the provision of sufficient resources and funding. An independent nuclear regulator is a major indication that a country is serious about its nuclear safety obligations and as such the regulator must have the authority to ensure that international obligations are discharged and nuclear safety principles are upheld.

5.1.7 Human Resource Development

Human resource development is critical to the successful operation of a nuclear energy power plant because knowledgeable and skilled personnel must be present to perform the necessary activities and discharge the relevant duties throughout the nuclear fuel cycle for the assurance of nuclear safety. In order to facilitate human resource development in the field of nuclear energy the government must:[113]

- Identify the availability and capability of the required work force through surveys of the experienced and fresh graduates of the country.
- Identify the period of recruitment and establish a system of recruiting the workforce.
- Commit to the training of the workforce by identifying institutions that provide the required nuclear training.
- Develop and upgrade training programs in the country to cater for the nuclear energy industry in the country.

[113] IAEA, 'Milestones in the Development of a National Infrastructure for Nuclear Power' *Nuclear Energy Series No. NG-G-3.1* (2015) 38-41.

- Develop an employment plan to facilitate the deployment of the trained workers in the nuclear energy power program.
- Ensure proper management of the workforce through the establishment of good working conditions and the development of a safety culture for the protection of the workforce.

It is crucial that the government establishes a full-fledged Nuclear Training Center in the country so as to ensure the growth of the human resources in the nuclear sector; trainers can be outsourced from other countries.

5.1.8 Develop National Infrastructure

The process of connecting a nuclear power plant to an Electrical Transmission System is a very demanding undertaking because if mishandled nuclear energy will cause serious harm to employees, the public and it will cause widespread damage to the environment. The existing grid capacity in Kenya is small and inadequate to cater to the needs of a nuclear power plant. There are also problems that have been identified with the transmission system such as redundant power lines and inadequate reserve margins. The current electricity supply infrastructure was not tailored to handle and meet the needs of nuclear energy thus the infrastructure is inadequate to support a nuclear power plant.[114]

The current electrical grid must be developed and enhanced in order to enable it to support nuclear energy.[115] The government must adequately prepare for the improvement of the electrical grid and that is a major and expensive investment.

[114] Lumadede H, 'Lessons learnt from the Pre-feasibility study for Kenya's Nuclear Power Program', 8th International Conference on Deregulated Electricity Market Issues in South-Eastern Europe , Croatia, September 2013 available at https://www.researchgate.net/publication/264194479_Lessons_Learnt_from_the_Prefeasibility_study_for_Kenya's_Nuclear_Power_Program on 7th February 2019.

[115] IAEA, 'Milestones in the Development of a National Infrastructure for Nuclear Power' *Nuclear Energy Series No. NG-G-3.1* (2015) 36.

5.1.9 Develop Strategies for the funding and financing of a national nuclear power program.

In order for the government to successfully implement and run a nuclear power plant in the country there are financial considerations that must be adequately catered for. The government should outline the costs of implementing a nuclear power program and identify acceptable options and means of meeting the expected costs. Funding is essential to a nuclear power program both at its inception and during its operation therefore the government must have a proper strategic plan on how to bear the costs throughout.[116] The probability of the occurrence of a nuclear accident where there is inadequate or untimely funding by the government is very high and such incidents should be avoided at all costs. The government must commit to allocate resources continuously to the nuclear energy power program.

5.2 Conclusion

Conclusively, the existing legislation does indeed fall short of the Nuclear Law threshold as laid out by the IAEA and as such it cannot support and regulate nuclear power as a source of energy in Kenya. That notwithstanding, the government has decided to pursue the implementation a nuclear energy power program in the country. This creates an urgent and pressing need to establish a robust nuclear legislative framework that conforms to the principles of the Constitution and to the obligations set out in the international nuclear energy instruments.

There is hope to actualise a nuclear energy power program in the country. However, it is not feasible that such an undertaking could reasonably be achieved in the next decade so as to meet the vision 2030 goals. The demands of a nuclear energy power program are vast and reach across all sectors of the economy. The Government should approach the matters surrounding nuclear energy with caution and properly weigh the expected benefits against the risks and financial burden.

[116] IAEA, 'Milestones in the Development of a National Infrastructure for Nuclear Power' *Nuclear Energy Series No. NG-G-3.1* (2015) 21.

BIBLIOGRAPHY

Books

Heilbron J, *The Oxford Companion to the History of Modern Science*, Oxford University Press, New York, 2003.

Armaroli N, Balzani V, *Energy for a sustainable world: From the Oil Age to a Sun-Powered Future*, Wiley-VCH Verlag & Co, Weinheim, 2011.

Stoiber C, Baer A, Pelzer N, *Handbook on Nuclear Law*, IAEA, Vienna, 2003.

Juma C,'*Current Status of Kenya's Nuclear Power Programme'*, Kenya Nuclear Electricity Board, Nairobi, 2016.

IAEA, *Fundamental Safety Principles*, IAEA, Austria, 2006

IAEA, *Defence in Depth in Nuclear Safety*, IAEA, Vienna, 1996

Bruntland Commission, *Report of the World Commission on Environment and Development: Our Common Future*, Oxford University Press, 1987

Brynard H, Ainslie L, Merwe P, *Uranium in South Africa*, Atomic Energy of South Africa Limited, 1987

Journal

Anderson H, 'The legacy of Fermi and Szilard' *Bulletin of Atomic Scientists, Vol 30 Issue 7* (1974)

Taylor M, 'Greenhouse gases and the nuclear fuel cycle: What emissions?' *IAEA Bulletin* (1997)

IAEA, 'Commissioning for Nuclear Power Plants', *IAEA Safety Standards Series No.SSG-28* (2014)

IAEA, 'Building a National Position for a New Nuclear Power Programme' *IAEA Nuclear Energy Series No. NG-T-3.14* (2016)

IAEA, 'Stakeholder Involvement Throughout the Life Cycle of Nuclear Facilities' *IAEA Nuclear Energy Series No.NG-T-1.4* (2011)

IAEA, 'Milestones in the Development of a National Infrastructure for Nuclear Power' *Nuclear Energy Series No. NG-G-3.1* (2015)

Statutes

The Constitution of Kenya (2010)

The Energy Act (Act No.12 of 2006)

The Energy Act (2017)

The Radiation Protection Act (CAP 243)

National Environmental Management Co-ordination Act (No.8 of 1999)

Prevention of Terrorism Act (No. 30 of 2012)

Constitution of South Africa (1996)

Nuclear Energy Act, (No.46 of 1999) of South Africa

National Regulator Act, (No.47 of 1999) of South Africa

Non-Proliferation of Weapons of Mass Destruction Act (No.87 0f 1993) of South Africa

Conference Papers

Cherf A, 'International Framework for nuclear safety', Regional Workshop on Nuclear Law for African Member States (Group 1), Arusha, 13 March 2017

Paniagua F, 'International Framework for Nuclear Security', Regional Workshop on Nuclear Law for African Member States (Group 1), Arusha, 13 March 2017

Stiober C, 'Elements of National Law and Decommissioning', IAEA Regional Workshop on Legal and Regulatory Aspects of Decommissioning of Research Reactors, Manila , June 2006

Carmona M, 'International Framework for nuclear safety', Regional Workshop on Nuclear Law for African Member States (Group 1), Arusha, 13 March 2017

Lumadede H, 'Lessons learnt from the Pre-feasibility study for Kenya's Nuclear Power Program', 8th International Conference on Deregulated Electricity Market Issues in South-Eastern Europe , Croatia, September 2013