

**SOUTH AFRICA'S PEACEFUL USE OF NUCLEAR ENERGY UNDER THE NUCLEAR NON-
PROLIFERATION TREATY AND RELATED TREATIES**

by

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SUMMARY

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I declare that the '**SOUTH AFRICA'S PEACEFUL USE OF NUCLEAR ENERGY UNDER THE NUCLEAR NON-PROLIFERATION TREATY AND RELATED TREATIES**' is my own work and that all sources that I used or quoted have been indicated and acknowledged by means of complete references.

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IN THE MEMORY OF MY MOTHER

AND

TO MY PRECIOUS FATHER

Key words

Nuclear energy, non-proliferation of nuclear weapons, nuclear safety, nuclear security, safeguards, nuclear liability, sustainable development, access to electricity, socio-economic rights, Millennium Developmental Goals, 9.6 GW.

Abstract

Energy is the natural power stored in matter which can be potential and kinetic energy. This occurs in nature in various forms such as chemical energy, thermal energy, electromagnetic radiation, gravitational energy, electric energy, elastic energy, nuclear energy, and rest energy. The scientific research relating to nuclear energy has revealed that atoms are the foundation of matter. In 1905 Albert Einstein initiated the quantum revolution utilising the Newtonian mass-energy equivalence concept in order to put his famous equation: $E = mc^2$, where energy is (E). This facilitated the nuclear research which focused on manufacturing the first atomic bomb. In 1945 the USA acquired its first two atomic bombs which were dropped on Nagasaki and Hiroshima, killing 200 000 people; mostly civilians. But nuclear energy research has been redirected by scientists in order to industrialise nuclear technology in order to address growing power needs. This encouraged policy makers to consider the risks posed by utilising nuclear energy for civil purposes. The shift towards peaceful nuclear energy applications has been motivated by the many valuable contributions to humankind which nuclear energy offers - for instance in the fields of energy generation, human health, agriculture and industry. The nature of nuclear energy lends itself to becoming an important component of the world energy and global economic system. Nuclear energy is a viable option for many countries including South Africa, because it offers an economic and clean source of electricity; the primary engine for socio-economic development. South Africa operates the only two nuclear power reactors in Africa, (Koeberg 1 and Koeberg 2) generating 1.8 GWe. South Africa's energy supply infrastructure consists fundamentally of coal-fired power plants which pose serious threats to the environment. Therefore, it is assumed that the planned 9.6 GW of new nuclear capacity by 2030 will meet

the requirements of South Africa's policy regarding the diversification of available energy resources to secure energy supply, support economic growth, and contribute to environmental management. Consequently, the legal system which governs nuclear energy programme is intended to prohibit the proliferation of nuclear weapons, ensure security and maintain the safe operation of nuclear facilities.

LIST OF ABBREVIATIONS

AEB	Atomic Energy Board
AEC	Atomic Energy Corporation, Limited
AGECC	Secretary-General's Advisory Group on Energy and Climate Change
Btu	British Thermal Units
Btu	British Thermal Units
CCGT	Gas-Fired Combined-Cycle Gas-Turbine
CCMA	Commission for Conciliation, Mediation and Arbitration
CNS	Council for Nuclear Safety
CO ₂	Carbon dioxide
CPPNM	Convention on the Physical Protection of Nuclear
CSP	Concentrating Solar Power
CTBT	Comprehensive Nuclear-Test-Ban Treaty
DCAC	Directorate Conventional Arms Control
DECC	United Kingdom Department of Energy and Climate Change
DFA	Department of Foreign Affairs
DI	Defence Intelligence
DME	South African Department of Minerals and Energy
DOA	South African Department of Agriculture
DoE	South African Department of Energy
DOH	South African Departments of Health
DPRK	Democratic People's Republic of Korea
EIA	Energy Information Administration
EU	European Union
Euratom	European Atomic Energy Community or Treaty establishing the European Atomic Energy Community
FAO	Food and Agriculture Organization of the United Nations
GCRS	Gas Cooled Reactors
GHGs	Greenhouse Gases

GWh	Gigawatt Hours
HEU	Highly Enriched Uranium
HTGRS	High Temperature Gas Cooled Reactors
HWRS	Heavy Water Reactors
ICJ	International Court of Justice
IEA	International Energy Agency
ILO	International Labour Organization
IMO	International Maritime Organization
INEP	Integrated National Electrification Programme
IPP	Independent Power Producer
IPPs	Independent Power Producers
IRP	Integrated Resource Plan 2010-2030
Kv	Kilovolt
KWh	Kilowatt hour
LMFBRs	Liquid Metal Fast Breeder Reactors
LWRS	Light Water Reactors
MDG	Millennium Development Goals
MECRs	Multilateral Export Control Regimes
Mt	Million Tonnes
MTCR	Missile Technology Control Regime
Mtoe	Million Tons of Oil Equivalent
MW	Megawatt
NDP	National Development Plan
NEA	OECD Nuclear Energy Agency
Necsa	South African Nuclear Energy Corporation
NIA	South African National Intelligence Agency
Niasa	Nuclear Industry Association of South Africa
NIP	South African National Infrastructure Plan
NNR	National Nuclear Regulator
NNWS	Non-Nuclear-Weapons States
NPC	South African Council for the Non-Proliferation of Weapons of Mass

	Destruction
NPS	Non-Proliferation Secretariat
NPT	Treaty on the Non-Proliferation of Nuclear Weapons
NPWMDA	Non-Proliferation of Weapons of Mass Destruction Act
NSG	Nuclear Suppliers Group
NSGC	Nuclear Security Guidance Committee
NUFCOR	Nuclear Fuels Corporation
NWFZs	Nuclear-Weapon-Free-Zones
NWS	Nuclear-Weapons States
OCGT	Gas-Fired Open Cycle (Single Cycle) Gas Turbine
OECD	Organisation for Economic Co-operation and Development
²³ p	Plutonium-239
PAHO	Pan American Health Organization
PBMR	pebble bed modular reactor
PPS	Physical Protection System
PV	Photo Voltaic
RDDs	Radiological Dispersal Devices
RDP	Reconstruction and Development Programme
REDs	Radiological Exposure Devices
SAMHS	South African Military Health Services of the Department of Defence
SAPP	Southern African Power Pool
SASS	South African Secret Service
SDRs	Special Drawing Rights
SIPs	Strategic Integrated Projects
SOE	State Owned Enterprise
TEPCO's	Tokyo Electric Power Company's
TMI	Three Miles Island I
TWh	Terawatt Hours
USA	United States of America
²³⁵ U	Uranium-235
U ₃ O ₈	Triuranium Octoxide

UCOR	Uranium Enrichment Corporation of South Africa
UF ₆	Uranium Hexafluoride
UK	United Kingdom
UNAEC	United Nations Atomic Energy Commission
UNDC	United Nations Disarmament Commission
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNGA	United Nations General Assembly
UNIDO	United Nations Industrial Development Organization
UNSC	United Nations Security Council
UNIFEM	United Nations Development Fund for Women
UNMOVIC	United Nations Monitoring, Verification and Inspection Commission
UNSCEAR	Scientific Committee on the Effects of Atomic Radiation
UNSCOM	United Nations Special Commission
UNSG	United Nations Secretary General
USSR	Soviet Socialist Republics
WA	Wassenaar Arrangement
WHO	World Health Organization
WWII	World War Two
ZOPFAN	Declaration of the Zone of Peace, Freedom and Neutrality
ICSANT	International Convention for the Suppression of Acts of Nuclear Terrorism
CANWFZ	Central Asian Nuclear Weapon Free Zone

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CHAPTER I

INTRODUCTION

1.1 INTRODUCTION

Energy is the natural power stored in the matter which can be potential and kinetic energy. These occur in nature in various forms such as chemical energy, thermal energy, electromagnetic radiation, gravitational energy, electric energy, elastic energy, nuclear energy, and rest energy.¹ Natural energy has been discovered gradually. The development of energy systems worldwide began by utilising the available primal resources such as animals, hydropower, wind, wood, biomass, etc.² Pre-industrial societies utilised renewable primitive sources of energy.³

Drastic changes have been introduced since the invention of the steam machine,⁴ which drove the industrial revolution.⁵ The energy produced by steam engine machines contributed largely to the development of the 18th century European societies in two vital areas, namely industry and transportation. Steam-powered engines harnessed productivity, the mass-production of goods, and market expansion.⁶ Steamboats functioned as “a vital

¹ Fullerton D *Aplusphysics: Your Guide to Regents Physics* (2011) at 120-130.

² Houghton J *Global Warming: The Complete Briefing* (2004) 3rd ed at 268.

³ Anton D “Diversity, globalisation and ways of future” (1995) *International Development Research Centre* <http://www.idrc.ca/openebooks/724-8/> (access 12 March 2012).

⁴ The first satisfactory efficient condensing steam-powered engine was built by James Watt in 1765. See, Borbon V, Cruz M, Flores R, Medina-Gerona Z, and Lee A *College Science Technology and Society* (2000) 1st ed at 57.

⁵ Ross S *The Industrial Revolution* (2008) at 24.

⁶ The first steam-powered engine created by Thomas Newcomen was deployed “to power water pumps in Irish coal mines in the 1700.” See, “Steam Factories in the 1800's” http://www.ehow.com/info_8185726_steam-factories-1800s.html(accessed 3 March 2012). Later the steam-powered engine revolutionised the American textile factories transforming them from small production unites into “a factory-based model.” See, Dickinson H and Titley A *Richard Trevithick: The Engineer and the Man* (1934) 1st ed at 10.

link in the supply and demand chain,”⁷ which allowed for the expansion of factories and extended their potential locations to include rivers and coastal ports.⁸

Gradually, the steam turbine was deployed in factories and thermal power plants boosting electrification which developed working trends by increasing working hours, productivity, and efficiency. Electrification became a vehicle of further developments involving the welfare of mankind and the quality of life including health, education, and entertainment. Electrification became a universal priority and policy of governments around the world because it “plays a very important role in productivity growth.”⁹ As early as the 1930s President Roosevelt was adamant to bring electricity to farms and American back roads, culminating in Roosevelt’s Tennessee valley Authority and the Rural Electrification Agency which brought electric power to millions of people.¹⁰

The scientific research relating to nuclear energy has revealed that atoms are the foundation of matter. The Greek definition of matter is based upon breaking down the earth into its basic substances or elements including earth, air, water, and fire. These elements made up the World as the Greeks knew it, forming both their natural and their philosophical world, and even “their own physical and spiritual values.”¹¹ Nevertheless, modern science concludes the existence of 105 elements that structure our surrounding,¹² which are unlikely to be found isolated and often compose compounds. For example, the water molecule H₂O is a chemical compound consisting of two atoms of hydrogen and one atom of oxygen. In the same context, the uranium Hexafluoride UF₆, which is enriched uranium

⁷ Strehlow J “The Effects of Steamboats on the Industrial Revolution” http://www.ehow.com/info_8558537_effects-steamboats-industrial-revolution.html updated on 7 June 2012. (accessed 3 March 2012).

⁸ *ibid.*

⁹ The Report on Electricity in economic growth by the USACommittee on Electricity in Economic Growth (1986) USA National Research Council at 77.

¹⁰ Clement A *Cotton Picking Boy: 1932 through 1936* (2002) at 66.

¹¹ Kenner C *Crystals For Beginners: A Guide to Collecting and Using Stones and Crystals* (2006) 1st ed at 50.

¹² USA Department of Energy (DOE) *Fundamentals Handbook: Nuclear Physics and Reactor Theory* Vol 1 (January 1993) at 1- 2.

fuel,¹³ is a chemical compound consisting of one atom of uranium combined with six atoms of fluorine.¹⁴ These compounds consist from uniting two or more of different atoms by means of chemical reactions.¹⁵

The basic building blocks of the atom include protons, neutrons and electrons.¹⁶ The protons, neutrons and electrons in certain elements such as uranium, radium, plutonium, thorium, etc. radiate atomic energy in the form of rays that became the focus of nuclear physics.¹⁷ Initially, these rays which emanate from the radioactive matters were called X-rays because of their unknown nature.¹⁸ In 1898 Marie and Pierre Curie studied the radiation of uranium, radium and plutonium and “classified the radiation from radium and plutonium into three types, according to the direction and deflection in a magnetic field. These three types of radiation were called Alpha (α), Beta (β) and Gamma (γ) radiation.”¹⁹ In 1905 Albert Einstein initiated the quantum revolution utilising the Newtonian mass-energy equivalence concept in order to put his famous equation: $E = mc^2$, where energy (E), m is mass, and c is the speed of light. “It states that energy (E) is equivalent to mass (m)-thus the equal sign. This means that mass converted to energy (as it is nuclear fission and fusion),”²⁰ where “nuclear fission is the splitting of atomic nuclei whilst nuclear fusion is the joining together of atomic nuclei.”²¹

¹³ IAEA *Nuclear Fuel Cycle Information System: A Directory of Nuclear Fuel Cycle Facilities* (April 2009 Edition) at 14.

¹⁴ Bagnall K “The Halogen chemistry of the actinides” (304-36) In Gutmann V *Halogen Chemistry Volume 3* (1967) at 365.

¹⁵ “The word atom comes from Greek words *a* for ‘not’ and *tomos* meaning cut”. See, Cohen H and Lefebvre C *Handbook of Categorization in Cognitive Science* (2005) at 264.

¹⁶ John Dalton explained the meaning of an atom at the beginning of the 19th century. See, Henderson H *Nuclear Power: A Reference Handbook* (2000) at 1.

¹⁷ Johnson R “Radioactivity in granite countertops” (207-227) in Karam P and Vetter B eds *Naturally Occurring Radioactive Materials (NORM) and Technologically Enhanced NORM (TENORM)* (16–19 July, 2009) at 208-209.

¹⁸ “Today X-ray-generated images are indispensable aids in the practice of medicine and dentistry.” See, Seager S and Michael R *Chemistry for Today: General, Organic, and Biochemistry* (2010) 7th ed at 317.

¹⁹ Weiner R and Mathews R *Environmental Engineering* (2003) 4th ed at 313.

²⁰ Ford K *101 Quantum Questions: What you Need to Know about the World You Can't See* (2011) at 41.

²¹ Catterall A *GCSE AQA Physics Revision Guide* (2006) at 72.

A series of scientists²² have explored the potential atomic energy and have developed theories to guide comprehensive nuclear applications.²³ Initially, the scientific endeavours were focused on building a nuclear bomb.²⁴ Just before the World War II the USA government committed to the Manhattan Project in order to expedite the research which intended to produce the bomb. In December 1938 “Otto Hahn and Fritz Strassmann identified the suspected fission of natural uranium under neutron bombardment” confirming the precepts of “Albert Einstein’s famous equation arising out of relativity theory equating mass with energy.”²⁵ In other words, the Otto Hahn and Fritz Strassmann experiment showed that splitting of an atom releases energy and theoretically the control of a chain reaction releases an enormous amount of nuclear energy.²⁶ On 2 December 1943 Enrico Fermi created the first artificial “self-sustaining nuclear chain reaction and thereby initiated the first controlled release of nuclear energy.”²⁷

The next step focused on building the bomb which took place at Los Alamos under the direction of J. Robert Oppenheimer. On 16 July 1945 the first short gun type nuclear device was tested at the Trinity site in New Mexico.²⁸ The bomb exploded with a force 2000 tons TNT.²⁹ The USA had acquired its first two atomic bombs which were “dropped on Nagasaki and Hiroshima in August 1945 causing the death of 200 000 people (mostly civilians) from

²² Such as, Albert Einstein put forth the theory that matter could be transformed into energy in 1905, Enrico Fermi discovered that uranium reacted to neutron bombardment in 1934, Otto Hahn and Fritz Strassmann discovered nuclear fission 1934. For further reading on the discovery of nuclear energy refer to Henderson H *Nuclear Power: A Reference Handbook* (2000) at 1-5.

²³ Such as, nuclear power, medical applications in its two folds diagnostics and treatment, industrial applications commercial applications and food processing and agriculture.

²⁴ “The UK Atomic Energy Agency was intended to be weapons”. See Stephen T CQ *Nuclear Law: The Law Applying to Nuclear Installations and Radioactive Substances in Its Historic Context* (2010) 2nd ed at 11. See also, Herken G *Cardinal Choices: Presidential Science Advising from the Atomic Bomb to SDI* (1992) at 32.

²⁵ Bradley F *No Strategic Targets Left* (1999) at 95.

²⁶ Saunders N *Energy for the Future and Global Warming: Nuclear Energy* (2008) at 8.

²⁷ Anderson H “The legacy of Fermi and Szilard” Vol 30 Issue 7 (September 1974) *Bulletin of the Atomic Scientists* at 56.

²⁸ Heilbron J *The Oxford Companion to the History of Modern Science* (2003) at 487.

²⁹ Byrnes M, King D, and Tierno, Jr P *Nuclear, Chemical, and Biological Terrorism: Emergency Response and Public Protection* (2003) at 11.

injuries sustained from the explosion and acute radiation sickness, and even more deaths from long-term effects of ionizing radiation.”³⁰

The discovery of radiation encouraged scientists to explore the benefits which could be derived from nuclear energy.³¹ The realisation that industrialising nuclear technology would solve many power problems encouraged policy makers to consider the risks posed by the deployment of nuclear energy in civil enterprises. The peaceful applications of nuclear energy have been motivated by the many valuable contributions to humankind in many fields which nuclear energy offers such as: power generation, human health, agriculture and industry.³²

The milestone initiative which gave thrust to the world effort to initiate the peaceful use of nuclear energy programmes was the project “Atoms for Peace “which was launched in 1953.³³ In his address to the United Nations General Assembly (UNGA), President Eisenhower acknowledged the benefits of nuclear energy and the right of nations to exploit it.³⁴ At that time the peaceful applications of nuclear energy was impeded by many technical problems.³⁵ After decades of technological efforts, which resulted in improving safety and

³⁰ Balzani V and Armaroli N *Energy for A Sustainable World: From the Oil Age to A Sun-Powered Future* (2010) at 150.

³¹ Bredimas A and Nuttall W “An international comparison of regulatory organizations and licensing procedures for new nuclear power plants” (1344–1354) Vol. 36 (2008) *Energy Policy* at 1345. Maddock numerates the countries which were ambitious to acquire nuclear weapons before the WWII. They include the United States which started on the path toward nuclear bomb and followed by the French, Japanese, USSR, German and British. See, Maddock S *Nuclear Apartheid: The Quest for American Atomic Supremacy from the World War II to the Present* (2010) at 14.

³² OpeningAddress by K. Suganuma, Consul General, Consulate of Japan in Edinburgh, UK *Illicit Nuclear Trafficking: Collective Experience and the Way Forward* (2008) IAEA at 39.

³³ Address by the President of the USA Dwight D. Eisenhower to the 470th Plenary Meeting of the UNGA on 8 December 1953.

³⁴ *Ibid.*

³⁵ For example, the design of Magnox stations evolved over time. See Tromans CQ *Nuclear Law: The Law Applying to Nuclear Installations and Radioactive Substances in Its Historic Context* (2010) 2nd ed at 14. See also, Stason E *Lectures on Atomic Energy Industrial and Legal Problems* (26-28 June 1952) at 14.

efficiency, nuclear power became capable of being deployed through base-load power plants.³⁶

The governments of the USA and a number of European countries promoted a nuclear energy policy because it offered them an alternative source of energy, with benefits that neither oil nor coal could offer.³⁷ As early as 1946, section 1 of the USA Atomic Energy Act (McMahon Act)³⁸ declared that “the development and utilization of atomic energy shall be directed towards public welfare, increasing the standard of living, strengthening free competition among private enterprises, insofar as it is practically possible and moreover, cementing world peace.”

The requirement to develop nuclear energy to serve human kind became the main objective of international institutions such as the European Atomic Energy Community (Euratom)³⁹ and the International Atomic Energy Agency (IAEA).⁴⁰ In this context, Article 2 of the Statute⁴¹ of the IAEA urges the Agency to “accelerate the contribution of atomic energy to peace, health and prosperity throughout the world...”⁴²

The nature of nuclear energy lends itself to becoming an important component of the world energy and global economic system.⁴³ Although the operation of power plants involve

³⁶ Hore-Lacy I *Nuclear Energy in The 21st Century* (c2006) at 4.

³⁷ Cameron P “The revival of nuclear power: an analysis of the legal implications” (71–87) Vol 19, no 1 (2007) *Journal of Environmental Law* at 73.

³⁸ USA Atomic Energy Act of 1946 (Public Law 585, 79th Congress). President Truman signed Atomic Energy Act into law in 1946. Hereinafter referred to as the McMahon Act.

³⁹ The Treaty establishing the European Atomic Energy Community was signed on the 25 March 1957. Hereinafter referred to as Euratom.

⁴⁰ The International Atomic Energy Agency was established at the New York Conference of September 1955. Hereinafter referred to as the IAEA.

⁴¹ “The Statute of the IAEA was approved in October 1956 by the United Nations Conference on the Statute of the IAEA and entered into force in July 1957.” See, *IAEA Safeguards Glossary* (2002) *International Nuclear Verification Series* no. 3 2001.

⁴² Similarly, the preamble to the Euratom states that: “It shall be the task of the Community to contribute to the raising of the standard of living in the Member States and to the development of relations with the other countries by creating the conditions necessary for the speedy establishment and growth of nuclear industries.”

⁴³ Brookes L and Motamen H *The Economics of Nuclear Energy* (1984) at 1.

inherited dangers,⁴⁴ nuclear power complements and may even substitute other forms of energy in satisfying the world growing demand for energy.⁴⁵ Nuclear energy is a viable option for many countries including South Africa⁴⁶ and other large emerging economies because nuclear energy offers an economic and clean source of electricity which is required as a primary engine for socio-economic development.⁴⁷

According to the United Nations Development Programme (UNDP)⁴⁸ the realisation of the Millennium Development Goals (MDGs)⁴⁹ is always linked to access to energy in order to “achieve primary education, promote gender equality and empower women, reduce child mortality improve internal health, combat HIV/AIDS, malaria and other diseases, ensure environmental sustainability and develop a global partnership for development.”⁵⁰ The underdevelopment in health, agriculture, education, and industries in Africa may be attributed to the shortage of access to affordable energy.⁵¹ The African human development goals require the development of adequate energy sector which is a prerequisite to improve access to energy as the most essential input for meeting each MDG. “Even though no MDG refers to energy explicitly, improved energy services—including modern cooking fuels,

⁴⁴ The operation of nuclear power plant is a process always connected to risks of nuclear radiation which causes irretrievable damages to public health, property, and environment.

⁴⁵ Commercial nuclear power is an alternative option of the US during energy crises and is foreseeable that the growth in electricity demand and the aging of power plants will require the construction of dozens of new plants. See, Travieso-Diaz M and Haemer H “The outlook for U.S. nuclear power in the 21st century” (79-86) Vol 17, issue 8 (2004) *The Electricity Journal* at 79.

⁴⁶ South Africa regards nuclear energy as a viable alternative to coal for electricity because it is “an important low carbon emission source of electricity” and because of limited resources of fossil fuels. See, Department of Minerals and Energy (DME), Nuclear Energy Policy of the Republic of South Africa (June 2008) at 7. Hereafter referred to as “the 2008 Nuclear Energy Policy.”

⁴⁷ Boussaha A, McDonald A, and Rogner H “Plan ‘A’ for Africa: African countries are building their capabilities for sustainable energy development through IAEA supported channels and tools” (36-39) (September 2007) *49/1 IAEA Bulletin* at 36.

⁴⁸ Hereafter referred to as the UNDP.

⁴⁹ Hereafter referred to as the MDGs.

⁵⁰ Mapako M “Energy, the millennium development goals and the key emerging issues” (1-23) (March 2010) *Africa Institute of South Africa* at 2.

⁵¹ *Ibid.*

improved cookstoves, increased sustainable biomass production, and expanded access to electricity and mechanical power—are necessary for meeting all the Goals.”⁵²

1.1.1 Nuclear Power in South Africa: Scope and Need for Expansion

The entire African Continent produces only 3.1% of the world’s electricity, of which South Africa accounts for 60%.⁵³ This forms part of the 54.7 GWe of power produced by the Southern African Electricity Pool (SAPP) in which Eskom is the main contributor with a production in excess of more than 40 GWe.⁵⁴ South Africa operates the only two nuclear power reactors in Africa, (Koeberg 1 and Koeberg 2)⁵⁵ generating 1.8 GWe. In South Africa nuclear energy is deployed as base-load⁵⁶ power plants and counts 3% of the national primary energy supply.⁵⁷ The two South African nuclear reactors generate 5% of the country’s electricity.⁵⁸

⁵² Modi V, McDade S, Lallement D, and Saghir J *Energy Services for the Millennium Development Goals* (November 2005) at 7.

⁵³ Kenny A “Energy supply in South Africa” (45-60) in Winkler H *Energy Policies for Sustainable Development in South Africa: Options for the Future* (April 2006) Energy Research Centre, University of Cape Town at 52.

⁵⁴ World Nuclear Association “Nuclear power in South Africa” updated April 2010 <http://www.world-nuclear.org/info/inf88.html> (accessed May, 4 2010).

⁵⁵ Koeberg 1 and Koeberg 2 are pressurised Water Reactors were built by Framatome (now Areva) and commissioned in 1984 and 1985 successively. See, Schneider M, Froggatt A, Hosokawa K, Thomas S, Yamaguchi Y, and Hazemann J *The World Nuclear Industry Status Report 2013 Paris* (July 2013) at 85-86.

⁵⁶ Hore-Lacy *Nuclear Energy in the 21st Century* at 4.

⁵⁷ Para 7.2 of the White Paper on the Energy Policy of the Republic of South Africa (December 1998). Published by the then DME. Hereafter referred to as “the 1998 White Paper on Energy Policy.” By “the end of the 2009/10 financial year the Department of Minerals and Energy” was known divided “into two separate entities as proclaimed by the State President.” Further “The financial year which ended on 31 March 2010 marked the establishment, at a rudimentary level, of the Department of Energy (DoE).” See Annual Report 2009/2010 of the DME at 14. Hereafter referred to the Department of Energy as the DoE.

⁵⁸ Parker F “The future of nuclear power in south Africa” Mail & Guardian, Johannesburg South Africa (3 August 2009) <http://www.mg.co.za/article/2009-08-03-the-future-of-nuclear-power-in-south-africa> (accessed 4 May 2010).

In order to meet soaring electricity demands “the Eskom board approved a plan to double generating capacity to 80 GWe by 2025.”⁵⁹ In 2008, South Africa began suffering electricity shortages. In January 2008, the then DME and Eskom released a new policy document; “National response to South Africa's electricity shortage.”⁶⁰ The document describes the predicament of electricity supply infrastructure in 2008 and outlines possible long- and short-term plans to cope with the emerging electricity crisis proposing the expansion of its electricity supply infrastructure.⁶¹

The contribution of multiple factors including the availability of resources and technologies relating to nuclear power, carbon constrained economy, price volatility of fuel oil and coal exhaustion will impact on the intended expansion of electricity supply infrastructure. Nonetheless, South Africa’s nuclear energy expansion programme can be understood in the view of three fundamental energy policy documents including the 1998 White Paper on the Energy Policy, The Nuclear Energy Policy of the Republic of South Africa of 2008,⁶² and the Integrated Resource Plan 2010-2030 (IRP).⁶³

The 1998 White Paper on the Energy Policy requires an investigation as to “whether new nuclear capacity will be an option in the future” which “will depend on the environmental and economic merits of the various alternative energy sources.”⁶⁴

The 2008 Nuclear Energy Policy states that:

⁵⁹ World Nuclear Association “Nuclear Power in South Africa” (Updated June 2013) <http://world-nuclear.org/info/Country-Profiles/Countries-O-S/South-Africa/#.UdVkxW2wehk> (accessed 4 June 2013).

⁶⁰ See, SouthAfrica. Info Gateway to the Nation “South Africa's energy supply” (accessed September, 30 2010) <http://www.southafrica.info/business/economy/infrastructure/energy.htm> See also, DME, Interventions to Address Electricity Shortages: National Response to South Africa’s Electricity Shortage (January 2008).

⁶¹ DME, National Response to South Africa’s Electricity Shortage.

⁶² DME, Nuclear Energy Policy of the Republic of South Africa (June 2008). Hereafter referred to as “the 2008 Nuclear Energy Policy.” http://www.energy.gov.za/files/policies/policy_nuclear_energy_2008.pdf (accessed 13 August 2013).

⁶³ DoE, Electricity Regulations on the Integrated Resource Plan 2010-2030. The IRP has been promulgated under the Electricity Regulation Act 4 of 2006. Government Notice No.34263 (6 MAY 2011). Hereafter referred to as the (IRP).

⁶⁴ Para 3.4.2 of the 1998 White Paper on Energy Policy.

“Nuclear energy is attractive for a number of reasons amongst which are the following:

- South Africa has sizeable uranium (and other potential nuclear material) reserves and a vibrant mining industry.
- The extraction of uranium ore does not present any major challenges.
- Value addition in the form of beneficiation of uranium ore and the implementation of a strong nuclear energy programme would lead to job creation and the further development of a skilled workforce.
- A solid regulatory framework, which would facilitate a structured development of the nuclear sector, already exists in South Africa.
- South Africa’s non-proliferation credentials, policy and legislative framework allows for the pursuit of a peaceful nuclear energy programme consistent with national and international nuclear nonproliferation obligations.
- Low carbon emissions based on full life cycle and significant role in achieving clean air by avoiding polluting emissions as compared to fossil fuels.
- The availability of safer more efficient new generation nuclear power technologies.
- Available energy resources for bulk electricity generation.”⁶⁵

The IRP contemplates four policy issues including nuclear options, emission constraints, import options, and energy efficiency.⁶⁶ These four policy issues are considered vital for the future expansion of electricity supply infrastructure of the country. After the “first round of public participation” initiated by the DoE in June 2010, the IRP realised the Revised Balanced Scenario (RBS).⁶⁷ The RBS proposes a nuclear fleet of 9.6 GW which is accepted by the DoE in order to “provide acceptable assurance of security of supply in the event of a peak oil-

⁶⁵ The 2008 Nuclear Energy Policy at 7-8.

⁶⁶ Para 4 of the IRP.

⁶⁷ “The Revised Balanced Scenario (RBS) was developed in discussion with other departments, incorporating different policy objectives and the cost optimisation was undertaken as part of the modelling process.” See, para 1.3 of the IRP. Hereafter referred to as the RBS.

type increase in fuel prices and ensure that sufficient dispatchable base-load capacity is constructed to meet demand in peak hours each year.”⁶⁸

1.1.2 Nuclear Energy in South Africa: A Unique Experience

The vision presented in the RBS is “premised on Article IV of the ... (NPT) which affirms South Africa’s ‘inalienable right’⁶⁹ “to carry out research, develop, produce and use nuclear energy for peaceful purposes.”⁷⁰ South Africa’s plans to expand its nuclear power generating capacity are similar to those in other many countries such as China, India, and Brazil.⁷¹ Nevertheless, the development of a nuclear energy programme requires a comprehensive nuclear legal framework which must provide for sustainable development, guarantee the proper functionality of nuclear power plants, establish nuclear safety standards, nuclear waste management and a nuclear security culture, safeguard non-diversion of nuclear materials for military purposes, provide for measures and emergency plans dealing with nuclear accidents, and institute a compensation and civil liability regime to address damages resulting from nuclear accidents.

Notwithstanding, the risks associated with generating electricity from nuclear capacity have been negotiated on a different level, while the focus remains on the non-proliferation regime. The non-proliferation regime can be defined as a prearranged set of norms designed to inhibit the potential proliferation of nuclear weapons or the diversion of peaceful nuclear programmes to further military purposes.

⁶⁸ Para 4.4 of the IRP.

⁶⁹ Although the “South Africa is a country in highest non-proliferation standings and does not need any reference to Article IV paragraph 1 of the NPT,” the 2008 Nuclear Energy policy contemplated the so-called “inalienable right.”

⁷⁰ The 2008 Nuclear Energy Policy at 6.

⁷¹ Yukiya Amano states that “at the moment, there are 66 new reactors under construction. Seven of them are in India...Other major users of nuclear power such as China and Russia also have significant expansion plans.” See, Yukiya Amano “IAEA perspectives on future of nuclear energy” (updated 11 March 2013)<http://www.iaea.org/newscenter/statements/2013/amsp2013n05.html> (accessed 30 June 2013). Although China is a nuclear weapon state and a signatory party to the NPT, India is also a nuclear weapon State but not a party to the NPT, and Brazil is a non-nuclear weapon state and a signatory party to the NPT, the status of China and India is irrelevant.

The non-proliferation regime is the core of the international nuclear regime which rests on the bargain of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT).⁷² The hypothesis of NPT is based on the nuclear bargain between nuclear weapons states (NWS)⁷³ and non-nuclear weapons states (NNWS)⁷⁴ which forbids any state other than the NWS to develop nuclear weapons and to disarm the NWS.

The maintenance of the non-proliferation regime hinges on three pillars: the non-proliferation of nuclear weapons, the inalienable right for nations to develop nuclear power for peaceful purposes, and the complete disarmament of nuclear weapons at the closest opportunity. The non-proliferation regime is supported by myriad of legal norms in international, regional and bilateral treaties and conventions, UNSC resolutions, and informal arrangements. These layers of nuclear norms have built the non-proliferation regime with the NPT as its cornerstone. However, few countries have defied the non-proliferation regime by developing technology leading to acquire nuclear weapons. These countries include the Democratic People's Republic of Korea (DPRK), India, Pakistan, Israel, South Africa, and possibly Iran.⁷⁵

For its own policy reasons South Africa, felt the need to challenge the NPT and the non-proliferation regime and developed a nuclear bomb. South Africa succeeded to manufacture six, or possibly even eight bombs.⁷⁶ “South Africa’s nuclear weapons programme appears to have been developed in part to counter” Union of Soviet Socialist Republics (USSR)⁷⁷ “threats to South Africa in the late 1970.”⁷⁸ The information about South Africa’s nuclear

⁷² The Treaty on the Non-Proliferation of Nuclear Weapons was signed in 1968 and came into force on 5 March 1970. Hereafter referred to as the NPT.

⁷³ Hereafter referred to as the NWS.

⁷⁴ Hereafter referred to as the NNWS.

⁷⁵ Iran is in a negotiating process with P 5 (+ Germany). Its nuclear program raised suspicions as to its nature is exclusively peaceful, but this was never confirmed.

⁷⁶ NTI: Research Library: Country Profile: South Africa, Nuclear Overview, (Updated January 2010)http://www.nti.org/e_research/profiles/SAfrica/Nuclear/index.html (accessed September, 30 2010).

⁷⁷ Hereafter referred to as the USSR.

⁷⁸ Kroenig M *Exporting the Bomb: Technology Transfer and the Spread of Nuclear Weapons* (2010) at 132. The USSR was established on 30 December 1922 by the Treaty on the Creation of the USSR and was formally

energy programme has been tainted by the attitude of the apartheid regime which “preferred to deal with these matters in secret and to cover their tracks by the strictest application of the Nuclear Energy Act.”⁷⁹ Nonetheless, Abdul Minty⁸⁰ stated in his keynote address at the Proceedings of Nuclear debate: a Conference on nuclear policy for a democratic South Africa in 1994 that:

“There are, of course, many explanations. One was that it wanted to blackmail, or perhaps ‘white-mail’ the international community, and independent Africa more particularly. It wanted to be in a position where it could stop the sanctions process. If sanctions had led to a point where it really threatened the survival of the South African regime, then it could in turn threaten with a nuclear weapon.”⁸¹

Eventually, the international disincentive measures accompanying the non-proliferation regime forced South Africa to abandon and to rollback its nuclear programme.⁸² Arguably, the determination of the international community to prevent any nuclear arms proliferation precipitated the isolation and eventually the demise of the Apartheid government as from 1980. Arguably, South Africa interplayed “external influence and regime change in the context of nuclear reversal”⁸³ because nuclear weapons were irrelevant to the actual security of the country, especially once it had entered the transitional era which focussed South Africa’s policies on transformative democratic normative rules. Nevertheless,

dissolved on 26 December 1991. See, Krüger H *The Nagorno-Karabakh Conflict: A Legal Analysis* (2010) 48. Hereafter referred to as the USSR.

⁷⁹ See, the opening address of by Trevor Manuel (3-5) in *The Nuclear Debate: Proceedings of a Conference on Nuclear Policy for a Democratic South Africa* (11–13 February 1994) at 4.

⁸⁰ Abdul Samad Minty was elected president of the IAEA’s General Conference in 2006. For more information about Abdul Minty refer South African History Online <http://www.sahistory.org.za/people/abdul-samad-minty> (accessed 8 June 2014)

⁸¹ See, Keynote address by Abdul Minty in *The nuclear debate* (7-15) (11–13 February 1994) at 13.

⁸² “An AEC official later stated that the possibility of black majority rule contributed to the decision to take these actions”. See, MasizaZ “A Chronology of South Africa's nuclear program” (35-55) (Fall 1993) *the Nonproliferation Review* at 35.

⁸³ Levite A “Never say never again: nuclear reversal revisited” (78-107) in Brown M, Cote Jr O, Lynn-jones S, and Miller S eds *New Global Dangers: Changing Dimensions of International Security* (2004) at 103.

“It is not known whether the decisive argument that convinced de Klerk to dismantle South Africa’s nuclear bomb was alluring prospect of normalising its international nuclear standing, or whether the nuclear and military bureaucracies feared a future in which an ANC government might have access to nuclear weapons. Whatever the case, de Klerk recognised that the new political climate demanded the full dismantling of the new weapons and issued orders to have them destroyed.”⁸⁴

The uncertainties relating to the incentives required to develop the bomb and the disincentives required to their rollback are important for the understanding of South Africa’s unique nuclear history. The five stages of this development were:

1. The establishment of a nuclear infrastructure for commercial purposes focusing on exporting uranium ore to the Allied Forces of World War II (WWII)⁸⁵ in the 1940s. Nuclear international market potentials pushed South Africa to establish the Atomic Energy Board in 1948⁸⁶ aiming at nuclear development activities.
2. The second era extended between 1952 and 1971, in which the USA imported more than 40 000 tons of uranium oxide from South Africa, valued at \$450 million and in return assisted South Africa in its nuclear programme.
3. The third era involved plans to develop a peaceful nuclear programme. These plans found their way to South Africa under the American “Atoms for Peace” programme and Pretoria received a small experimental reactor (SAFARI-1)⁸⁷ that was installed at Pelindaba.⁸⁸

⁸⁴ Fig D *Uranium Road: Questioning South Africa’s Nuclear Direction* (2005) at 70.

⁸⁵ Hereafter referred to as the WWII.

⁸⁶ Jan Smuts decided to mimic the American, Canadian and UK model and to establish relatively autonomous Atomic Energy Board to manage nuclear related affairs. See, Fig D “Nuclear energy rethink? the rise and demise of South Africa’s PBMR” (1-40) Paper 210 (April 2010) *Institute for Security Studies* at 3.

⁸⁷ SAFARI-1 is a 20 MW research reactor was commissioned in 1965 and was intended for high level nuclear physics research programmes. See, para A.7 of the 2008 Nuclear Energy Policy.

⁸⁸ Pelindaba is nuclear site situated near Hartbeespoort Dam some 18 miles west of Pretoria. It is considered the main Nuclear Research Centre in South Africa. The Nuclear Energy Corporation of South Africa (NECSA) runs the site. <http://www.necsa.co.za/> (accessed September, 30 2010).

4. The fourth era was marked by the change of the direction of the nuclear policy objectives of the South African Government because of the perceived regional threats, resulting in the development of a South African nuclear bomb. In 1970 B J Vorster, the then Prime Minister of South Africa, renamed the Atomic Energy Board (AEB) into the Atomic Energy Corporation (AEC) and placed it in charge of an aggressive uranium enrichment programme that was commenced at installations in Valindaba.⁸⁹ Soon, the Armaments Corporation of South Africa (Armcor)⁹⁰ took over the project and up to 8 gun type bombs were developed as a possible deterrent means for the preservation of national security and the upholding of the apartheid regime of the increasingly unpopular government in Pretoria.
5. The fifth era, commencing in 1992, introduced a new nuclear normative rules in parallel with the new democratic dispensation, when the administration of President F W de Klerk decided to dismantle the South African nuclear weapons.⁹¹

The most important issues emanating from the fifth era lie in the practical steps required to comply with the NPT norms which influence the construction of South Africa's legal landscape governing the country's nuclear energy programme. This has developed concurrently with the development of new constitutional dispensation. That is to say, the construction of nuclear legal norms in South Africa is required to commit to democratic

⁸⁹ The Valindaba experimental uranium enrichment plant, also known as Pelindaba East or Y-plant, was completed in 1975 by the Uranium Enrichment Corporation of South Africa (UCOR) and started producing High Enriched Uranium in 1978. The plant was dismantled on 1 February 1991. See, Albright D "South Africa and the affordable bomb" (37-47) (July 1994) *Bulletin of the Atomic Scientists* at 39-41.

⁹⁰ ARMSCOR is the Armaments Corporation of South Africa Ltd established by section 2 of the Armaments Development and Production Act 31 of 1993, "which continues to exist under that name despite the repeal of that Act". In terms of Armaments Corporation of South Africa, Limited Act 51 of 2003 ARMSCOR "is the officially appointed acquisition organisation for the South African Department of Defence and with the approval of the South African Minister of Defence, also renders a professional acquisition service to other government departments and public entities". In terms of section 4(2)(g) ARMSCOR is required "to establish a compliance administration system" in order to verify the Non-Proliferation of Weapons of Mass Destruction (NPWMD). Hereafter referred to as the NPWMD.

⁹¹ NTI: Building A safer World Research Library: Country Profiles "South Africa, Nuclear" (Last updated: February, 2013) http://www.nti.org/e_research/profiles/SAfrica/Nuclear/index.html (accessed 13 August 2013).

values, rule of law, and fundamental human rights including the socio-economic rights cluster, the protection of environment, sustainable development, and international law which prohibits the proliferation of nuclear weapons.

1.1.3 South African Nuclear Legal Architecture

The South Africa's nuclear legal system constitutes a complete reception and reflection of the international normative rules governing the uses of nuclear technology. It commenced by signing the NPT in 1993, conclusion of the Comprehensive Safeguards⁹² and the conclusion of an Protocol Additional to the Agreement⁹³ between the Government of South Africa and the Agency for the Application of Safeguards in connection with the NPT. This enabled the establishment of legal construct which prohibits and prevents proliferation of nuclear weapons, whilst promoting the peaceful use of nuclear energy.

1.1.3.1 South Africa's Nuclear Energy Governance

Nuclear related activities are mainly governed by two institutions namely; South African Nuclear Energy Corporation (Necsa)⁹⁴ and the National Nuclear Regulator (NNR).⁹⁵ Necsa deals with the development of nuclear technology through the promotion of research "in the field of nuclear energy and radiation science and technology."⁹⁶ The NNR deals with "the protection of persons, property and environment against nuclear damage through the establishment of safety standards and regulatory practices."⁹⁷ Add to that the South African

⁹² South Africa signed the Comprehensive Safeguards on 16 September 1991.

⁹³ Protocol Additional to the Agreement between the Government of the Republic of South Africa and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-proliferation of Nuclear Weapons was approved by the Board of Governors on 12 June 2002 and signed on 13 September 2002. IAEA INFCIRC/394/Add.1 (24 October 2002). <http://www.iaea.org/Publications/Documents/Infcircs/2002/infcirc394a1.pdf> (accessed 17 October 2013).

⁹⁴ Hereafter referred to as Necsa.

⁹⁵ Hereafter referred to as NNR.

⁹⁶ Article 13(a) of the Nuclear Energy Act 46 of 1999.

⁹⁷ Article 5(a) of the National Nuclear Regulator Act 47 of 1999.

Council for the Non-Proliferation of Weapons of Mass Destruction (NPC)⁹⁸ and the National Radioactive Waste Disposal Institute (NRWDI).⁹⁹ The NPC is tasked to “protect the interests, carry out the responsibilities and fulfil the obligations of the Republic with regard to non-proliferation” ... “on behalf of the State.”¹⁰⁰ The NRWDI is intended to perform any function that may be assigned to it by the Minister in terms of section 55(2) of the Nuclear Energy Act...in relation to radioactive waste disposal.”¹⁰¹

South Africa’s nuclear energy governance adopts many principles into its legal system which are universally relevant and required to ensure compliance with the objectives of many UN resolutions, conventions, treaties, and bilateral and multilateral agreements. In general, these principles include

“the safety principle, the security principle, the responsibility principle, the permission principle, the continuous control principle, the compensation principle, the sustainable development principle, the compliance principle, the independence principle, the transparency principle, and the international co-operation principle.”¹⁰²

Nuclear energy governance reflects a legal environment in which nuclear radiation related activities are conducted according to the objectives of the industrialisation of nuclear energy. These objectives are set clearly in Article 3 of the IAEA Statute stipulating “the contribution of atomic energy to peace, health and prosperity throughout the world,” as long it will not “further any military purpose.”¹⁰³

South Africa’s nuclear energy governance is based on a three leveled framework of domestic and international laws and regulations, treaties and conventions:

⁹⁸ Commentators refer to WMD as CBRN weapons (chemical, biological, radiation and nuclear). However, Proliferation of Weapons of Mass Destruction Act 36 of 1998 used the terminology of WMD.

⁹⁹ 53 of 2008. Hereafter referred to as NRWDI.

¹⁰⁰ Section 6(1) of the Non-Proliferation of Weapons of Mass Destruction Act 87 of 1993. Hereafter referred to as the NPC.

¹⁰¹ Section 5(a) of the NRWDI.

¹⁰² Stoiber C, Baer A, Pelzer N, and Tonhauser W *Handbook on Nuclear Law* (2003) at 5.

¹⁰³ Article 3 of the Statute of the IAEA.

- The first level comprises of interweaved national policies and national laws and regulations including licensing, nuclear safety and security, radioactive waste management, siting, commissioning and decommissioning etc.
 - The 1998 White Paper on Energy Policy which retains the option to deploy nuclear power supply and encourages the optimisation of the existing nuclear industrial infrastructure.
 - The 2008 Nuclear Energy Policy.
 - The IRP which proposes 9.6 GW of nuclear capacity by 2025.
 - The Nuclear Energy Act¹⁰⁴ which provides for the establishment of Necsa, the establishment of a ministerial committee responsible “for the implementation and application of the Safeguards Agreement and any additional protocols entered into by the Republic and the IAEA in support of the NPT acceded to by the Republic,” the establishment of mechanisms governing the acquisition, possession, importation, and exportation of nuclear fuel and equipment which comply with the international obligations of the Republic,” and the establishment of nuclear waste management standards.¹⁰⁵
 - National Nuclear Regulator Act (NNRA)¹⁰⁶ which provides for the establishment of the NNR in order to maintain “the protection of persons, property and environment against nuclear damage.”¹⁰⁷
 - Radioactive Waste Management Policy and Strategy of 2005 which provides for a national radioactive waste management.
 - National Radioactive Waste Disposal Institute Act¹⁰⁸ which provides “for the establishment of a National Radioactive Waste Disposal Institute in order to manage radioactive waste disposal on a national basis...”¹⁰⁹
 - Non-Proliferation of Weapons of Mass Destruction Act (NPWMDA)¹¹⁰ which provides

¹⁰⁴ 46 of 1999.

¹⁰⁵ The preamble of Nuclear Energy Act 46 of 1999.

¹⁰⁶ 47 of 1999. Hereafter referred to as the NNRA.

¹⁰⁷ See, the preamble of the NNRA.

¹⁰⁸ 53 of 2008.

¹⁰⁹ See, the title of the NRWDI.

“for control over weapons of mass destruction; and the establishment of a Council to control and manage matters relating to the proliferation of such weapons in the Republic; to determine its objects and functions; to prescribe the manner in which it is to be managed and controlled; and to provide for matters connected therewith.”¹¹¹

- The second level is based on international binding law including the IAEA Statute; Resolutions of the UNGA and the UNSC. This category of norms informs the first category in many aspects and it forms the non-proliferation regime.
 - The NPT.
 - The Statute of the IAEA.
 - Safeguards agreement and Additional Protocols.
 - Vienna Convention on Civil Liability for Nuclear Damage.¹¹²
 - Convention on the Physical Protection of Nuclear Material (CPPNM).¹¹³
 - Convention on Nuclear Safety.¹¹⁴
 - Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (the Nuclear Assistance Convention).¹¹⁵
 - Convention on Early Notification of a Nuclear Accident (the Nuclear Early Notification Convention).¹¹⁶

¹¹⁰ 87 of 1993, as amended in 1995, 1996 and 2005. Hereafter referred to as the NPWMDA.

¹¹¹ The preamble of the NPWMDA.

¹¹² The Convention was adopted on 21 May 1963 and entered into force on 12 November 1977.

¹¹³ The Convention was adopted on 26 October 1979 in Vienna. The Convention entered into force on 8 February 1987. Hereafter referred to as the CPPNM.

¹¹⁴ The Convention on Nuclear Safety was adopted on 17 June 1994 by a Diplomatic Conference convened by the IAEA at its Headquarters from 14 to 17 June 1994. It was opened for signature on 20 September 1994 during the thirty-eighth regular session of the Agency's General Conference and it entered into force on 27 October 1986.

¹¹⁵ The Convention was adopted by the General Conference at its special session, 24-26 September 1986, and was opened for signature at Vienna on 26 September 1986 and at New York on 6 October 1986. Hereafter referred to as the Nuclear Assistance Convention.

- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention on Safety of Radioactive Waste).¹¹⁷
- The International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT).¹¹⁸
- The Amendment to the CPPNM.¹¹⁹
- Safeguards Agreement and Additional Protocols.
- UNSC Resolutions 1540 (2004) and 1673 (2006).
- Multilateral Export Control Regimes (MECRs)¹²⁰ e.g. the Missile Technology Control Regime (MTCR),¹²¹ Nuclear Suppliers Group (NSG),¹²² and Zangger Committee.¹²³

¹¹⁶ The Convention was adopted by the General Conference at its special session, 24-26 September 1986, and was opened for signature at Vienna on 26 September 1986 and at New York on 6 October 1986. It entered into force on 27 October 1986, i.e. thirty days after the date (26 September 1986) on which three States expressed their consent to be bound by the Convention, as required under Article 12 thereof. Hereafter referred to as the Nuclear Early Notification Convention.

¹¹⁷ The Joint Convention was adopted on 5 September 1997 by a Diplomatic Conference convened by the International Atomic Energy Agency at its headquarters from 1 to 5 September 1997. The Joint Convention was opened for signature at Vienna on 29 September 1997 during the forty-first session of the General Conference of the International Atomic Energy Agency and will remain open for signature until its entry into force. Hereafter referred to as the Joint Convention on Safety of Radioactive Waste.

¹¹⁸ Refer to the UNGA resolution 59/290 which was adopted on the report of its Ad Hoc Committee established by its resolution 51/210 of 17 December 1996, Fifty-ninth session, Agenda item 148, 91st plenary meeting 13 April 2005. Hereafter referred to as the ICSANT.

¹¹⁹ The Amendment to the CPPNM was proposed as a Final Act at Vienna on 8 July 2005. However, the Final Act is not in force yet.

¹²⁰ Hereafter referred to as the MECRs.

¹²¹ South Africa joined the MTCR in 1995. Hereafter referred to as the MTCR.

¹²² South Africa is a member of the NSG and “continued its participation in the various export control regimes, such as the Nuclear Suppliers Group and the Missile Technology Control Regime.” See, Annual Report 2011 – 2012 of the Department of International Relations and Cooperation at 53. Hereafter referred to as the NSG.

¹²³ “South Africa became a member of the ZC on 23 October 1993. Zangger Committee Controls are implemented in South Africa by (NECSA).” See, Republic of South Africa Department of International relations and cooperation “Zangger Committee” <http://www.dfa.gov.za/foreign/Multilateral/inter/zc.htm> (accessed 14 August 2013).

- Nuclear-Weapons-Free Zone(NWFZs)¹²⁴ including the Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (Tlatelolco),¹²⁵ the South Pacific Nuclear Free Zone Treaty (Rarotonga),¹²⁶ the Southeast Asian Nuclear-Weapon-Free Zone Treaty (Bangkok Treaty),¹²⁷ the African Nuclear-Weapon-Free Zone Treaty (Pelindaba Treaty),¹²⁸ and the Central Asian Nuclear Weapon Free Zone Treaty (CANWFZ).¹²⁹
- The third category comprises national ancillary Governance Instruments including:
 - The Hazardous Substances Act.¹³⁰
 - The Non-Proliferation of Weapons of Mass Destruction Act.¹³¹
 - The Mine Health & Safety Act.¹³²
 - The Mineral and Petroleum Resources Development Act (MPRDA).¹³³
 - The National Environmental Management Act (NEMA).¹³⁴
 - The National Water Act.¹³⁵
 - The Electricity Regulation Act.¹³⁶

¹²⁴ Hereafter referred to as the NWFZs.

¹²⁵The Treaty of Tlatelolco was signed on 14 February 1967 and entered into force on 22 April 1968. <http://opanal.org/opanal/Tlatelolco/Tlatelolco-i.htm> (access 15 July 2013). Hereafter referred to as the Tlatelolco.

¹²⁶ The treaty was signed at Rarotonga on 6 August 1985. Hereafter referred to as the Treaty of Rarotonga.

¹²⁷ The Treaty of Rarotonga was ratified by a body comprising the independent countries of the South Pacific including Australia, the Cook Islands, Fiji, Kiribati, Nauru, New Zealand, Niue, Papua New Guinea, the Solomon Islands, Tonga, Tuvalu, Vanuatu and Western Samoa and opened it to signature on 6 August 1985. <http://www.iaea.org/Publications/Documents/Infcircs/Others/inf331.shtml> (access 15 July 2013). Hereafter referred to as the Bangkok Treaty. The Bangkok Treaty was opened for signature on 15 December 1995 and entered into force on 28 March 1997. <http://cns.miis.edu/inventory/pdfs/aptbang.pdf> (access 15 July 2013).

¹²⁸ The treaty was signed in 1996 and came into effect with the 28th ratification on 15 July 2009. Hereafter referred to as the Pelindaba Treaty.

¹²⁹ The CANWFZ was signed on 8 September 2006 and entered into force 2009.

¹³⁰ 15 of 1973.

¹³¹ 87 of 1993.

¹³² 29 of 1996.

¹³³ 28 of 2002.

¹³⁴ 107 of 1998.

¹³⁵ 36 of 1998.

- The National Energy Regulator Act (NERSA).¹³⁷
- The National Energy Act.¹³⁸
- Free Basic Electricity Policy for the Republic of South Africa.¹³⁹
- Free Basic Alternative Energy Policy (Households Energy Support Programme).¹⁴⁰

The exposé of the above legal frameworks shows that nuclear energy laws are specialised and predesigned to deal with the distinctive nature and nuclear activities. However, nuclear energy law gradually became an integral part of the law because of the interconnections between nuclear activities and other legal regimes.

1.1.3.2 The Universal Access to Electricity

It is the underlying assumption of South Africa's nuclear energy expansion policy that deploying fissionable materials as an alternative for fossil materials will play a major role in the access to clean, cheap and sustainable source of energy.¹⁴¹

Universal access to affordable electricity became a common denominator in the debates around the realisation of the socio-economic rights cluster. The UN Millennium Declaration, 2000 and the 2012 UN International Year of Sustainable Energy for All may embody a framework for international law of universal access to electricity. South African statutory norms including the National Energy Act¹⁴² and the Electricity Regulations Act¹⁴³ and many

¹³⁶ 4 of 2006.

¹³⁷ 40 of 2004.

¹³⁸ 34 of 2008.

¹³⁹ DME, Electricity Basic, Services Support Tariff, Notice 25088 of 2003.

¹⁴⁰ DME, Notice 391 OF 2007.

¹⁴¹ Ruff J "Nuclear power making comeback" (20 April 2010) *NEI Smart Brief*. <http://www.omaha.com/article/20100420/MONEY/704209941#nuclear-power-making-comeback> (accessed 14 August 2013).

¹⁴² Section 2(i) of the National Energy Act intends to "facilitate energy access for improvement of the quality of life of the people of Republic."

¹⁴³ Section 2(d) of the Electricity Regulations Act intends to "facilitate universal access to electricity."

draft policies,¹⁴⁴ have recognised or presupposed the need for a universal access to affordable electricity.

The progressive realisation of universal access to electricity requires an adequate electricity supply infrastructure. This means that the profile of the electricity supply infrastructure is required to be modern, robust and reliable, operating in a “secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.”¹⁴⁵ The question is whether nuclear power plants contribute to the facilitation of the universal access to affordable electricity while mitigating environmental concerns.

This study is intended to explore the socio-economic rights dimension of generating electricity from nuclear capacity. Although, nuclear energy risks resulting from operating nuclear power plants are required to be studied, evaluated, minimised, and prevented, the need for universal access to electricity which is interlinked to the fulfilment of socio-economic rights rationalises such operation. The research is therefore focussed on two directions:

- The first focal point deals with normative rules deduced from the non-proliferation regime, dealing with the parameters of the NPT, the norms of the IAEA, and the nature of nuclear law. This legal framework determines the extent of the usage that each country make of nuclear energy, including for South Africa, and it influences the domestic laws governing the deployment of nuclear energy for peaceful purposes.
- The second focal point deals with the South African legal normative rules governing the operation of nuclear installations in the context of its energy mix for the overall objective of guaranteeing electricity supply as an integral part of the realisation of the socio-economic rights of its people.

¹⁴⁴ See, the objectives of the Free Basic Alternative Energy Policy. See also Free Basic Electricity Policy.

¹⁴⁵ Section 24(b)(iii) of the Constitution of the Republic of South Africa.

1.2. RESEARCH PROBLEM

The UN estimates that “40% of the world's population rely on wood, coal, charcoal, or animal waste to cook their food breathing in toxic smoke that causes lung disease and kills nearly two million people a year, most of them women and children.”¹⁴⁶ Secretary-General Ban Ki-moon speaking at the opening ceremony of the World Future Energy Summit 2012 in Abu Dhabi stated that “globally, one person in five still lacks access to modern electricity and twice that number – three billion people – rely on wood, coal, charcoal, or animal waste for cooking and heating.” Further he called upon “to build a new energy future... a future that harnesses the power of technology and innovation in the service of people and the planet.”¹⁴⁷

Nuclear energy can be envisaged as a socio-economic option, which supplies reliable and affordable modern electricity improving the living standards of all. That is to say, electricity supply from nuclear energy would constitute the reasonable measure taken within the available resources of the state to achieve the progressive realisation of right to health care, food, water and social security.¹⁴⁸

During his visit in November 2012 to Ingula Pumped Storage Scheme in Ladysmith, KwaZulu-Natal, the President of South Africa Mr Jacob Zuma stated that children, “in rural areas should be able to study using electricity at night and not candles. People must cook [and] iron using electricity in every corner of our country,”¹⁴⁹ he remarked that “electricity sounds

¹⁴⁶ See, UN, Sustainable Energy for All, “Universal access”<http://www.sustainableenergyforall.org/objectives/universal-access>(Accessed 15 August 2013).

¹⁴⁷ Secretary-General Ban Ki-moon speaks at the opening ceremony of the World Future Energy Summit 2012 in Abu Dhabi, United Arab Emirates <http://www.un.org/apps/news/story.asp?NewsID=40951&Cr=energy&Cr1#>. UK9qkWekbng (accessed 15 August 2013).

¹⁴⁸ Section 27(2) of the Constitution.

¹⁴⁹ See, News24 “Electricity for all key, Zuma says” posted 10 November 2012 <http://www.news24.com/SouthAfrica/Politics/Electricity-for-all-key-Zuma-says-20121110> (accessed 15 August 2013).

like a simple basic service but it is actually the lifeblood of the economy”¹⁵⁰ and “very key developmental goal.”¹⁵¹ Similarly, during his visit to South Africa President Mr Barack Obama remarked:

“And we believe that nations must have the power to connect their people to the promise of the 21st century. Access to electricity is fundamental to opportunity in this age. It’s the light that children study by; the energy that allows an idea to be transformed into a real business. It’s the lifeline for families to meet their most basic needs. And it’s the connection that’s needed to plug Africa into the grid of the global economy. You’ve got to have power. And yet two-thirds of the population in sub-Saharan Africa lacks access to power -- and the percentage is much higher for those who don’t live in cities.”¹⁵²

A country such as South Africa challenged by poverty, environmental dilapidations and resources scarcity including water, oil and gas may enhance its economy by developing nuclear energy as a major enabling factor in realising sustainable development and socio-economic rights.

The statutory provisions are set forth in the National Energy Act and the Electricity Regulation Act and policy documents such as the 1998 White Paper on Energy Policy, the 2008 Nuclear Energy Policy, the IRP and the National Developmental Plan (NDP)¹⁵³ recognise

¹⁵⁰ See, “Remarks by President Jacob Zuma on the occasion of visiting Medupi Power Plant for the Boiler Pressure Test of the First Unit of the Power Station, Lephalale, Limpopo” posted on 8 June 2012 on the website of the presidency of the Republic of South Africa. <http://www.thepresidency.gov.za/pebble.asp?reid=6186> (accessed 15 August 2013).

¹⁵¹ See, News24 “electricity for all key, Zuma says” posted 10 November 2012. <http://www.news24.com/SouthAfrica/Politics/Electricity-for-all-key-Zuma-says-20121110> (accessed 15 August 2013).

¹⁵² “Remarks by President Obama at the University of Cape Town, South Africa” (30 June 2013) <http://iipdigital.usembassy.gov/st/english/texttrans/2013/06/20130630277884.html#ixzz2XIY4A8TV> (accessed 15 August 2013).

¹⁵³ The National Development Plan 2030: Our future - make it work (15 August 2012) National Planning Commission, Department of Presidency, at 164. <http://www.info.gov.za/view/DownloadFileAction?id=172306> (accessed 12 December 2012). Hereafter referred to as the NDP.

the need for universal access to affordable electricity. These instruments prescribe the development of electricity supply infrastructure in adequate manner. In technical terms, adequacy of electricity supply infrastructure refers to industrial planning which is required to deploy the available modern technologies to the maximum use of the available resources taking into consideration the precept of sustainable development in order to maintain the security, reliability, and affordability of electricity supply. The IRP which is the plan required to be developed and published in the Gazette by the Minister of Energy “on an annual basis”¹⁵⁴ provides for the instalment of 9.6 GW of nuclear energy.

Containing the threat of any military side of nuclear energy started as an international responsibility. As early as 1958 the UNGA, in its Thirteen Session, sought to “establish an ad hoc committee to study the dangers inherent in further dissemination of nuclear weapons...,”¹⁵⁵ and to conclude a resolution to suspend nuclear weapons tests.¹⁵⁶ After long negotiations,¹⁵⁷ these objectives materialised in 1961, when the UNGA unanimously adopted the “Irish Resolution on the prevention of wider dissemination of nuclear weapons.”¹⁵⁸

More discussions and negotiations brought about Resolution 2373 (XXII) on Treaty on the Non-Proliferation of Nuclear Weapons.¹⁵⁹ The UNSC Resolution 255 reiterated the Treaty provisions in particular, the undertaking “not to receive the transfer from any transferor ...of nuclear weapons..., not to seek or receive any assistance in the manufacture of nuclear

¹⁵⁴ Section 6 of the National Energy Act.

¹⁵⁵ UNGA Official Record (GAOR), 13th Session, Anns., a.i. 64, 70-72, Doc. A/c.1/L.206, 17 October 1958.

¹⁵⁶ GAOR, 13th Sess., Anns., a.i. 64, 70-72, Doc. A/c.1/L.2065, 10 Oct 1958.

¹⁵⁷ For example see, UNGA resolution 1380(XIV) 20 November 1959, also UNGA resolution 1576 (XV) 20 November 1959.

¹⁵⁸ UNGA resolution 1665 (XVI) on prevention of the wider dissemination of nuclear weapons, 4 December 1961.

¹⁵⁹ UNGA 23rd Sess. 1672 plenary meeting 12 June 1968, the Treaty was signed in London, Moscow and Washington on 1 July 1968. See, Kaplan M “The Nuclear Non-Proliferation Treaty: Its rationale, prospects and possible impact on international law” (1-20) Vol 18, no 1 (1969) *Journal of Public Law* at 13. The NPT was opened for signature in 1968, entered into force in 1970 and extended indefinitely in 1995. The NPT is in force in 187 States as of 31 December 2001.

weapons or other nuclear explosive devices”.¹⁶⁰ The wording of the Resolution in particular the undertaking was directed to non-nuclear-weapon States and signalled that commitments were intended as instruments to prohibit horizontal proliferation only. In return the security of the NNWSs is guaranteed by the UNSC and its “nuclear-weapon State permanent members”, who would live up to their “obligations under the United Nations Charter.”¹⁶¹

The NPT limits recognition as NWS to those states that “manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January 1967.”¹⁶² These states are China, France, the Union of Soviet Socialist Republics (USSR) ‘Russia’, UK, and USA.¹⁶³ In the mean times the NPT prohibits any other state from acquiring

“nuclear weapons or other nuclear explosive devices or of control over such weapons or explosive devices directly, or indirectly; not to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices; and not to seek or receive any assistance in the manufacture of nuclear weapons or other nuclear explosive devices”¹⁶⁴

In return the NPT guarantees the peaceful use of nuclear power¹⁶⁵ and promises an eventual complete nuclear disarmament.¹⁶⁶ In this regime, institutions such as the IAEA, the Organisation for European Economic Co-operation (OECD) Nuclear Energy Agency (NEA),¹⁶⁷

¹⁶⁰ UNSC Council resolution 255 of 19 June 1968, adopted at the 1433rd meeting by 10 votes to none, with 5 abstentions (Algeria, Brazil, France, India and Pakistan).

¹⁶¹ See article 1 of resolution 255.

¹⁶² Article IX.3 of the NPT.

¹⁶³ The NPT entered into force with three of the 5 Nuclear weapon States (the USSR, the UK and the USA). France and China joined only 1992.

¹⁶⁴ Article 2 of the NPT.

¹⁶⁵ Article 4 of the NPT.

¹⁶⁶ Article 6 of the NPT.

¹⁶⁷ The Statute of the OECD NEA was adopted on 20 December 1957 and subsequently approved by the OECD Council on 30 September 1961. Hereafter referred to as the NEA. <http://www.oecd-nea.org/nea/statute.html> (accessed 25 January 2013).

and Euratom became relevant playing practical roles in developing nuclear civil programmes.

The IAEA has “exclusive world-wide competence to deal with issues connected to the peaceful use of nuclear energy.”¹⁶⁸ The IAEA has composed a technical matrix of standards and recommendations on the peaceful use of nuclear energy by which it carries out its “specific roles as the international safeguards inspectorate and as a multilateral channel for transferring peaceful applications of nuclear technology.”¹⁶⁹

The South African approach to nuclear normative rules follow international normative rules governing nuclear energy. In 1991 South Africa signed the NPT and started executing international obligations through a matrix of legal instruments, whilst continuing to operate nuclear installations in Koeberg and Pelindaba. The objectives of the South African nuclear legislations are to govern and drive the functionality of nuclear energy according to international standards within the parameters of the non-proliferation regime. However, opponents of nuclear generation in South Africa argue that renewable generation could replace nuclear generation in the future.”¹⁷⁰ This does not dissuade the government of South Africa which has made “a commitment to the construction of the nuclear fleet is made based on government policy and reduced risk exposure to future fuel and renewable costs.”¹⁷¹ “The increased cost of gas, coal and diesel in the “Peak Oil”¹⁷² scenario also leads to a nuclear programme (of 9,6 GW) and reduced capacity from renewable options.”¹⁷³

¹⁶⁸ Nocera N *The legal regime of nuclear energy* (2005) at 13.

¹⁶⁹ The IAEA “IAEA and the NPT” http://www.iaea.org/NewsCenter/Focus/Npt/key_role.shtml (accessed 14 August 2013).

¹⁷⁰ Para 3.1. of the IRP

¹⁷¹ Para 8.2 of the IRP.

¹⁷² Para B.31.4 of the IRP reads as follows: “A “Peak Oil” scenario including escalated prices for diesel (to R400/GJ from the R200/GJ used in the Revised Balanced scenario), gas (to R160/GJ from R80/GJ) and coal (to R600/ton from R200/ton).”

¹⁷³ Para B.36 of the IRP.

The national debate contemplated in the IRP about the future profile of the electricity supply infrastructure of South Africa¹⁷⁴ is intended as a democratic process which gives the IRP legitimacy and assists the Minister of Energy in designing the best combination of electricity supply infrastructure. In developing the IRP many aspects are taken into account including the following:

1. “plans relating to transport, electricity, petroleum, water, trade, macro-economy energy infrastructure development, housing, air quality management, greenhouse gas mitigation within the energy sector and integrated development plans of local and provincial authorities.”¹⁷⁵
2. “sustainable development.”¹⁷⁶
3. “optimal use of indigenous and regional energy resources.”¹⁷⁷
4. “balance between supply and demand.”¹⁷⁸
5. “economic viability.”¹⁷⁹
6. “environmental, health, safety and socio-economic impacts.”¹⁸⁰
7. “developmental requirements of the Southern African region.”¹⁸¹
8. “South Africa also possesses sizeable uranium reserves and has an extensive uranium mining industry, making the country one of the important producers of uranium in the world. The presence of this primary energy source in South Africa is a key element of security of energy supply nationally.”¹⁸²

¹⁷⁴ Section 6(7) the National Energy Act requires the Minister “before finalising the Integrated Energy Plan” to
“—

- (a) invite public comments; and
- (b) duly consider such comments.”

¹⁷⁵ Section 6(3)(a) of the National Energy Act.

¹⁷⁶ Section 6(4)(a) of the National Energy Act.

¹⁷⁷ Section 6(4)(b) of the National Energy Act.

¹⁷⁸ Section 6(4)(c) of the National Energy Act.

¹⁷⁹ Section 6(4)(d) of the National Energy Act.

¹⁸⁰ Section 6(4)(e) of the National Energy Act.

¹⁸¹ Section 6(4)(f) of the National Energy Act.

¹⁸² The 2008 Nuclear Energy Policy at 7.

Promoting nuclear energy requires cooperation amongst states and the technological assistance from the nuclear Haves because they have advanced in nuclear technologies. This has created a relation between many actors controlled by the non-proliferation regime. The NPT which is the cornerstone of the regime strikes a balance between competing interests of the Haves and the Have-nots,¹⁸³ where the IAEA functions as a broker to guarantee non-proliferation of nuclear weapons and to achieve the safe use of peaceful nuclear energy. That is to say, when the NNWSs accepted to denounce all the ambitions to acquire nuclear weapons and their right to develop nuclear power for peaceful purposes has been preserved, while the NWSs are seeking the closest moment to achieve the complete nuclear disarmament, the IAEA supported by the UNSC has taken the responsibility to administer the dynamics of nuclear energy.

The South Africa's nuclear energy development falls within the international dynamics of nuclear energy and the municipal dynamics relating to the country's development programme.

1.3 RESEARCH QUESTIONS

1. What are the legal frameworks dealing with nuclear externalities including nuclear safety, security, and non-proliferation of nuclear weapons?
2. What are the dynamics of the legal frameworks governing nuclear energy programmes?
3. What is the role of international nuclear institutions e.g. IAEA in developing nuclear governance?
4. How does nuclear governance relate to the UN system and the impact of that on the development of international nuclear regime?
5. What is the impact of global nuclear order on the South African municipal nuclear regime?
6. What are the available arguments rationalising the hazards and threats of nuclear power for peaceful purposes?

¹⁸³ Ford C "Haves and Have-Nots: "Unfairness" in Nuclear Weapons Possession" *New Paradigms Forum: Proliferation Issues and Much More* <http://www.newparadigmsforum.com/NPFtestsite/?p=658> (accessed 25 January 2013).

7. Does the South African nuclear energy regime provide for adequate legal mechanisms intended to deal with nuclear energy externalities?
8. Does access to affordable, reliable, clean, and modern electricity rationalise the externalities of nuclear power programme?
9. Does the contextualisation of nuclear energy with the socio-economic rights regime rationalise nuclear energy development?

1.4 UNDERLYING ASSUMPTIONS

The few nuclear accidents – though immensely tragic for the populations of the poor villages surrounding Chernobyl (Ukraine) and the large inhabited zones affected by radiation around Fukushima have fuelled anti-nuclear sentiments worldwide. Nevertheless, extensive plans are still paving the way for an increasing reliance on nuclear power globally. Therefore a new balance must be sought between the inclusion of nuclear energy in the electricity supply infrastructure and the requirements of sustainable development, keeping in mind that nuclear energy poses “unusual risks to human health, safety and the environment, and also national and international security risks.”¹⁸⁴

The requirement to achieve universal access to affordable, reliable and modern electricity supply and security of such electricity supply, whilst mitigating environmental problems and utilising indigenous resources and guarding against the volatility of the prices of fossil fuels and their exhaustible nature, renders nuclear power as the preferred solution to the energy challenge in South Africa. Therefore, the 9.6 GW of additional nuclear energy contemplated in the IRP will become the reconciling factor between the requirements to develop the electricity supply infrastructure in a “secure ecologically sustainable development, using natural resources while promoting the universal access of electricity as a “justifiable economic and social development.”¹⁸⁵

The hypothesis of the thesis revolves around the deployment of nuclear energy as an essential component of the electricity supply infrastructure, to facilitate the progressive

¹⁸⁴ Stoiber *Handbook on nuclear law* at 11.

¹⁸⁵ Section 24 of the Constitution.

realisation of access to affordable, reliable, and clean electricity. This involves several assumptions including:

- Access to affordable electricity is a socio-economic need which requires a progressive legal framework that shall extend to determine the components of the electricity supply infrastructure and its mix of fossil fuels, nuclear energy, and renewable energies.
- Access to affordable, clean and modern electricity supplies requires the rationalisation of the further development of South Africa's nuclear energy programme.
- The management of the components of the electricity supply infrastructure must take into account the constitutional goal of sustainable development.
- The integration of nuclear energy as a fundamental component of the electricity supply infrastructure is governed by mixed regulatory frameworks which have their origins in international, domestic, public, and private law and standards.
- Nuclear energy regulation is characterised by co-dependent systems which support each other in order to achieve the objects of the NPT.
- Nuclear energy activities incur serious risks including human health, environment, and security requiring intensive regulation.

1.5 OBJECTIVES AND SCOPE

The objectives of this thesis are as follows:

- The examination of the peaceful applications of nuclear energy specifically the development of nuclear power plants in order to build adequate electricity supply infrastructure which requires nuclear power.
- The non-proliferation regime and its institutions including normative rules governing the non-proliferation of nuclear weapons, the disarmament of nuclear weapons, and the peaceful use of nuclear energy.
- The examination of universal access to electricity which requires the examination of the electricity supply infrastructure.

- The examination of the components of the electricity supply infrastructure which requires the best management of energy resources including fossil fuel, nuclear energy and renewables.
- The deployment of 9.6 GW of additional nuclear capacity into the South African electricity supply infrastructure.
- The impact of deploying nuclear power as a major component in the future electricity supply infrastructure is tested against any relevant constitutional normative rules, international human rights instruments, environmental normative rules, and the UN resolutions.

1.6 THE AIM OF THE STUDY

This study hopes to provide a thorough investigation and assessment of the legal, regulatory and policy framework for the peaceful use and possible expansion of nuclear energy in South Africa. The complex nature of nuclear technology relating to its military uses has intensified the restrictions and controls on the use of the nuclear energy for peaceful purposes, bringing about its uniquely co-dependent usages, on both the international and national levels of legal regulation. The dynamics of Multi-Level Complex Systems governing nuclear activities are the subject of this study. While, highlighting the international nuclear regime, the normative rules governing the nuclear order will be analysed so as to demonstrate that nuclear power as a solution to energy shortages in decarbonised economies throughout the world is a mandated option.

1.7 SIGNIFICANCE

This thesis is intended to present an additional knowledge resource in support of the legal environment regulating the peaceful use of nuclear energy, by showing the steps undertaken to allow South Africa to operate nuclear installations according to international standards. The thesis highlights the inadequacies in the legal framework relating to the universal access to affordable electricity and links that to the potential solutions which lie in the expansion of South Africa's nuclear energy programme taking into consideration sustainable development and socio-economic rights. This study is important for individuals such as lawyers, judges, personnel of certain institutions including the NNR and Necsca, and

scholars. Moreover, institutions such as the departments of the state and Eskom may find in this study an important reference to reform and amend certain regulatory norms.

1.8 RESEARCH METHODS

This thesis is organised into five integrated themes dealing with South Africa's peaceful use of nuclear energy. These themes include:

1. The international nuclear regime as a comprehensive legal system governing nuclear energy development worldwide.
2. South Africa's nuclear regime which is required to govern South Africa's nuclear energy programme in compliance with the precepts of the international nuclear regime.
3. South Africa's nuclear energy development in the context of energy mix.
4. Legal analysis of access to affordable electricity as a socio-economic right. This is intended to rationalise further development of the electricity supply infrastructure, taking into consideration the need for access to electricity in realisation of socio-economic rights, the environmental impacts of the energy sector, scarcity of energy resources, and the mitigating role of nuclear power in the context of climate change and security of supply.
5. South Africa's governance of access to electricity and of the generation of nuclear energy attempting to re-focus the relationship between administrative processes in selecting the most appropriate components of electricity supply infrastructure with nuclear power generation that will mitigate environmental concerns and improve the current qualities of electricity supply in South Africa.

Although the NPT allows for nuclear development, the thesis investigates additional rationales to justify and positively legitimise it, even against the background of accompanying risks.

This thesis is set out in six chapters.

- The first chapter introduces the topic of the thesis and the research problem. The second chapter analyses the international nuclear regime with special reference to

nuclear non-proliferation regime and including nuclear safety and security and liability for nuclear damage.

- The third chapter is dedicated to South Africa's present legal regime governing nuclear energy and its development. This chapter analyses the existed legal framework in order to identify the legal mechanisms designed to guarantee the non-proliferation of nuclear weapons, safety and security. Further, this analyses the impact of international nuclear norms and international nuclear obligation on the South Africa's nuclear regime has been investigated through tracing international regulatory frameworks which have direct application in South Africa. The data analysed in this chapter is mainly sourced from primary sources including the relevant acts, bilateral agreements between South Africa and the IAEA, voluntary adherence of South Africa to themes, relevant international treaties, and a limited number of the cases explaining the enforcement of international law in South Africa. Secondary sources have a very limited role in this chapter because of the limited number of publications on the subject matter. The data analysed in this chapter seeks to establish a linkage between South Africa's nuclear legal framework, and its constitutional order pertaining to sustainable development, so as to permit the contextualisation of the nuclear energy risks in the electricity supply infrastructure.
- The fourth chapter analyses the development of nuclear energy as a fundamental component of electricity supply infrastructure. In this chapter the research method takes a new course. Instead of explaining nuclear energy alone as a component of electricity supply infrastructure, the risks accompanying other components including fossil fuels and renewables are considered by way of data relating to energy scarcity and adverse environmental impacts. This research method is intended to underpin the hypothesis of this present thesis by taking into account global energy trends.
- The fifth chapter makes deductions from the underlying assumptions stipulated in Article IV of the NPT, namely the establishment of an international legal framework for nuclear energy generation and the significant role of nuclear energy in achieving the universal goal of access to affordable, clean and economic electricity, the possibility of substituting coal-fired base-load power plants with nuclear power plants, and the role of nuclear energy in achieving sustainable development and at the same time mitigating GHGs and global warming. Also, it is required to consider

the normative rules governing socio-economic rights and their constitutional relevance, especially in so far as the South African Constitutional Court has contributed to the interpretation of these norms. These norms also have their universal foundation originating in international human rights instruments. The research methods in this chapter are both quantitative and qualitative. The qualitative methods are intended to yield conclusions relating to the legal frameworks applicable to universal access to electricity, following a three-pronged approach:

- That electricity is a socio-economic need requiring constitutional protection.
- That access to affordable and economic electricity supply is an international human right contemplated in amongst others in the Convention on the Elimination of Discrimination Against Women (CEDAW).¹⁸⁶
- That environmental protection requirements impact on the future development of an electricity supply infrastructure, favouring nuclear energy based upon the empirical data relating to the available quantity of uranium in South Africa, the estimated remain repositories of coal in South Africa, adverse impacts of fossil fuels on the environment, and the potential quantity of electricity generated from renewables.

The findings of chapters three and four together with the conclusions of this fifth chapter are intended to contribute in identifying the obligations of the State in the definition of the role of nuclear energy for the achievement of universal access to electricity and sustainable development.

- The sixth chapter concludes this thesis by proposing that the universal access to electricity should be recognised as a common denominator that rationalises the choices in the electricity supply infrastructure, in particular sustainable development objectives, socio-economic rights, energy security, and environmental protection. This final chapter examines the various roles of the state in achieving access to affordable and economic electricity; taking into consideration that the qualities

¹⁸⁶ Hereafter referred to as the (CEDAW). It was adopted in 1979 by the UNGA and came into force on 3 September 1981 in accordance with article 27(1). South Africa signed the Convention in 1993 and ratified it on 15 December 1995.

attached to electricity supply are dependent on the electricity supply infrastructure. That is to say, the qualitative and quantitative objectives of the electricity supply which depend on the selection of the best combination of fossil-power plants, nuclear power plants, and renewables must guide the choices to be made by the state in its integrated energy planning. The findings of the previous chapters relating to the environment, energy scarcity, carbon constrained economy, sustainable development, regional integration, and the role of access to affordable and modern electricity in achieving socio-economic rights are thus factorised in the selection process in order to promote energy security, socio-economic rights and the environment. The choice of which component should be emphasised in the IRP, within the legislative framework in place in South Africa requires the use of the empirical data relating to the environment and prices of fossil fuels in order to draw qualitative conclusions. This can be applied by drawing a balance between the goals of energy development and sustainable development and the impact of nuclear energy on them, as well as on the resulting realisation of the universal access of affordable and economic electricity.

1.9 LITERATURE REVIEW AND OUTLINES OF CHAPTERS

The nature of the topic of this thesis played a major role in selecting the literature. In general, the literature pertaining to the development of nuclear energy is voluminous. It includes courts' judgments in various jurisdictions, the interventions of UN organs and other international organisations, economic and political sciences authorities, and legal writings. The scope of the thesis had to exclude many materials and focus on primary sources as well as writings directly relevant to South Africa. It must be noted that the secondary literature relating to South Africa is scarce because of the secrecy affecting nuclear energy development under the apartheid government. The literature and sources utilised in each chapter varies based on the specific and general hypothesis. It is possible to distinguish as follows:

- The second chapter refers mostly to treaties, conventions, UNGA resolutions, UNSC resolutions, the role of international organisations and their publications, IAEA

documents including standards, resolutions, and others and the ICJ Nuclear Threat Advisory Opinion.

- The third chapter analyses the South Africa's nuclear regime by reference to the Constitution, legislation, judicial decisions, and standards as well as secondary source as appropriate and relevant.
- The fourth chapter which is dedicated to the nuclear energy mix relies on sources of literature giving access to empirical data relating to the various aspects of the electricity supply infrastructure. The data was collected to identify the advantages and disadvantages of fossil fuels, fissile fuel, and renewables in order to arrive at conclusion on the best combination of electricity supply infrastructure. The relevant literature in this regards was found in South Africa's policy documents, IEA's publications, IAEA's publications, Eskom's reports and publications, and related materials.
- The fifth chapter analyses the universal access to electricity as an inferred right which falls in the socio-economic rights cluster. Due to the fact that the Constitutional Court did not regard access to electricity as a constitutional right, it becomes necessary to identify the right to access to electricity in the international human rights instruments and African related instruments. The sources analysed in this chapter have been sourced from the Constitution, Constitutional Court's decisions, policy documents, related legislations, and international human rights instruments and African instruments. The secondary sources of literature were limited to those discussing the right to housing, adequate living standards and equality.
- The sixth and last chapter analyses the role of the State and its state owned enterprise (SOE) e.g. Eskom. The chapter relies on the findings of the preceding chapters, and on the Constitution, relevant legislation, case law, and writings.

CHAPTER II

INTERNATIONAL NUCLEAR LEGAL REGIME

2.1 INTRODUCTION

The legal construct governing nuclear energy has been evolving since the bombardment of Nagasaki and Hiroshima. The devastating effects of the “Little Boy” bomb on the city of Hiroshima on 6 August 1945 and of “Fat Man” over Nagasaki on 9 August of the same year¹⁸⁷ have profoundly marked the international community approaches towards nuclear energy.

Immediately in 1945, the New Zealander Atomic Energy Act¹⁸⁸ was promulgated as the first municipal legislation governing activities related to nuclear energy and ionising radiation, followed by the McMahon Act.

On 24 January 1946, the UNGA passed its first Resolution which established the UN Atomic Energy Commission (UNAEC) in order “to deal with the problems raised by the discovery of atomic energy.”¹⁸⁹ The Resolution identified the need for peaceful uses of nuclear energy and the requirement to eliminate nuclear weapons. Article 5 of the Resolution prescribed terms of reference of the UNAEC providing that:

“The Commission shall proceed with the utmost dispatch and enquire into all phases of the problem, and make such recommendations from time to time with respect to them as it finds possible. In particular, the Commission shall make specific proposals:

- (a) For extending between all nations the exchange of basic scientific information for peaceful ends;

¹⁸⁷ Ross *S Causes and Consequences of the Second World War* (2003) 1st ed at 39.

¹⁸⁸ The title of the Atomic Energy Act 1945 states the following:

“An Act to make provision for the control in New Zealand of the means of producing atomic energy and for that purpose to provide for the control of the mining and treatment of the ores of uranium and other elements which may be used for the production of atomic energy, and to provide for the vesting of such substances in the Crown.”

¹⁸⁹ Para 1 of the UNGA resolution 1, session 1 which established a United Nations Atomic Energy Commission (UNAEC) on 24 January 1946. Hereafter referred to as UNAEC.

- (b) The control of atomic energy to the extent necessary to ensure its use only for peaceful purposes;
- (c) For elimination of from national armaments of atomic weapons and all other major weapons adaptable to mass destruction;
- (d) For effective safeguards by way of inspection and other means to protect complying States against hazards of violations and evasions.”¹⁹⁰

The Resolution laid down the initial foundation of the nuclear energy legal order including the cooperation in peaceful nuclear science between nations, the promise of the elimination of national nuclear armaments, and the establishment of safeguards intended for safety and non-proliferation compliance.

The function of the UNAEC was stalled by the tension between the USA and the USSR.¹⁹¹ The USA submitted in June 1946 its Baruch-Plan to the UNAEC in order to establish further control over nuclear energy by proposing “both the elimination of nuclear weapons and the implementation of international control over the exploitation of all aspects of nuclear energy.”¹⁹² The USSR disagreed with internationalising the ownership and control over nuclear facilities and proposed a national-based approach to nuclear ownership and development. Consequently, the UNAEC was disbanded in 1952.

Nevertheless, the international community did not stop engaging on the nuclear issue and the function of the UNAEC was revived by virtue of UNGA Resolution 502 (VI) of January 1952 which created a new commission called the UN Disarmament Commission (UNDC) under the UNSC to deal with disarmament.¹⁹³ The UNDC became the arena of “proposals to suspend nuclear weapons testing, to cease production of fissionable materials, to reduce

¹⁹⁰ Article 5 the UGA resolution 1.

¹⁹¹ The Commission “was the one of the first casualties of the cold war” marking the failure of the international community to cooperate in peaceful nuclear development. See, Bratt D *The Politics of Candu Exports* (2006) at 50.

¹⁹² Simpson J, Bowen W, Harries M, and Anstey I eds *NPT Briefing Book: 2012 Edition* (2012) King's College, Centre for Science and Security Studies and James Martin Center for Nonproliferation Studies, Part I at 4.

¹⁹³ The UNG resolution 502 (VI) adopted on 11 January 1952, on the “Regulation, Limitation and Balanced Reduction of All Armed Forces and All Armaments and International Control of Atomic Energy.”

nuclear weapons stockpiles, to increase inspection capabilities, and to study ways to prevent the expansion of the arms race into outer space.”¹⁹⁴

In 1953 a reconciliatory mode in international relations relating to nuclear energy prevailed due to the speech by President Eisenhower entitled “Atoms for peace” which paved the way for the establishment of the IAEA.¹⁹⁵ The establishment of the IAEA has been a milestone in the process of advancing the peaceful applications of nuclear energy while bringing its dangers under control. This was complemented by the NPT which rests on three pillars:

1. The non-proliferation of nuclear weapons.
2. The complete disarmament of nuclear weapons.
3. The peaceful use of nuclear energy.

The Statute of the IAEA and the NPT established a dynamic system propelling the development of nuclear energy law, thereby, the assimilation of a central nuclear non-proliferation regime which consists of “treaties, conventions and common (multilateral and bilateral) arrangements covering security and physical protection, export controls, nuclear test-bans and, potentially, fissile material production cut-offs.”¹⁹⁶ The non-proliferation regime is viewed in the context of the additional dissemination “of nuclear weapons into many hands” which “would further jeopardize prospects for international peace and security.”¹⁹⁷ Nevertheless, the non-proliferation regime relies on the tenets of the NPT which establishes “a comprehensive, legally binding framework which conceive both applications of nuclear energy including its civil uses and military programmes.

Notwithstanding the development of the nuclear legal frameworks intended to prevent nuclear weapons proliferation and to promote civilian nuclear applications, the world came

¹⁹⁴ Gorman R *Great Debates at the United Nations: An Encyclopaedia of Fifty Key Issues, 1945-200* (2001) at 41-42.

¹⁹⁵ Hubbard C *Power Plays: Enriched Uranium and Homeland Security* (2013) at 81.

¹⁹⁶ World Nuclear Association “Safeguards to prevent nuclear proliferation” (updated April 2012) <http://www.world-nuclear.org/info/Safety-and-Security/Non-Proliferation/Safeguards-to-Prevent-Nuclear-Proliferation/> (accessed 7 November 2012).

¹⁹⁷ Smith R “Explaining the non-proliferation regime: anomalies for contemporary international relations theory” (253-281) Vol 41, no 2 (Spring 1987) *International Organization* at 257.

to witness a nuclear arms race, with four additional nuclear weapons states emerging, namely India, Israel, North Korea, and Pakistan, as well as several severe nuclear incidents occurring: TMI, Chernobyl, and Fukushima. This underlines the imperfections of the nuclear energy regime.

The current non-proliferation regime is designed to achieve besides the non-proliferation of nuclear weapons two other objects including the “inalienable right of all the Parties to the”¹⁹⁸ NPT to develop nuclear power plants to generate electricity and the realisation of the complete nuclear “disarmament under strict and effective international control.”¹⁹⁹

The components of non-proliferation regime include the NPT, the IAEA Safeguards, and the treaties and regimes establishing auxiliary norms designed to inhibit horizontal proliferation, establish additional legal commitments to achieve the complete disarmament and for the regulation of nuclear energy for civil purposes.

2.2 NUCLEAR ENERGY LAW

The dual nature of nuclear energy has been perceived as a serious threat to environment and future generation. The International Court of Justice (ICJ)²⁰⁰ in its *Advisory Opinion on the Legality of the Threat or Use of Nuclear Weapons*²⁰¹ described the impact of nuclear explosion as follows:

“The radiation released by a nuclear explosion would affect health, agriculture, natural resources and demography over a very wide area. Further, the use of nuclear weapons would be a serious danger to future generations. Ionizing radiation has the potential

¹⁹⁸ Article IV of the NPT.

¹⁹⁹ Article VI of the NPT.

²⁰⁰ Hereafter referred to as the ICJ.

²⁰¹ *Advisory Opinion on the Legality of the Threat or Use of Nuclear Weapons* 35 ILM 809 (1996). The ICJ gave this *Advisory Opinion* as it was requested by the UNGA resolution 49/75 K adopted on 15 Dec. 1994 pursuant to article 96 of the UN Charter. Hereafter referred to as the *ICJ Nuclear Threat Advisory Opinion*.

to damage the future environment, food and marine ecosystem, and to cause genetic defects and illness in future generations.”²⁰²

The establishment of the IAEA in 1957 has provided a legal infrastructure dealing with the use of nuclear energy for peaceful purposes and the conclusion of the NPT in 1967 has provided legal mechanisms dealing with the elimination of nuclear weapons. On the one hand, Article II of the IAEA Statute requires the Agency to find ways “to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world.”²⁰³ On the other hand, Article III.B.1 of the Statute requires the IAEA to “furthering the establishment of safeguarded worldwide disarmament and in conformity with any international agreements entered into pursuant to such policies” while it carries out its function.

The NPT supports the mission of the IAEA by establishing a central concept which is the nuclear non-proliferation regime. Both the IAEA Statute and the NPT have fundamentally contributed to the tenets of nuclear energy law which has emerged with two groups of norms which are integral to the effects and purposes of nuclear energy. The first group includes normative rules dealing with the nuclear development for military purposes. The second group includes regulatory frameworks governing the peaceful application of nuclear energy.²⁰⁴ Since 1945 these nuclear legal frameworks have played major roles in the evolution of nuclear energy law to regulate the significant expansion of nuclear power plants.

2.2.1 The Evolution of Nuclear Law

The tension between NNWSs and NWSs resulting from the requirement to eliminating nuclear weapons from the world while developing nuclear energy programmes for peaceful purposes determined the international nuclear order. The first Resolution of the UNGA in 1945 laid down the foundation of a prospective nuclear regulatory framework which allowed for the investigation of industrialisation of nuclear technology. The industrial use of

²⁰² Para 35 of the *ICJ Nuclear Threat Advisory Opinion*.

²⁰³ Article II of the IAEA Statute.

²⁰⁴ Haraszti G *Questions of International Law: Volume 2* (1981) at 98.

nuclear energy promptly indicated a shift of critical problems from “the technical areas to the financial, management and legal areas.”²⁰⁵ These legal areas have evolved alongside the evolution of the technology itself, the economic trends relating to energy scarcity and rising demand, nuclear incidents, and nuclear divergences. This has resulted in the emergence of a matrix of legal instruments which have been building the legal architecture of nuclear law since 1945. These legal instruments can be distinguished chronologically in decade intervals in which certain political, technological, and economic factors influenced the shaping of nuclear norms.

2.2.1.1 The 1945-1953: The Emergence of Nuclear Law

The second half of the 1950s witnessed the reconstruction efforts after WWII. But the shadows of Hiroshima and Nagasaki were still very much present. Post-war legal norms reflected the fear of nuclear war and focused on mechanisms intended to avoid further military use of nuclear energy whilst safeguarding its myriad peaceful applications. This was reflected in the first Resolution of the UNGA which established the UNAEC as an international nuclear governing body and the UNSC as a competent authority over nuclear issues.²⁰⁶ Further, the Resolution became the reference for proposals intended to extend cooperation in the field of peaceful uses of nuclear energy,²⁰⁷ whilst at the same time introducing measures for disarmament,²⁰⁸ and recommending “effective safeguards by way of inspection and other means to protect complying States against the hazards of violations and evasions.”²⁰⁹ These original nuclear norms were of an international law nature and intended to broaden the government of nuclear energy which was still monopolised by the USA.

The USA introduced in the 1946 the McMahon Act which was intended to maintain the American monopoly over nuclear technology and restrict the application of this new

²⁰⁵ Hafstad L “Nuclear reactor developments” (3-16) in Stason E *Lectures on Atomic Energy: Industrial and Legal Problems* (26- 28 June 1952) at 3.

²⁰⁶ Article 2(b) of resolution 1 of the UNGA.

²⁰⁷ Article 5(a) of resolution 1 of the UNGA.

²⁰⁸ Article 5(c) of resolution 1 of the UNGA.

²⁰⁹ Article 5(d) of resolution 1 of the UNGA.

technology to military applications.²¹⁰ The Act regulated atomic information and created a category of so called restricted data which was defined so as “to include any information on the manufacture or utilization of fissile materials.”²¹¹ The Act prohibited sharing information contradicting the objectives of the UNAEC relating to sharing “basic scientific information for peaceful ends” amongst all nations.²¹² Consequently, the Act had played a major role in terminating the UNAEC mandate and extending the nuclear tension between USA and USSR.²¹³ The USSR “believed, not incorrectly, that the USA wished to preserve its atomic monopoly as long as possible”²¹⁴ whilst forcing the Baruch plan. The Baruch plan was premised on the proposition of the USA which:

“...insisted on *special* treatment of atomic energy problems by the United Nations from the beginning; the creation of an International Atomic Development Authority not subject to veto in the Security Council; the separation of atomic bomb disarmament from all other forms; the control of *all* atomic energy developments by the Authority; the establishment of special penalties for violations of any ultimate agreements; and the location of atomic energy plants for strategic reasons primarily based on the needs of the Authority, rather than on the industrial needs of the individual countries involved.”²¹⁵

²¹⁰ Section 1(a) of the Act found and declared the following: “Research and experimentation in the field of nuclear chain reaction have attained the stage at which the release of atomic energy on a large scale is practical. The significance of the atomic bomb for military purposes is evident. The effect of the use of atomic energy for civilian purposes upon the social, economic, and political structures of today cannot now be determined...” See, Ruebhausen O and Mehren R “The Atomic Energy Act and the Private Production of Atomic Power” (1450-1496) Vol 66, issue 8 (June 1953) *Harvard Law Review* at 1471.

²¹¹ Dietrich J “Atomic Energy Act” (18-19) in Croddy E and Wirtz J eds *Weapons of Mass Destruction: An Encyclopaedia of Worldwide Policy, Technology, and History, Volume 1* (2005) at 18.

²¹² Article 5(a) of resolution 1 of the UNGA.

²¹³ The McMahon Act forced the British to conduct “a compressive reassessment to their policy in UNAEC...” See, Schrafstetter S and Twigge S *Avoiding Armageddon: Western Europe, the United States, and the Struggle for Nuclear Nonproliferation, 1945-1970* (2004) at 30.

²¹⁴ Offner A *Another Such Victory: President Truman and the Cold War, 1945-1953* (2002) at 149.

²¹⁵ Blackett S *Fear, War, and the Bomb: Military and Political Consequences of Atomic Energy* (1949) at 244.

The Baruch Plan was countered by the USSR which did not accept any proposition that might impede their progress towards producing its own nuclear weapons in order to achieve a military balance with the USA. On 29 August 1949 the USSR conducted its first atomic test²¹⁶ ending the American monopoly over nuclear technology and ushering the world into the realm of the Cold War nuclear arms race.²¹⁷ The Eisenhower administration realised that nuclear energy technology was no longer secret and hence developed an interest in the peaceful settlement of the Cold War.²¹⁸ The USSR “agreed to participate in the talks and negotiations proposed by Eisenhower’s ‘Atoms for Peace’ plan...” as early as in 1953.²¹⁹

2.2.1.2 The 1950s: The Age of Nuclear Institutions

The era from 1945 to 1953 was marked by the USA “policy of hegemonic control over nuclear technology” violating its commitments²²⁰ relating “to post war sharing of the technology” with its allies including Canada and the UK.²²¹ Nevertheless, the nuclear testing of the USSR compelled the USA to adjust its policy so as to relax cold war tensions.

The UNGA seized the opportunity and pursued the proposal pertaining to the formation of an international organisation dealing with scientific research in the field of nuclear energy for peaceful purposes. The UNGA passed Resolution 810(IX) on 4 December 1954 which expressed “the hope that” the IAEA would “be established without delay.”²²² The Statute of the IAEA was prepared in March 1956 and discussed in an international conference convened at the UN on 20-26 September 1956. All UN Members were present at the

²¹⁶ The bomb was designed very similar to the first US “Fat Man” plutonium bomb, using a TNT/hexogen implosion lens. It was internally code-named *First Lightning* (*Первая молния*, or *Pervaya Molniya*). See, Garrett B and Hart J *The A to Z of Nuclear, Biological and Chemical Warfare* (2007) at 180.

²¹⁷ Nagel S *Peace, Prosperity, and Democracy at the Cutting Edge, Volume 1* (2003) at 24.

²¹⁸ Wenger A *Living with Peril: Eisenhower, Kennedy, and Nuclear Weapons* (1997) at 37.

²¹⁹ Athanasopoulos H *Nuclear Disarmament in International Law* (2000) at 19.

²²⁰ Canada, UK, and the USA signed the Quebec Agreement in 1943 by which outlined the terms of cooperation of the three countries in the field of nuclear energy and nuclear weapons. See, *The American Atom: A Documentary History of Nuclear Policies from the Discovery of Fission to the Present* (1984) at 31.

²²¹ Braithwaite J and Drahos P *Global Business Regulation* (2000) at 298.

²²² Article 1 of resolution 810(IX) of the UNGA, 047th plenary meeting on 4 November 1954.

conference as well as the representatives of the UN Specialised Agencies. The IAEA was established by multilateral treaty,²²³ which entered into force on 29 July 1957.

The IAEA's legal framework, similar to any other international organisation, includes the rules regulating membership and the organs of the IAEA. The rules regulating membership require to differentiate between initial members and other members. The initial members of the IAEA were required to be members of the "United Nations or of any of the specialized agencies."²²⁴ Further, they were required to sign the "Statute within ninety days after it is opened for signature" and to deposit "an instrument of ratification."²²⁵ Other members can join the Agency regardless of their membership in the UN or in any of the specialised agencies. Membership of these states requires the deposit of "an instrument of acceptance" of the "Statute after their membership has been approved by the General Conference upon the recommendation of the Board of Governors."²²⁶

The IAEA is governed by several organs including the General Conference, Board of Governors, and the Staff.

- **The General Conference** is composed of "representatives of all member states."²²⁷ The General Conference meets "in regular annual session..."²²⁸ in order to "discuss any questions or any matters within the scope of" the "Statute or relating to the powers and functions of any organs provided for in" the "Statute..."²²⁹ The General Conference takes actions and is competent, in terms of Article V.to:
 1. Elect members of the Board of Governors in accordance with article VI;
 2. Approve States for membership in accordance with article IV;

²²³ Jankowitsch-Prevor O "The normative role of the International Atomic Energy Agency, legal basis and legal sources" (13-30) in *International Nuclear Law: History, Evolution and Outlook* (2010) at 13.

²²⁴ Article IV.A of the IAEA Statute.

²²⁵ Article IV.A of the IAEA Statute.

²²⁶ Article IV.B of the IAEA Statute.

²²⁷ Article V.A of the IAEA Statute.

²²⁸ Article V.A of the IAEA Statute.

²²⁹ Article V(D) of the IAEA Statute.

3. Suspend a member from the privileges and rights of membership in accordance with article XIX;
4. Consider the annual report of the Board;
5. In accordance with article XIV, approve the budget of the Agency recommended by the Board or return it with recommendations as to its entirety or parts to the Board for resubmission to the General Conference;
6. Approve reports to be submitted to the United Nations as required by the relationship agreement between the Agency and the United Nations, except reports referred to in paragraph C of article XII, or return them to the Board with its recommendations;
7. Approve any agreement or agreements between the Agency and the United Nations and other organizations as provided in article XVI or return such agreements with its recommendations to the Board, for resubmission to the General Conference;
8. Approve rules and limitations regarding the exercise of borrowing powers by the Board, in accordance with paragraph G of article XIV; approve rules regarding the acceptance of voluntary contributions to the Agency; and approve, in accordance with paragraph F of article XIV, the manner in which the general fund referred to in that paragraph may be used;
9. Approve amendments to this Statute in accordance with paragraph C of article XVIII;
10. Approve the appointment of the Director General in accordance with paragraph A of article VII.
11. The General Conference shall have the authority:
 1. To take decisions on any matter specifically referred to the General Conference for this purpose by the Board;
 2. To propose matters for consideration by the Board and request from the Board reports on any matter relating to the functions of the Agency.”

- **The Board of Governors** consists of thirty-five states.²³⁰ The Board has eight permanent members, and rotating members in the 8 'geographical areas. The Board is authorised "to carry out the functions of the" IAEA²³¹ including the election of "a Chairman and other officers from among its members,"²³² preparing "an annual report to the General Conference concerning the affairs of the" IAEA "and any projects approved by" it. These reports must be prepared "for submission to the General Conference," as the IAEA may be required to submit them to the UN or to any other organisation.²³³
- **The Staff** is the professional and general service of the Agency which is headed by a Director General.²³⁴ The Director General is "responsible for the appointment, organization, and functioning of the staff and shall be under the authority of and subject to the control of the Board of Governors."²³⁵ The Director General oversees six departments that do the actual work in carrying out the policies of the IAEA including Nuclear Energy, Nuclear Safety and Security, Nuclear Sciences and Applications, Safeguards, Technical Cooperation, and Management. The staff and various structures of the IAEA help the Director General to perform "his duties in accordance with regulations adopted by the Board."²³⁶

The organs of the IAEA are structured in a manner so as to help it achieve its objectives including the acceleration and enlargement of "the contribution of atomic energy to peace, health and prosperity throughout the world. It shall ensure, so far as it is able, that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose."²³⁷ The non-military conditionality is

²³⁰ The composition of the IAEA Board of Governors for the 2012/2013 period included 35 members. "IAEA Board of Governors" <http://www.iaea.org/About/Policy/Board/> (accessed 12 January 2013).

²³¹ Article VI(2)(F) of the IAEA Statute.

²³² Article VI(2)(H) of the IAEA Statute.

²³³ Article VI(2)(J) of the IAEA Statute.

²³⁴ Article VII(A) of the IAEA Statute.

²³⁵ Article VII(B) of the IAEA Statute.

²³⁶ Article VII.B of the IAEA Statute.

²³⁷ Article II of the IAEA Statute.

supervised by means of the Safeguards.²³⁸ The Safeguards give statutory rights and responsibilities to the IAEA to verify state parties' compliance with the Statute relating to military non-divergences and "applicable health and safety standards,"²³⁹ which are established by the IAEA.²⁴⁰

Two other regional organisations cover to some extent the same areas as the IAEA:²⁴¹

- The Treaty establishing the European Atomic Energy Community established Euratom on the 25 March 1957. Six European states, Belgium, France, Germany, Italy, Luxembourg and the Netherlands regarded nuclear energy as a means of achieving energy independence.²⁴² These States shared their interest in developing nuclear power so as "to contribute to the raising of the standard of living in the Member States and the development of relations with other countries by creating the conditions necessary for the speedy establishment and growth of nuclear industries."²⁴³
- The Nuclear Energy Agency (NEA), 1958 which "is a specialised agency within the Organisation for Economic Co-operation and Development (OECD), an intergovernmental organisation of industrialised countries based in Paris, France."²⁴⁴ The purpose of the NEA is to "further the development of the production and uses of nuclear energy, including applications of ionizing radiations, for peaceful purposes by

²³⁸ Article XII of the IAEA Statute.

²³⁹ Article XII.A.1 of the IAEA Statute.

²⁴⁰ Article IX.1.3 of the IAEA Statute.

²⁴¹ The African continent has known nuclear institutions since the 1980s and accommodates the Arab Atomic Energy Agency (AAEA) which was established in 1982 and the African Commission on Nuclear Energy (AFCON) which was established in 2011. See, Arab Atomic Energy Agency. <http://www.aaea.org.tn/en/revus.htm> and Arab Encyclopedia: Arab Atomic Energy Agency (AAEA) http://www.arab-ency.com/index.php?module=pnEncyclopedia&func=display_term&id=14947&m=1 (accessed 25 January 2013). See, also Africa: The African Commission on Nuclear Energy Convenes its Second Meeting (Press release on 26 July 2012) <http://allafrica.com/stories/201207261025.html> (accessed 25 January 2013).

²⁴² The six states joined in order to venture nuclear energy for civil purposes because the costs of investing in nuclear energy could not be met by individual state.

²⁴³ Article 1 of the Euratom.

²⁴⁴ The Nuclear Energy Agency <http://www.oecd-nea.org/nea/> (accessed 9 June 2014).

the participating countries, through co-operation between those countries and a harmonisation of measures taken at the national level”, whilst “taking due account of the public interest and mindful of the need to prevent the proliferation of nuclear explosive devices.”²⁴⁵

Today the IAEA and Euratom play a major role in establishing safety standards, and in securing nuclear security and non-proliferation of nuclear weapons. Since the establishment of the IAEA in 1957, the Safeguards have functioned as “an indispensable instrument for nuclear non-proliferation and peaceful nuclear cooperation.”²⁴⁶ However, the IAEA has wider responsibility “for international activities concerned with the peaceful uses of atomic energy in accordance with its Statute...,”²⁴⁷ while the Euratom and the NEA are regional organisations which are exclusive to the European Community (EC) and the OECD respectively. Euratom was established as a building block of the EC²⁴⁸ and “to ensure the development of nuclear energy within the Community.”²⁴⁹ Similarly, the Statute of NEA was designed to include members from “European countries only, which is why it was called the European Nuclear Energy Agency.”²⁵⁰

The IAEA was set up as an autonomous organisation in 1957. However, it has a special relationship with the UN which is illustrated in its Statute and re-emphasised in the Agreement Governing the Relationship Between the UN and the IAEA. According to the Agreement:

²⁴⁵ Article 1(b) of the Statute of the NEA.

²⁴⁶ Non-Proliferation of nuclear weapons and nuclear security: AEA Safeguards Agreements and Additional Protocols (May 2005) IAEA Vienna at1. <http://www.iaea.org/Publications/Booklets/nuke.pdf>(accessed 25 January 2013).

²⁴⁷ Article I.1 of the Agreement Governing the Relationship Between the United Nations and the International Atomic Energy Agency <http://www.iaea.org/Publications/Documents/Infcircs/Others/infcirc11.pdf> (accessed 9 March 2013). The IAEA has concluded more agreements including Agreement on the Privileges and Immunities of the IAEA, IAEA Headquarters Agreement with Austria and Related Agreements, IAEA Relationship Agreements with Specialized Agencies, and IAEA Cooperation Agreements with Intergovernmental Organizations.

²⁴⁸ Article 198(c) of the Euratom.

²⁴⁹ Article 124 of the Euratom.

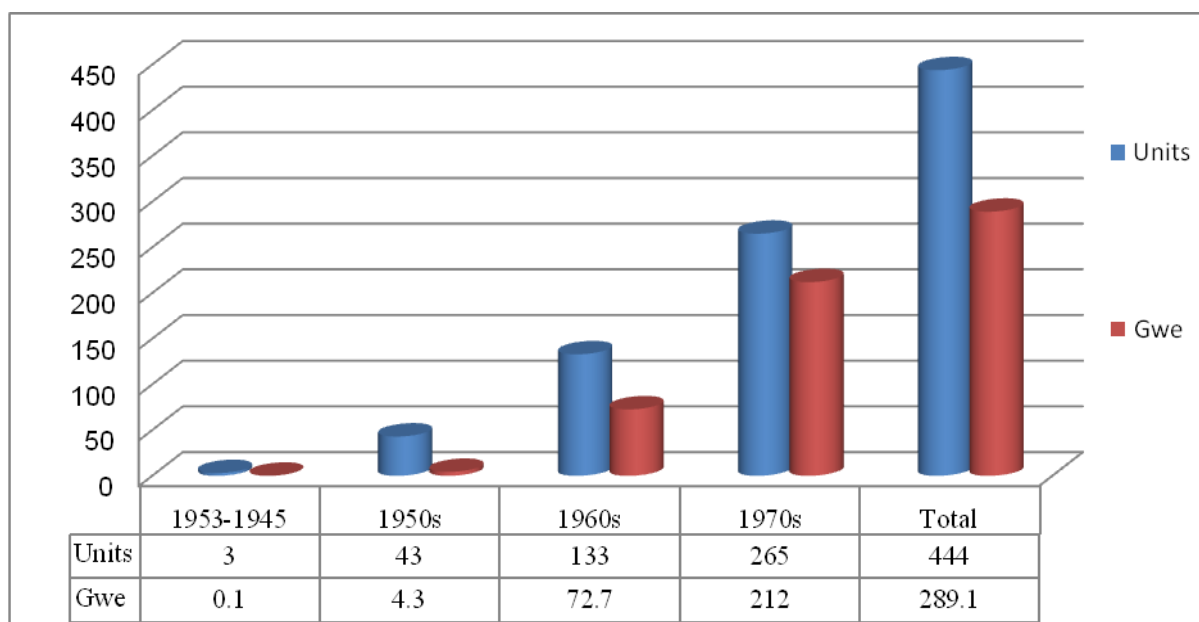
²⁵⁰ See, the Statute of the NEA.

“The United Nations recognizes that the Agency, by virtue of its inter-governmental character and international responsibilities, will function under its Statute as an autonomous international organization in the working relationship with the United Nations established by this Agreement.”²⁵¹

The IAEA reports to the UN²⁵² and the UNSG²⁵³ and considers “any resolution relating to” it “adopted by the” UNGA or by the UNSC,²⁵⁴ and it co-operates with the UNSC “by furnishing to it at its request such information and assistance as may be required in the exercise of its responsibility for the maintenance or restoration of international peace and security.”²⁵⁵

2.2.1.3 The 1960s

Figure II- 1 Nuclear power growth 1951-1970²⁵⁶



²⁵¹ Article I.1 of the Agreement Governing the Relationship Between the UN and the IAEA. Hereafter referred to as IAEA UN Agreement.

²⁵² Article III of the IAEA UN Agreement.

²⁵³ Article IV of the IAEA UN Agreement.

²⁵⁴ Article V of the IAEA UN Agreement.

²⁵⁵ Article IX of the IAEA UN Agreement.

²⁵⁶ “Nuclear power growth: 1951-86.” See, Char N and Csik B “Nuclear power development: history and outlook, events have changed the global prospects for nuclear power” (19-25) Issue 3 (1987) *IAEA Bulletin* at 20.

The 1960s witnessed significant expansion of nuclear power programmes in many countries. The associated industrial risks needed regulation relating to safety standards and civil liability for damages caused by nuclear accidents. As reflected in figure 2.1, 133 nuclear power plants with 72.7 Gwe of capacity were built by the end of the 1960s. This means that, by the end of the 1960s there were 179 nuclear power plants with an installed capacity amounting to 77.1 Gwe.²⁵⁷

In the 1960s nuclear accidents such as an explosion at the Stationary Low-Power Reactor Number One in Idaho Falls in 1966 and the partial meltdown at the Enrico Nuclear Generating Station in Michigan in 1966²⁵⁸ indicated an imperfect legal system in respect of nuclear activities, in particular regarding safety, nuclear third party liability, international nuclear liability, and potential cross boundary consequences of a nuclear incidents. The need for more adequate regulation was dealt with in two approaches:

On the one hand, the IAEA took the initiative hence the “development of radiation safety standards is a statutory function of the IAEA.”²⁵⁹ Article III.6 of the IAEA Statute authorises the agency

“To establish or adopt, in consultation and, where appropriate, in collaboration with the competent organs of the United Nations and with the specialized agencies concerned, standards of safety for protection of health and minimization of danger to life and property (including such standards for labour conditions), and to provide for the application of these standards to its own operation as well as to the operations making use of materials, services, equipment, facilities, and information made available by the Agency or at its request or under its control or supervision; and to provide for the application of these standards, at the request of the parties, to operations under any bilateral or multilateral arrangements, or, at the request of a State, to any of that State's activities in the field of atomic energy.”

²⁵⁷ *Ibid.*

²⁵⁸ Patterson W *Nuclear Power* (1883) 2nd ed at 50-102.

²⁵⁹ Alfonso A and Wrixon A “Radiation safety standards: documenting international progress” (28-31) Vol 41, no 2 (1999) *IAEA Bulletin* at 28.

The Board of Governors of the IAEA approved the first basic safety standards in 1962²⁶⁰ which were revised and republished in 1967.²⁶¹ These first basic safety standards have undergone many revisions, in cooperation with other organisations and international bodies, in order to better align with the nuclear energy development.²⁶²

The Vienna Convention on Civil Liability for Nuclear Damage was concluded under the IAEA's auspices in 1963 in order to satisfy "the desirability of establishing some minimum standards to provide financial protection against damage resulting from certain peaceful uses of nuclear energy."²⁶³ The Convention established legal guidelines intended to develop nuclear third party liability, and an international nuclear liability regime to regulate potential cross boundary consequences of nuclear accidents. The guidelines were based on civil law concepts attributing absolute liability to the operators of the nuclear installations, limiting liability in amount and time, obliging the operator to maintain insurance, defining the jurisdiction of the court, and establishing the principle of non-discrimination of victims on the grounds of nationality, domicile or residence.²⁶⁴

²⁶⁰ IAEA Safety Standards for protecting people and the environment, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards (2011) Interim edition, General Safety Requirements Part 3 No. GSR http://www-pub.iaea.org/MTCD/publications/PDF/p1531interim_web.pdf (accessed 15 April 2013).

²⁶¹ Basic Safety Standards for Radiation Protection of the 1967 edition "is no longer valid." <http://www-ns.iaea.org/standards/> (accessed 15 April 2013).

²⁶² The IAEA, International Labour Organization (ILO), OECD Nuclear Energy Agency (OECD/NEA) and World Health Organization (WHO) jointly sponsored the third revision which was published in 1982 as Edition of Safety Series No. 9. The Food and Agriculture Organization of the United Nations (FAO), IAEA, ILO, OECD/NEA, Pan American Health Organization (PAHO) and WHO jointly sponsored the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (the BSS) which was published by the IAEA in February 1996 as Safety Series No. 115.

²⁶³ The preamble of the Vienna Convention on Civil Liability for Nuclear Damage.

²⁶⁴ After the Vienna Convention on Civil Liability for Nuclear Damaged two main international legal instruments have emerged and are waiting for entry into force:

1. The Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage which was adopted by a Diplomatic Conference, 8-12 September 1997, and was opened for signature at Vienna on 29 September 1997 at the 41st General Conference of the International Atomic Energy Agency. The Protocol will remain open for signature until its entry into force.

2.2.1.4 The 1970s

The era of the 1970s witnessed two major issues:

Firstly: A significant expansion of nuclear power plants. By the end of 1970s the number of nuclear power plants reached 444 with a capacity totalling 289.1 Gwe.²⁶⁵ That required the industry to become involved in the entire nuclear fuel cycle increasing “the potential dangers posed by the unlawful taking and use of nuclear material.”²⁶⁶ In response, the CPPNM was drafted under the auspices of the IAEA.

The CPPNM established a legal mechanisms for the legal protection of nuclear materials during domestic use, storage and transport and requires “each State Party” to “make the offences described in article” 7.1²⁶⁷ “punishable by appropriate penalties which take into account their grave nature”, of nuclear crimes.²⁶⁸

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2. The Convention on Supplementary Compensation for Nuclear Damage was adopted on 12 September 1997, and was opened for signature on 29 September 1997 at the 41st General Conference of the IAEA. The Convention will remain open for signature until its entry into force.

²⁶⁵ See figure 2.1 above.

²⁶⁶ Para 3 of the preamble of the CPPNM.

²⁶⁷ “The intentional commission of:

- a. an act without lawful authority which constitutes the receipt, possession, use, transfer, alteration, disposal or dispersal of nuclear material and which causes or is likely to cause death or serious injury to any person or substantial damage to property;
- b. a theft or robbery of nuclear material;
- c. an embezzlement or fraudulent obtaining of nuclear material;
- d. an act constituting a demand for nuclear material by threat or use of force or by any other form of intimidation;
- e. a threat:
 - i. to use nuclear material to cause death or serious injury to any person or substantial property damage, or
 - ii. to commit an offence described in sub-paragraph (b) in order to compel a natural or legal person, international organization or State to do or to refrain from doing any act;
- f. an attempt to commit any offence described in paragraphs (a), (b) or (c); and
- g. an act which constitutes participation in any offence described in paragraphs (a) to (f) shall be made a punishable offence by each State Party under its national law.”

²⁶⁸ Article 7.2 of the CPPNM.

Secondly: The shaping of the concepts of NWS and NNWS. The USA had successfully tested and deployed nuclear weapons in 1945. This was followed by the USSR in 1949, the UK in 1952, France in 1960, and China in 1964.²⁶⁹ These countries thus had “manufactured and exploded a nuclear weapon or other nuclear explosive nuclear device prior to 1 January 1967.”²⁷⁰ The countries so singled out are also the permanent members of the UNSC that enjoy a veto.²⁷¹ The competitive nature of relations amongst these countries in particular the USA and USSR lead to a nuclear arms race during which the global nuclear arsenal grew in a manner that became a threat to humanity. The international community needed to prevent NWSs from stockpiling further nuclear weapons and prevent NNWSs from manufacturing nuclear weapons.

The solution was defined in the NPT which was negotiated on the basis of the revision of the first Resolution of the UNGA. The NPT was negotiated in order to achieve “three major (and many minor) purposes” including:

1. The prevention of “the creation of additional independent nuclear weapon states in Europe.”²⁷²
2. The establishment of “a framework for the development of a world-wide nuclear power industry.”²⁷³
3. The establishment of a legal binding agreement which would “...serve as one of a number of building blocks which together would bring the nuclear arms race under control and lead to nuclear disarmament.”²⁷⁴

The NPT established the criteria to define NWSs and NNWSs and consequently, in terms of the IAEA objectives, enforced its Safeguards on NNWSs. The NPT establishes its status as the cornerstone of the non-proliferation regime.²⁷⁵

²⁶⁹ See, Kaplan M “The Nuclear Non-proliferation Treaty...” at 20

²⁷⁰ Article IX.3 the NPT.

²⁷¹ Article 23.1 of the UN Charter.

²⁷² Simpson J “The Non-Proliferation Treaty at its half-life” (1-12) in Bellany I, Blacker C, and Gallacher J eds *The Nuclear Non-Proliferation Treaty* (1985) at 2.

²⁷³ *Ibid.*

²⁷⁴ *Ibid.*

²⁷⁵ The NPT is discussed under the heading dealing with the non-proliferation regime.

2.2.1.5 The 1980s

The 1980s era witnessed two major nuclear incidents:

Firstly: On 28 March 1979 a partial nuclear meltdown took place in one of the two USA TMI nuclear power plants, in Dauphin County, Pennsylvania. Naturally, the confidence in the utilities which had ordered “more than 190 nuclear power plants”...“from 1965 through 1978” was shaken.²⁷⁶ The accident had no trans-boundary effects. Nevertheless, the accident exposed the social, political, psychological,²⁷⁷ and institutional risks associated with nuclear technology deployed in power plants.²⁷⁸ Consequently, legal norms governing the nuclear industry were reviewed in “order to deal with legal battle to establish liability.”²⁷⁹

Secondly: On 26 April 1986 a nuclear accident occurred at Chernobyl Nuclear Power Plant in Ukraine which caused the release of large quantities of radioactive particles into the atmosphere. “The release measured millions, perhaps hundreds of millions of curies (the radioactive decay rate of one gram of radium), caused more than 25 fatalities from acute radiation exposure, and may eventually lead to thousands of delayed cancers.”²⁸⁰ The sweeping passage of the Chernobyl cloud which placed “300 million to 400 million people in 15 nations at risk...exposed major inadequacies in national and international risk management systems.”²⁸¹ The nuclear incident at the Chernobyl power plant revealed the

²⁷⁶ Osif B, Baratta A, and Conkling T *TMI 25 Years Later: The Three Mile Island Nuclear Power Plant Accident and Its Impact* (2006) at 76.

²⁷⁷ For example, the film: *The China Syndrome* became the discourse of the public which has exposed and dramatised the social and psychological impact of nuclear incidents. See, Farrell T and Goodnight G “Accidental rhetoric: the root metaphors of Three Mile Island” (271-300) Vol 48, iss 4 (1981) *Communication Monographs* at 280.

²⁷⁸ Nelkin D “Some social and political dimensions of nuclear power: examples from Three Mile Island” (132-142) Vol 75, no. 1 (March 1981) *the American Political Science Review* at 135, 140.

²⁷⁹ Nelkin D “Some Social and Political Dimensions of Nuclear Power” at 138.

²⁸⁰ Hohenemser C, Deicher M, Ernst A, Hofsäss H, Lindner G, and Recknagel E “Chernobyl: An Early Report” (6-43) Vol 28, n 5 (1986) *Environment: Science and Policy for Sustainable Development* at 6.

²⁸¹ *Ibid* at 39-40.

fact that international legal system would not be able to provide “clear answers to many of the issues of responsibility and international cooperation”²⁸² and safety.

The accident was invoked by many voices which called for the establishment of an adequate universal framework able to maintain reliable and safe nuclear power development.²⁸³ The accident revealed the international common interest in developing nuclear safety measures.²⁸⁴ At the same time, it exposed serious deficiencies “in the framework of international safeguards”²⁸⁵ which led to the emergence of the Nuclear Assistance Convention and the Early Notification Convention. At a later stage, the international community adopted the Convention on Nuclear Safety and the Joint Convention on Safety of Radioactive Waste.

The 1980s achieved extensive production, storing and transporting of nuclear materials, increasing the potential risks of an unlawful take and use of nuclear materials. The international community showed heightened concern about offences relating to nuclear materials. The international community’s quest was focused on developing a legal framework by which the physical protection of nuclear materials can be maintained and offences relating to nuclear materials can be securely prevented, detected, and punished. This has manifested in the adoption of the CPPNM creating legal obligations on states parties to “take appropriate steps within the framework of its national law and consistent with international law” to protect nuclear materials “while in domestic use, storage and transport” as far as practicable.²⁸⁶

²⁸² Boyle A “Chernobyl and the development of international environmental law” (203-220) in Butler W ed *Perestroika and International Law* (1990) at 204.

²⁸³ Reyners P and Lellouche E “Regulations and control by international organisations in the context of nuclear accident: the International Atomic Energy Agency and the OECD Nuclear Energy Agency” (1-17) in Cameron P and Hancher L eds *Nuclear Energy Law After Chernobyl* (1988) at 1.

²⁸⁴ Cameron P “The Vienna Conventions on Early Notification and Assistance” (19- 32) in Cameron P and Hancher L eds *Nuclear Energy Law After Chernobyl* (1988) at 31.

²⁸⁵ *Ibid* at 19.

²⁸⁶ Article 2(2) and 3 of the CPPNM.

2.2.1.6 The 1990s

The 1990s were marked by the enforcement of the NPT norms, the practical applications of the Safeguards system for the first time and the indefinite extension of the NPT. The UNSC passed Resolution 687 (1991)²⁸⁷ inviting “Iraq to reaffirm unconditionally its obligations under the” NPT “of 1 July 1968”²⁸⁸ and to “agree not to acquire or develop nuclear weapons...”²⁸⁹ The Resolution represents the practical demonstration of the powers of the UNSC to act under Chapter VII of the UN Charter in order to manage the norms established by the NPT in technical applications as follows:

1. Iraqi declaration about its nuclear weapons capability.²⁹⁰
2. The establishment of a Special Commission to “carry out immediate on-site inspection of Iraq's biological, chemical and missile capabilities, based on Iraq's declarations and the designation of any additional locations by the Special Commission itself.”²⁹¹
3. Placing all of Iraqi “nuclear-weapons-usable materials under the exclusive control, for custody and removal, of the” IAEA, “with the assistance and cooperation of the Special Commission which is part of the plan of the Secretary-General” as provided in Article 9(b)(i) of the Resolution.²⁹²
4. The requirement “to carry out immediate on-site inspection of Iraq's nuclear capabilities based on Iraq's declarations and the designation of any additional locations by the Special Commission.”²⁹³
5. Treaty compliance including monitoring, verification, and inspection.²⁹⁴

The government of Iraq denied “having undeclared nuclear-weapons-usable material” and restricted the access of the IAEA inspection team frustrating the functioning of the Special

²⁸⁷ Resolution 687 was adopted by the UNSC at its 2981st meeting on 3 April 1991.

²⁸⁸ Article 11 of resolution 687.

²⁸⁹ Article 12 of resolution 687.

²⁹⁰ Article 12 of resolution 687.

²⁹¹ Article 9.i of resolution 687.

²⁹² Article 12 of resolution 687.

²⁹³ Article 13 of resolution 687.

²⁹⁴ Article 13 of resolution 687.

Commission. Several UNSC resolutions were passed in order to force Iraq to comply with its obligations and to cooperate and allow unconditional and unrestricted access to sites and persons by the Special Commission and the IAEA.

The second important event was the compliance of South Africa with the NPT as a non-nuclear-weapon State after terminating its nuclear weapons programme on 10 July 1991 voluntarily. Promptly the country “concluded an NPT safeguards agreement with the IAEA on 16 September the same year.”²⁹⁵

“The IAEA performed the task of verifying South Africa’s dismantlement undertakings, and was tasked by the 1992 General Conference to report on the correctness and completeness of South Africa’s initial NPT declarations. The South African experience gave the Agency important operational experience, and contributed positively to the development of strengthened safeguards.”²⁹⁶

The nuclear experiences of South Africa and Iraq²⁹⁷ exposed weaknesses of the Safeguards System as structured in IAEA’s document INFCIRC/153.²⁹⁸ In 1997 a Model Additional Protocol INFCIRC/540 (Corrected) was designed and adopted by the IAEA Board of Governance in order to strengthen the effectiveness and improve the efficiency of the IAEA safeguards system.²⁹⁹ Together the INFCIRC/153 and the INFCIRC/540 provide a mechanism

²⁹⁵ *Non-Proliferation of Nuclear Weapons & Nuclear Security: IAEA Safeguards Agreements and Additional Protocols* (May 2005) at 7 <http://www.iaea.org/Publications/Booklets/nuke.pdf> (accessed 9 June 2013).

²⁹⁶ *Ibid.*

²⁹⁷ There is no intention to compare Iraq with South Africa because Iraq had refused to allow the IAEA Safeguards inspections, then did not allow open access to facilities to the inspectors present in the country, and did not reveal its clandestine program as required by the mandates of the IAEA teams of inspector. Contrary to this, South Africa did not hide anything after deciding the roll -back. Nevertheless, both cases revealed the weaknesses of the Safeguards.

²⁹⁸ The Structure and Content of Agreements between the Agency and States required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons: INFCIRC/153 (Corr.) of 1972. Hereafter referred to as the INFCIRC/153.

²⁹⁹ Dekker G *The Law of Arms Control: International Supervision and Enforcement* (2001) at 275.

by which the IAEA verifies the peaceful use of declared nuclear activities in a state, assures the completeness of a state's declarations, and deters states from nuclear diversion.³⁰⁰

The third fundamental development in the 90s era was the achievement of the indefinite extension of the NPT during the 1995 Review and Extension Conference. The outcome of the Conference "confirmed that the ultimate objective of the Treaty is a nuclear-weapon free world, and supported the 'Atoms for Peace' approach for the use and transfer of peaceful nuclear technology consistent with NPT provisions."³⁰¹ Further, it pointed at "the continued importance of the IAEA's "existing, and in some cases expanding, roles in areas of verification and safeguards, nuclear safety, waste disposal, transfer of nuclear technology, and technical assistance."³⁰²

2.2.1.7 The 2000s:

The 21st century witnessed the attack of 9 September 2001 on the American Twin Towers. The attack against the Twin Towers exposed the international nuclear vulnerability by making nuclear reactors as "preferred targets during military conflict."³⁰³ The attack would have been truly devastating if it had been directed at nuclear installations or if the airplanes used to carry out the attack had been loaded with nuclear explosive devices. Although the majority of attacks on nuclear installation were carried by states,³⁰⁴ the attack against the Twin Towers alerted the international community to the fact that spiteful acts by non-state

³⁰⁰ Doyle J *Nuclear Safeguards, Security and Nonproliferation: Achieving Security with Technology and Policy* (2008) at 137.

³⁰¹ Andemicael B, Pelz M, and Priest J "Measure for measure: the NPT and the road ahead" Vol 37, no 3 (1995) *IAEA Bulletin*. <http://www.iaea.org/Publications/Magazines/Bulletin/Bull373/priest.html> (accessed 13 June 2013).

³⁰² *Ibid.*

³⁰³ Sovacool B *Contesting the Future of Nuclear Power: A Critical Global Assessment of Atomic Energy* (2011) at 192.

³⁰⁴ For example, Iran's attack on Al Tuwaitha nuclear complex in Iraq in 1980, Israel's attack on Iraq's Osirak nuclear research facility in 1981, Iraq's attacks on Iran's Bushehr nuclear plant six times between 1984 and 1987, the USA attacks on three Iraqi nuclear reactors and an enrichment pilot facility in 1991, Iraq's attacks on Israel's Dimona reactor in 1991, Israel's attack on a Syrian reactor under construction in 2007.

actors may contemplate serious nuclear threats.³⁰⁵ The UNSC adopted global standards in order to improve the physical protection of nuclear materials and facilities.³⁰⁶ These standards are contemplated in Resolution 1540 on 28 April 2004 which was adopted by the UNSC while acting under Chapter VII of the UN Charter. The UNSC has established 1540 Committee which is required to “report to the Security Council for its examination, on the implementation of this resolution.”³⁰⁷

Another unfortunate event which is not related to terrorism is the Fukushima nuclear accident which was caused on 11 March 2011 by “a 9.0 magnitude earthquake and subsequent tsunami occurred off the Oshika Peninsula of Tohoku Japan”.³⁰⁸ The accident posed adverse effects on people, properties and environment. Radioactive isotopes were released and contaminated coolant water that was discharged into the sea.

The Japanese authorities implemented a 20 km exclusion zone around the power plant, and evacuated “more than 200,000 people...from nearby areas.”³⁰⁹ However, “the levels of environmental radioactivity in the 20-30 km zone and some of the surrounding areas” extended “beyond the 30km zone.”³¹⁰ The accident provoked adverse effects which undoubtedly will increase over time. The official data released by Japanese Ministry of

³⁰⁵ Although the development of the norms against nuclear terrorism can be referred to UNGA resolution 51/210 of 17 December 1996, thereby establishing ad hoc Committee as part of the UNGA efforts to establish the Convention for the Suppression of Terrorist Bombings and, the attack against the Twin Towers augmented the realisation of the International Convention for the ICSANT.

³⁰⁶ Bunn G “Enforcing international standards: protecting nuclear materials from terrorists post-9/11” *Arms Control Today* (January/February 2007) http://www.armscontrol.org/act/2007_01-02/Bunn (2 June 2014).

³⁰⁷ Article 4 of resolution 1540. The mandate of the 1540 Committee has been extended by many successive resolutions.

³⁰⁸ Hoevea J and Jacobson M “Worldwide health effects of the Fukushima Daiichi nuclear accident” (1-15) (2012) *The Royal Society of Chemistry* at 1. See, also, Al Faruque A “Nuclear energy and the environment” (375-392) in Alam S, Bhuiyan M, Chowdhury T, and Techera E eds *Routledge Handbook of International Environmental Law* (2013) 1st ed at 397.

³⁰⁹ Bellestri T “Nuclear power (energy)” (360-372) in Schiffman H *Green Issues and Debates: An A-to-Z Guide* (2011) at 363.

³¹⁰ *Nuclear Safety Review for the Year 2012* (July 2012) GC(56)/INF/, printed at the IAEA in Austria IAEA/NSR/2012 at 9. http://www.iaea.org/About/Policy/GC/GC56/GC56InfDocuments/English/gc56inf-2_en.pdf (accessed 30 June 2013).

Education, Culture, Sports, Science and Technology, shows “that over the next 50 years it would be possible to have around 400,000 additional cancer patients within a 200-kilometer radius of the plant.”³¹¹

The Fukushima accident alarmed the international community which convened the Fukushima Ministerial Conference on Nuclear Safety in June 2011.³¹² “The Ministerial Conference adopted a declaration which, inter alia, requested the Director General of the IAEA to draft an Action Plan on Nuclear Safety (the Action Plan). The Action Plan, which defined a programme of work to strengthen the global nuclear safety framework...”³¹³

2.2.2 The Non-Proliferation Regime

The non-proliferation regime is an international legal project comprised of many treaties and conventions focusing on nuclear energy and its ramifications. Since 1945 nuclear normative rules have accumulated forming the legal construct which governs the development of nuclear energy programmes throughout the world. The evolution of the non-proliferation regime is a result of the evolution of nuclear law which has developed to meet the requirements for the non-proliferation of nuclear weapons and for the safety and security of the utilisation of nuclear energy for peaceful purposes. This view can be criticised based on the assumption that the non-proliferation regime is a USA and its allies’ legal construct intended to control the risks of any potential nuclear attack on them. This is true to some extent because the USA “and its allies determined that the proliferation of the ability to wage nuclear war is the most serious threat to their security.”³¹⁴ Therefore, it would be convenient for the USA and its allies to benefit from the creation of the non-

³¹¹ The official released data was analysed by Professor Chris Busby (the European Committee of Radiation Risk). See, Finance GreenWatch “How to minimize consequences of nuclear catastrophe (Japan Today)” 18th April 2011 <http://financegreenwatch.org/?p=760> (accessed 30 June 2013).

³¹² See, IAEA Action Plan on Nuclear Safety. The Action Plan “was unanimously adopted by the Board of Governors and endorsed by all Member States at the 55th regular session of the General Conference in September 2011.” See, Report by the Director General, Fukushima Ministerial Conference on Nuclear Safety (15-17 December 2012) GOV/INF/2013/2.

³¹³ *Ibid.*

³¹⁴ Chafetz G “The political psychology of the nuclear nonproliferation regime” (743-75) Vol 57, no. 3 (August 1995) *the Journal of Politics* at 743.

proliferation regime where the USA becomes the “principal guardian” of this regime³¹⁵ whilst empowering itself to prevent any further horizontal proliferation of nuclear weapons. Roger K. Smith considers that “the term regime” is increasingly becoming appended to the term ‘non-proliferation’ to describe the system of cooperation concerning the ‘horizontal’ spread of nuclear weapons.”³¹⁶ However, the constitution of the non-proliferation regime cannot be limited to the legal mechanisms which limit the horizontal proliferation of nuclear weapons. This is due to the fact that the non-proliferation regime has been built on the original nuclear bargain which gives NNWSs enough “incentives to overcome their nuclear ambitions”³¹⁷ to develop nuclear weapons. These incentives are in the form of cooperation in peaceful nuclear programmes and the promise to eliminate nuclear weapons completely. The ICJ considers that “the regime of the Non-Proliferation Treaty constitutes more than acquiescence by the non-nuclear States in the reality of possession of nuclear weapons by the five nuclear Powers.”³¹⁸ It is viewed that the non-proliferation regime constitutes two additional parallel legal constructs:

1. The complete nuclear disarmament fully recognised by Article VI of the NPT which requires the NWS “to negotiate in good faith a nuclear disarmament.”³¹⁹
2. The acceleration and enlargement of the “contribution of atomic energy to peace, health and prosperity throughout the world.”³²⁰

The promotion of the non-proliferation objective requires a universal shared “interest in preventing the spread of nuclear weapons and their use.”³²¹ This required the consensus of the USSR-USA “on the risks posed by proliferation.”³²² The USA took the initiative and

³¹⁵ *Ibid* at 746.

³¹⁶ Smith R “Explaining the Non-Proliferation Regime: Anomalies for Contemporary International Relations Theory” (253-281) Vol 41, no 2 (Spring 1987) *International Organization* at 253.

³¹⁷ Rublee M *Nonproliferation Norms: Why States Choose Nuclear Restraint* (2009) at 201.

³¹⁸ The ICJ *Nuclear Threat Advisory Opinion* at 837.

³¹⁹ *Ibid* at 830.

³²⁰ Article II of the IAEA.

³²¹ White T “International responses to Iranian nuclear defiance: the Non-Aligned Movement and the issue of non-compliance” (453-476) Vol 18, no 3 (2007) *the European Journal of International Law* at 458- 459.

³²² Wonder E “The nuclear marketplace and the nonproliferation regime” (71-82) in Pilat J ed *The Nonproliferation Predicament* (1985) at 72.

proposed its “Atoms for Peace” as an international project. Simultaneously, on the national level the USA replaced the McMahon Act which had introduced strict policies relating to “scientific and technical information,”³²³ by the Atomic Energy Act of 1954 which provided for “a program for the dissemination of unclassified scientific and technical information and for the control, dissemination, and declassification of Restricted Data, subject to appropriate safeguards, so as to encourage scientific and industrial progress.”³²⁴ That was a paradigm shift in the policy of the USA from the terms of reference proposed by the Baruch Plan. The new USA policy was declared in section 1 of the Atomic Energy Act of 1954 as follows:

- “a. the development, use, and control of atomic energy shall be directed so as to make the maximum contribution to the general welfare, subject at all times to the paramount objective of making the maximum contribution to the common defense and security; and
- b. the development, use, and control of atomic energy shall be directed so as to promote world peace, improve the general welfare, increase the standard of living, and strengthen free competition in private enterprise.”

“It is commonly believed that the American ‘Atoms for Peace’ policy and Atomic Energy Act of 1954 paved the track for the establishment of IAEA in 1957 to regulate nuclear technology dissemination for civilian uses.”³²⁵ With the conclusion of the NPT, the non-proliferation regime was established providing for the development of the required “set of legal norms and voluntary undertakings” which have been developing “both within and outside of the framework of the IAEA to deal with the peaceful uses of nuclear energy and nuclear weapons proliferation.”³²⁶ These have assembled without “formal international

³²³ Section 1(b)(2) of the USA Atomic Energy Act of 1946. A Military Liaison Committee was also established to function as a controlling mechanism in respect to the dissemination of the scientific and technical information relating to military purposes. See, section 4(c) of the Act.

³²⁴ Section 3(b) of the Atomic Energy Act of 1954

³²⁵ Sadiq M “International non-proliferation regime: Pakistan and Indian perspectives” (13-36) Vol XIII, no. 1 (Winter 2013) *Islamabad Policy Research Institute Journal* at 17.

³²⁶ ElBaradei M, Nwogugu E, and Rames J “International law and nuclear energy: overview of the legal framework - the global legal order for the atom's safe and peaceful uses is grounded on a mix of binding norms and advisory regulations” (16-25) Vol 3 (1995) *IAEA Bulletin* at 22.

organization at its core, but instead an international treaty combined with rolling international conferences at which key decisions are taken”³²⁷ such as the indefinite extension of the NPT. This accepted practice was combined with the complex normative rules involving the UNSC which originated in the consensus of the NWSs. That is to say that there are intermixed categories of norms which design the objectives and the goals that prescribe the activities of states parties to the relevant treaties, accepted protocol and regimes, and arrangements. These are fundamentally guided by the non-proliferation regime which rigorously dismisses proliferation of nuclear weapons, aspires for complete disarmament, and welcomes nuclear power as a source of energy. Consequently, the submission to define the non-proliferation regime with a focus on the horizontal proliferation of nuclear weapons overlooks the complete terms of reference laid out by the NPT which is “the essence of the ‘nuclear bargain’ between the nuclear ‘haves’ and ‘have nots.’”³²⁸

The NPT which became the cornerstone of the non-proliferation regime contemplates the Safeguards which “underwent a major transformation in character and scope” during the 1970s.³²⁹ Mohamed ElBaradei *et al* regard that the transformation of the Safeguards resulted in “the development of what is referred to as the ‘non-proliferation regime’”³³⁰ They referred the emergence of the regime to Article III of the NPT. This means that, Mohamed ElBaradei *et al* could define the non-proliferation regime by its major components which were integrated in the Comprehensive Safeguards Agreements which is a Safeguards standard (reproduced as INFCIRC/153 (Corrected)) in 1972.

The NPT standing alone does not form a perfect legal system because of discrepancies such as non-compliance and avoidance. The NPT regime requires integral institutions to guarantee verification, controlling and enforcement mechanisms in order to realise its objectives. These institutions have been legally and voluntarily institutionalised by building

³²⁷ Held D, McGrew A, Goldblatt D, and Perraton J *Global Transformations: Politics, Economics and Culture* (2004) at 51.

³²⁸ Roger K. Smith “Explaining the non-proliferation regime: anomalies for contemporary international relations theory” (Vol. 41, No. 2 Spring, 1987) (253-28) *International Organization* at 257.

³²⁹ ElBaradei “International law and nuclear energy: overview...” at. 22.

³³⁰ *Ibid.*

up the regime to form the dynamic systems that define the Treaty goals, detect discrepancies, process correction, apply sanctions to force compliance, measure monitoring systems and modify goals. Integral institutions which can be found within the sphere of many institutions such as the IAEA Safeguards, NWFZs, MECRs, Comprehensive Nuclear-Test-Ban Treaty (CTBT),³³¹ etc. supplement the non-proliferation regime. That is to say, the non-proliferation regime includes many treaties, sub regimes such as MECRs, Safeguards which oversees regime-compliance, the IAEA which possesses the technical expertise and human resources required to maintain the objectives of the regime, the NPT which provides for legitimacy, and the UNSC which functions as a guarantor of this legal regime.

2.2.2.1 The Treaty on the Non-Proliferation of Nuclear Weapons (NPT)

The establishment of the IAEA in 1958 founded the nuclear legal construct in an emerging neoliberal world by focusing on the institutionalisation of the shared interests of participating states. The Irish initiative in the UN culminated in the adoption of Resolution 1380(XIV) on 20 November 1959 by the UNGA³³² focusing on the “prevention of the wider dissemination of nuclear weapons.”³³³ UNGA Resolution 1380(XIV) expressed the international shared interest which was focused on the elimination of the dangers inherited in further proliferation of nuclear power³³⁴ and concluded the agreement on the nonproliferation, by prohibiting NNWSs from manufacturing or otherwise acquiring control over nuclear weapons, and by prohibiting NWSs from transfer information necessary to manufacture them.³³⁵ This paved the way for UNGA Resolution 2028 (XX) on 19 November 1965 which called for negotiation to conclude an international treaty based on five principles:

“a) The treaty should be clean from any loop-holes which might permit NWSs or NNWSs to proliferate, directly or indirectly, nuclear weapons in any form.

³³¹ Comprehensive Nuclear-Test-Ban Treaty: Draft Resolution United Nations (6 September 1996) <http://www.fas.org/nuke/control/ctbt/text/ctbt1.htm>(access 15 July 2013). Hereafter referred to as CTBT.

³³² UNGA resolution 1380 (XIV) on 20 November 1959.

³³³ The title of UNGA resolution 1380 (XIV).

³³⁴ Shaker M *The Nuclear Non-Proliferation Treaty: Origin and Implementation (1959- 1979)* (1980) at 4.

³³⁵ *Ibid* at 30.

- b) The treaty should embody an acceptable balance of mutual responsibilities and obligations of both NWSs and NNWSs.
- c) The treaty should be a step towards the achievement of general and complete disarmament and, more particularly, nuclear disarmament.
- d) There should be acceptable and workable provisions to ensure the effectiveness of the treaty.
- e) Nothing in the treaty should adversely affect the right of any group of States to conclude regional treaties in order to ensure the total absence of nuclear weapons in their territories.”³³⁶

After hard negotiations within and outside the UN, the NPT materialised, establishing a comprehensive and legally binding framework which provides for the following:

1. The establishment of the U.S, Russia (formerly the USSR), the UK, France, and China as sanctioned NWSs because they have “manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January 1967.”³³⁷
2. The grouping of the rest of the states of the world which had not manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January 1967 in the category of NNWSs who must undertake not to acquire nuclear weapons.³³⁸
3. The acknowledgement of the “inalienable right of all the Parties to the Treaty to develop research, production and use of nuclear energy for peaceful purposes.”³³⁹
4. The requirement “to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control.”³⁴⁰

³³⁶ UNGA resolution 2028 (XX).

³³⁷ Article IX.3 of the NPT.

³³⁸ Article I and II of the NPT.

³³⁹ Article IV.1 of the NPT.

³⁴⁰ Article VI of the NPT.

5. The establishment of the Safeguards of the IAEA as an integral commitment of NNWSs party to the NPT.³⁴¹

The NPT entered into force in 1970 and was extended indefinitely in 1995. Several regional and bilateral and multilateral treaties have complemented the NPT. The NPT is intended to achieve quantifiable goals and qualitative objectives. The goals of the NPT intended to ensure that NNWSs do not manufacture, transfer, or receive of nuclear weapons.³⁴² The objectives of the NPT include the following:

- “Not in any way to assist, encourage, or induce any non-nuclear-weapon State to manufacture or otherwise acquire nuclear weapons.”³⁴³
- “Not to seek or receive any assistance in the manufacture of nuclear weapons.”³⁴⁴
- “Pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament.”³⁴⁵

The assessment of the NPT is based on goals and objectives which are evaluated during the treaty review conferences convened “at five-year intervals.”³⁴⁶ Of course these review conferences function as continuous mechanisms for stabilising the operation of the NPT by modifying its goals and objectives, dealing with non-compliance, and introducing enforcement measures. Further, the incorporation of the Safeguards in Article III of the NPT provides a mechanism to measure the performance of the NPT with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons.³⁴⁷

³⁴¹ Article III of the NPT.

³⁴² Avenhaus R and Kyriakopoulos N “conceptual framewrork” (14-37) in Avenhaus R and Kyriakopoulos N, Richard M and Stein G eds *Verifying Treaty Compliance: Limiting Weapons of Mass Destruction and Monitoring Kyoto Protocol Provisions* (2006) at 18.

³⁴³ Article I of the NPT.

³⁴⁴ Article II of the NPT.

³⁴⁵ Article VI of the NPT.

³⁴⁶ Article VIII.3 of the NPT.

³⁴⁷ The *ICJ Nuclear Advisory Opinion* at 837.

2.2.2.2 The Safeguards of the IAEA

The IAEA Safeguards³⁴⁸ establish a safety and security system which functions as an integral extension of the non-proliferation regime. The Safeguards are a technical tool which is sanctioned by the NPT to realise its non-proliferation and safety objectives. The Safeguards focus on ensuring that all “special fissionable and other materials, services, equipment, facilities, and information made available by the Agency or at its request or under its supervision or control are not used in such a way as to further any military purpose...”³⁴⁹

As it is technically well established that nuclear technology which is deployed for peaceful purposes can be diverted to serve military purposes,³⁵⁰ the international community has required the establishment of a verification system which ensures the non-diversion of nuclear technology. This requirement has its origin in Article 5(d) of the UNGA Resolution 1 which required the UNAEC to make a specific proposal “for effective safeguards by way of inspection and means to protect complying States against the hazards of violations and evasions.”

The development of the Safeguards system has found its way into a statutory mandate which requires the IAEA to ensure “that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose.”³⁵¹ The IAEA exercises the Safeguards control pursuant to a complex construct of legal normative rules and international agreements. The legal norms governing the functionality of the safeguards are intermixed with the IAEA statutory provisions as sanctioned by the NPT³⁵² and anchored in other five treaties establishing NWFZs.³⁵³

³⁴⁸ The dictionary definition of ‘safeguard’ is very wide “a proviso, stipulation, quality or circumstance, that tends to prevent something undesired.” The Concise Oxford Dictionary; Webster’s contains a similar but more general definition: “a precautionary measure, stipulation or device.”

³⁴⁹ Article III.5 of the IAEA Statute.

³⁵⁰ Section 1 of the USA Atomic Energy Act of 1954 (30 August 1954) declares that “atomic energy is capable of application for peaceful as well as military purposes...”

³⁵¹ Article II of the IAEA Statute.

³⁵² Article III of the NPT requires “non-nuclear-weapon State to conclude an agreement with the IAEA, in accordance with the IAEA’s Statute and its safeguards system, to enable the IAEA to verify the fulfilment of its

2.2.2.2.1 *The IAEA Statutory Provisions Governing the Safeguards*

The Statute of the IAEA prescribes the Safeguards as an agreement which is required to be concluded between the IAEA and NNWSs in accordance with Article III.1 of the NPT.³⁵⁴ The Safeguards bring about a statutory system which authorises the IAEA to develop legal and technical mechanisms intended to curb horizontal proliferation and maintain safety.³⁵⁵

The IAEA Statute provides the non-proliferation regime with a fundamental tool which authorises the IAEA

“To establish and administer safeguards designed to ensure that special fissionable and other materials, services, equipment, facilities, and information made available by the Agency or at its request or under its supervision or control are not used in such a way as to further any military purpose; and to apply safeguards, at the request of the parties, to any bilateral or multilateral arrangement, or at the request of a State, to any of that State's activities in the field of atomic energy.”³⁵⁶

The second statutory tool which can be used to enforce the non-proliferation regime is through the agreement concluded between the IAEA and any member or group of members desiring to develop atomic energy projects for peaceful purposes. When the member or group of members “request the assistance of the” IAEA “in securing special fissionable and other materials, services, equipment, and facilities necessary for this purpose,”³⁵⁷ the IAEA applies the Safeguards by way of “an agreement with the member or group of members

obligation not to develop, manufacture, or otherwise acquire nuclear weapons or other nuclear explosive devices”. See, *IAEA Safeguards: Staying Ahead of the Game* (July 2007) IAEA at 6.

³⁵³ See, *IAEA The Evolution of IAEA Safeguards* (November 1998) International Nuclear Verification Series no 2 at 4.

³⁵⁴ See, section 1 of INFCIRC/153 (Corr.) of 1972.

³⁵⁵ Correspondingly, the Euratom establishes regional safeguards system which is based on the Euratom Treaty which deals with safeguards in its Chapter 7. Since the introduction of cooperation principle between the Euratom and the IAEA, the Euratom safeguards system became an “integral part of the international regime of nuclear non-proliferation.” See, Sww, FAS: the Nuclear Information Project, Nuclear Non-Proliferation Treaty [NPT] chronology <http://www.fas.org/nuke/control/npt/chron.htm> (accessed 15 July 2013).

³⁵⁶ Article III.A.5 of the IAEA Statute.

³⁵⁷ Article XI.A of the IAEA Statute.

submitting the project.”³⁵⁸ The IAEA ensures that the agreement obliges “the member or group of members submitting the project.”³⁵⁹

- Not to use the assistance provided by the IAEA “in such a way as to further any military purposes.”³⁶⁰
- To subject the submitted project “to the safeguards provided for in article XII, the relevant safeguards being specified in the agreement.”³⁶¹

Further, the IAEA:

- Approves “the means to be used for the chemical processing of irradiated materials solely to ensure that this chemical processing will not lend itself to diversion of materials for military purposes.”³⁶²
- Requires “that special fissionable materials recovered or produced as a by-product be used for peaceful purposes under continuing Agency safeguards for research or in reactors, existing or under construction.”³⁶³
- Accounts “for source and special fissionable materials supplied and fissionable products.”³⁶⁴
- Determines “whether there is compliance with the undertaking against use in furtherance of any military purpose.”³⁶⁵
- Assesses the “correctness and completeness of the State’s declarations to the IAEA concerning nuclear material and nuclear-related activities.”³⁶⁶

The IAEA has been developing safeguards agreements since 1961 e.g. “INFCIRC/66-type safeguards agreements as the Inspectors’ Document, which was adopted by the IAEA Board

³⁵⁸ Article XI.A.F of the IAEA Statute.

³⁵⁹ Article XI.A.F.4 of the IAEA Statute.

³⁶⁰ Article XI.A.F.4 of the IAEA Statute.

³⁶¹ Article XI.A.F.4 of the IAEA Statute.

³⁶² Article XI.5 of the IAEA Statute.

³⁶³ Article XI.5 of the IAEA Statute.

³⁶⁴ Article XII.5 of the IAEA Statute.

³⁶⁵ Article XII.5 of the IAEA Statute.

³⁶⁶ IAEA Safeguards: Stemming the spread of nuclear weapons (2002) IAEA, page number omitted.

of Governors in 1961.”³⁶⁷ The authority to establish such a document is provided by Article III.A.5 which authorises the IAEA “to establish and administer safeguards under the following three conditions:

- “(i) To carry out the obligation established by Article II;
- (ii) To any bilateral or multilateral arrangement, at the request of the parties thereto; or
- (iii) To any nuclear activity of a State, at its request.”³⁶⁸

For example “the Government of the French Republic and the Government of the Republic of South Africa have requested the Agency to apply safeguards to the nuclear power station and to the nuclear material to be used therein;”³⁶⁹ namely “the Koeberg Nuclear Power Station Units I and II of 15 October 1976.”³⁷⁰ Article 1(g) of the agreement defines the "Safeguards Document" so as to mean “Agency document INFCIRC/66/Rev. 2.” The purpose of this document is to establish a system pursuant to Article II of the IAEA Statute which encourages the international cooperation in the fields of nuclear technology for peaceful purposes while the Safeguards system maintains the peaceful nature of this cooperation.

However, “the application of safeguards under most INFCIRC/66 type agreements has been suspended,”³⁷¹ as “most of the agreements under which the Agency applies safeguards are of the comprehensive type.”³⁷² The Comprehensive Safeguards Agreements are a Safeguards standard (reproduced as INFCIRC/153 (Corrected))³⁷³ which was established in 1972 as it became a requirement under the Treaty of Tlatelolco in 1967 and subsequently

³⁶⁷ IAEA *Safeguards Glossary: 2001 edition* (2001) IAEA at 6.

³⁶⁸ Szasz P *The Law and Practices of the International Atomic Energy Agency* (1970) IAEA Legal Series no.7 at 547.

³⁶⁹ The preamble of the Text of the Agreement of 5 January 1977 Between the Agency, France and South Africa for the Application of Safeguards in Respect of the Koeberg Nuclear Power Station (INFCIRC/244). <http://www.iaea.org/Publications/Documents/Infircs/Others/infirc244.pdf> (accessed 2 July 2013). Hereafter referred to as the INFCIRC/244.

³⁷⁰ Article 1(a) of the INFCIRC/244.

³⁷¹ Stoiber *Handbook on nuclear law* at 123.

³⁷² Para B.1.4 of the Safeguards System of the IAEA. http://www.iaea.org/safeguards/documents/safeg_system.pdf (accessed 30 June 2013).

³⁷³ INFCIRC/153 (Corr.) of 1972.

under the NPT in 1986. The INFCIRC/153 (Corrected) is suitable for application to both simple nuclear activities and complex nuclear fuel cycles, i.e. a system applicable to reactors and to conversion, enrichment, fabrication and reprocessing plants which produce and process reactor fuel.

For example, the South Africa's "installations under IAEA safeguards which were formerly inspected in accordance with an INFCIRC/66-type safeguards agreement" includes the following:³⁷⁴

- SAFARI-1 research reactor of the Atomic Energy Corporation located at Pelindaba.
- Hot cell complex of the Atomic Energy Corporation which came on line at Pelindaba.³⁷⁵
- Koeberg nuclear power reactor units 1 and 2 under the then Electricity Supply Commission.³⁷⁶

This has developed since South Africa signed the Comprehensive Safeguards Agreement (INFCIRC/153-type) in 1991 to include additional installations as follows:³⁷⁷

-Uranium conversion.

-Uranium hexafluoride (UF₆) production plant.

-Pilot highly enriched uranium (HEU) enrichment plant (Y-plant), now defunct HEU storage facility.

-HEU-UF₆ and metal/alloy production plant.

-HEU fuel fabrication plant.

-Semi-commercial low-enriched uranium (LEU) enrichment plant (Z-plant).

-MLIS laser enrichment R&D facility.

-LEU fuel fabrication plant.

-Natural uranium/depleted uranium metal plants.

³⁷⁴ Baeckmann A, Dillon G, and Perricos D "Nuclear verification in South Africa: verifying South Africa's declared nuclear inventory, and the termination of its weapons programme, was a complex task" (42-48) Vol 1 (1995) *IAEA Bulletin* at 43.

³⁷⁵ Masiza Z "A chronology of South Africa's nuclear program" (Fall 1993) *the Nonproliferation Review* at 43.

³⁷⁶ Baeckmann "Nuclear verification in South Africa..." at 43.

³⁷⁷ *Ibid.*

- Decontamination plants.
- Waste storage compound.
- Locations outside facilities.”³⁷⁸

Further development in the Safeguards system became inevitable as the experience of the IAEA in Iraq in 1991 and in the DPRK revealed the limitations of Safeguards³⁷⁹ as they concentrated on declared nuclear material only,³⁸⁰ simply, because the undeclared nuclear materials cannot be safeguarded. This forms a potential deficiency in the non-proliferation regime as a whole because the undeclared nuclear activities may be deployed to further nuclear weapons. In an attempt to remedy the deficiencies detected in the Safeguards system the IAEA Board of Governors approved the Model Protocol Additional to the Agreement(s) between State(s) and the IAEA for the Application of Safeguards, INFCIRC/540 (Corrected) in 1997³⁸¹ “in order to strengthen the effectiveness and improve the efficiency of the safeguards system as a contribution to global nuclear nonproliferation objectives.”³⁸²

Additional Protocol INFCIRC/540 requires the Safeguards agreement to apply as long as it is “relevant to and compatible with the provisions of the Protocol.”³⁸³ In a case of conflict between the provisions of the Safeguards Agreement and those of this Protocol, the provisions of the “Protocol shall apply.”³⁸⁴ The Additional Protocol is intended to remedy the inadequacies of the IAEA’s Safeguards regime by introducing “a qualitative system aimed at gathering a comprehensive picture of a state’s nuclear and nuclear-related activities, including all nuclear-related imports and exports.”³⁸⁵ The INFCIRC/540 introduces key changes by improving on the Safeguards by expanding the verification responsibilities of

³⁷⁸ *Ibid.*

³⁷⁹ *IAEA Safeguards: Staying Ahead of the Game* (July 2007) IAEA Vienna at 8.

³⁸⁰ *Ibid.*

³⁸¹ Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards, INFCIRC/540 (Corrected), IAEA Vienna (1997).

³⁸² See, Forward of the INFCIRC/540(Corrected).

³⁸³ Article 1 of the INFCIRC/540(Corrected).

³⁸⁴ Article 1 of INFCIRC/540 (Corrected).

³⁸⁵ Arms Control Association “The 1997 IAEA Additional Protocol at a glance” Updated 2012 <http://www.armscontrol.org/factsheets/IAEAProtoco> (accessed 30 June 2013).

both the IAEA and each state party, consequently minimising proliferation of nuclear weapons risks.

2.2.2.2.2 *The NPT Normative Rules Governing the Safeguards*

The NPT normative rules governing the Safeguards are based on “the principle of safeguarding effectively the flow of source and special fissionable materials by use of instruments and other techniques at certain strategic points”³⁸⁶ in order to curb the proliferation of nuclear weapons. This should be implemented in a manner designed to achieve the precepts of Article IV of the NPT. Further, when implementing the Safeguards the economic interest and technological development and any other nuclear achievement for civil purposes should not be hampered ³⁸⁷

The NPT requires only NNWSs party to accept the Safeguards. Article III.1 reads as follows:

“Each non-nuclear-weapon State Party to the Treaty undertakes to accept safeguards, as set forth in an agreement to be negotiated and concluded with the International Atomic Energy Agency in accordance with the Statute of the International Atomic Energy Agency and the Agency’s safeguards system, for the exclusive purpose of verification of the fulfilment of its obligations assumed under this Treaty with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices. Procedures for the safeguards required by this article shall be followed with respect to source or special fissionable material whether it is being produced, processed or used in any principal nuclear facility or is outside any such facility. The safeguards required by this article shall be applied to all source or special fissionable material in all peaceful nuclear activities within the territory of such State, under its jurisdiction, or carried out under its control anywhere.”

³⁸⁶ The preamble of the NPT.

³⁸⁷ Article III.4 of the NPT.

The NPT requires the NNWSs party to conclude the Safeguards agreement based on negotiations between the state or group of states with the IAEA.³⁸⁸ This is vital in order to give effect to Article III of the NPT which functions as an operative provision for XII of the IAEA Statute providing a legal mechanism for treaty verification and compliance in a single state or a group of states.

2.2.2.2.3 *The NWFZs Regulatory Frameworks Governing the Safeguards*

The norms stemming from the NWFZs have supported the nuclear non-proliferation regime, particularly the re-enforcement of the IAEA Safeguards system. The NWFZs function as regional barriers which halt the proliferation of nuclear weapons. The five NWFZs require the respective contracting parties to fulfil the objective of Article III.1 of the NPT:

- The Treaty of Tlatelolco requires “each Contracting Party” to “negotiate multilateral or bilateral agreements with the” IAEA “for the application of its safeguards to its nuclear activities.”³⁸⁹
- The Bangkok Treaty requires each state party to undertake “to support the continued effectiveness of the international non-proliferation system based on the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) and the IAEA safeguards system,”³⁹⁰ Further, Article 5 of the Bangkok Treaty requires that “each State Party which has not done so shall conclude an agreement with the IAEA for the application of full scope safeguards to its peaceful nuclear activities not later than eighteen months after the entry into force for that State Party of this Treaty.”
- The Treaty of Rarotonga requires in Article 4 each Party to undertake to give due regards to Article III.1 of the NPT and “to support the continued effectiveness of the international non-proliferation system based on the NPT and the IAEA safeguards system.”³⁹¹

³⁸⁸ Article III.4 of the NPT.

³⁸⁹ Article 13 of the Treaty of Tlatelolco.

³⁹⁰ Article 4(2)(d) of the Bangkok Treaty.

³⁹¹ Article 4(b) of Rarotonga Treaty.

- The Pelindaba Treaty re-enforces the Safeguards in Africa. The Pelindaba Treaty requires each party:
 - “to conclude a comprehensive safeguards agreement with the IAEA for the purpose of verifying compliance with the undertakings”³⁹²
 - “to conduct all activities for the peaceful use of nuclear energy under strict non-proliferation measures to provide assurance of exclusively peaceful uses.”³⁹³
- The Treaty on a Nuclear-Weapon-Free Zone in Central Asia (CANWFZ) incorporates the IAEA Safeguards in Article 8. Article 8 of the CANWFZ reads as follows:

“Each Party undertakes:

- (a) To use for exclusively peaceful purposes the nuclear material and facilities which are within its territory, under its jurisdiction, or under its control anywhere;
- (b) To conclude with the IAEA and bring into force, if it has not already done so, an agreement for the application of safeguards in accordance with the NPT (INFCIRC/153 (Corr.)), and an Additional Protocol (INFCIRC/540 (Corr.)) not later than 18 months after the entry into force of this Treaty;
- (c) Not to provide: (i) source or special fissionable material or (ii) equipment or material especially designed or prepared for the processing, use or production of special fissionable material, to any non-nuclear-weapon State, unless that State has concluded with the IAEA a comprehensive safeguards agreement and its Additional Protocol referred to in paragraph (b) of this article.”

The Safeguards are legally binding because it is the NPT norms which are accepted by the states members of the UN except for: India, Pakistan and Israel + the DPRK. However, the scope of the application of the Safeguards is still debatable. This is due to the fact that it

³⁹² Article 9(b) the Pelindaba Treaty.

³⁹³ Article 9(a) the Pelindaba Treaty.

does not extend to nuclear-weapon States. The wording of Article III.1 of the NPT can be construed that the IAEA Safeguards are designed to be applied to NNWSs only. Nevertheless, the “IAEA safeguards are a central element of the nuclear non-proliferation regime. This, in turn, is an essential component of the international security system.”³⁹⁴

2.2.2.3 Nuclear Weapons Non-Proliferation Normative Rules

The major powers failed to resolve the nuclear weapons issue. “Proposals to suspend nuclear weapons testing, to cease production of fissionable materials, to reduce nuclear weapons stockpiles, to increase inspection capabilities, and to study ways to prevent the expansion of the arms race into outer space” were never resolved in discussions in the UN Disarmament Commission.³⁹⁵ Instead, the NPT introduced the compromise whereby NNWSs denounced acquiring nuclear weapons. Further, the NPT required the cooperation between both NWSs and NNWSs paving the way for the emergence of legally binding norms which prohibit nuclear tests and the placement of nuclear weapons in the space or oceans and the establishment of NWFZs and voluntarily commitments which can be found in the MECRs.

2.2.2.3.1 The Prohibition of Nuclear Tests

Nuclear weapons tests including atmospheric, underground, exoatmospheric, and underwater tests have been carried out throughout the 20th century. Nuclear tests release very large amounts of radioactive materials into the environment generating adverse effects to people, property and the environment.³⁹⁶ For example, the USA conducted its first test of a dry fuel thermonuclear hydrogen bomb in November 1952 which led to enormous accidental radiological contamination generating environmental and health problems.³⁹⁷ On 1 March 1954 another blast took place on Bikini atoll in the Marshal Islands which “produced panic throughout the world. This was a bomb of unprecedented power, five times that of the 1952 device.”³⁹⁸ One of the Marshall Islands in the Pacific, where the

³⁹⁴ See, Forward by ElBaradei M in *IAEA Safeguards: Staying Ahead of the Game* (July 2007) at 11.

³⁹⁵ Gorman *Debates at the United Nations...* at 41-42.

³⁹⁶ Tomonaga M “Atomic bomb casualty: experiences from Hiroshima” (144-151) in Taipale I ed *War or Health: A Reader* (2001) at 148.

³⁹⁷ Olson R *Homework Helpers: From Reconstruction through the Dawn of the 21st Century* (2007) at 182.

³⁹⁸ Ellwood R *The Fifties Spiritual Marketplace: American Religion In A Decade of Conflict* (1997) at 125.

detonation took place, completely vaporised.³⁹⁹ The fallout from the detonation unexpectedly poisoned 28 United States personnel and 236 islanders and the crew of the Japanese fishing boat (Daigo Fukuryū Maru).⁴⁰⁰

“Parliamentary outrage, even terror, was expressed in several capitals. Prime, Minister Churchill to the House of Commons, in a voice cracking with intensity, stated that the atomic worries ‘fill my mind out of all comparison with anything else,’ and in India Prime Minister Nehru called for a worldwide disarmament conference.”⁴⁰¹

The pressure of the international community focused on the creation of a moratorium on nuclear testing from 1958 to 1961, which ended with tests by the USSR.⁴⁰² The Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water (the Partial Test-Ban Treaty) was concluded and entered into force in 1963.⁴⁰³ Article 1 of the Treaty requires

“each of the Parties to...undertake to prohibit, to prevent, and not to carry out any nuclear weapon test explosion, or any other nuclear explosion, at any place under its jurisdiction or control:”⁴⁰⁴

- (a) in the atmosphere, beyond its limits, including outer space; or under water, including territorial waters or high seas.”

Although nuclear norms prohibiting nuclear tests seem to have prevailed, the USA, USSR, UK, France, China, India, Pakistan, Israel, South Africa, and recently, the DPRK have tested various nuclear weapons devices. However, the nuclear rivalry during the cold war had been the core business of the USA and USSR. The two countries signed the Treaty on the Limitation of Underground Nuclear Weapon Tests (the Threshold Test-Ban Treaty) on 11

³⁹⁹ Clifford E, Kett J, Halttunen K, and Salisbury N *The Enduring Vision: A History of the American People: Since 1865* (2010) 7th edition vol 2 at 806.

⁴⁰⁰ Ellwood R *The Fifties Spiritual Marketplace...* at 125.

⁴⁰¹ *Ibid.*

⁴⁰² Simões A “Nuclear power” (400-404) in Rothenberg M *History of Science in the United States* (2001) at 403.

⁴⁰³ The Partial Test-Ban Treaty was signed by the Original parties including the USSR, the United Kingdom and Northern Ireland, and the United States. The Treaty entered into force on 10 October, 1963.

⁴⁰⁴ Article 1 of the Partial Test-Ban Treaty.

February 1971,⁴⁰⁵ by which they declared “their intention to achieve at the earliest possible date the cessation of the nuclear arms race and to take effective measures toward reductions in strategic arms, nuclear disarmament, and general and complete disarmament under strict and effective international control.”⁴⁰⁶ Further, the two countries recognised the need to establish an appropriate agreement to assure that underground nuclear explosions for peaceful purposes do not diverse into nuclear weapons. Accordingly they signed the Treaty on Underground Nuclear Explosions for Peaceful Purposes (the Peaceful Nuclear Explosions Treaty) in 1967.⁴⁰⁷

The international community’s endeavour to restrict the proliferation of nuclear weapons and to limit the dangers of irradiation of nuclear materials resulting from nuclear tests succeeded with the adoption of the CTBT in 1996.⁴⁰⁸ The States Parties to the Treaty welcome “the international agreements and other positive measures of recent years”...“in the field of the prevention of nuclear proliferation in all its aspects.”⁴⁰⁹ They further recognise:

“That the cessation of all nuclear weapon test explosions and all other nuclear explosions, by constraining the development and qualitative improvement of nuclear weapons and ending the development of advanced new types of nuclear weapons, constitutes an effective measure of nuclear disarmament and non-proliferation in all its aspects.”⁴¹⁰

Article 1 of the CTBT creates obligations on states parties as follows:

⁴⁰⁵ The Treaty Between the United States of America and the USSR on the Limitation of Underground Nuclear Weapon Tests was signed at Moscow July 3, 1974, ratified December 8, 1990 and entered into force December 11, 1990. <http://www.state.gov/t/isn/5204.htm#treaty> (accessed 15 July 2013).

⁴⁰⁶ See, the preamble of the Threshold Test-Ban Treaty.

⁴⁰⁷ The Peaceful Nuclear Explosions Treaty was signed at Washington and Moscow May 28, 1976 and Entered into force (11 December 1990). <http://www.armscontrol.org/documents/pnet> (accessed 15 July 2013).

⁴⁰⁸ CTBT Draft Resolution.

⁴⁰⁹ The preamble of the CTBT.

⁴¹⁰ *Ibid.*

- “1. Each State Party undertakes not to carry out any nuclear weapon test explosion or any other nuclear explosion, and to prohibit and prevent any such nuclear explosion at any place under its jurisdiction or control.
2. Each State Party undertakes, furthermore, to refrain from causing, encouraging, or in any way participating in the carrying out of any nuclear weapon test explosion or any other nuclear explosion.”

The prohibition of nuclear tests was emphasised in the NWFZs treaties.⁴¹¹ Article 6 of the Treaty of Rarotonga, prevents testing of any nuclear explosive devices in states party’s territories⁴¹² or assisting or encouraging “the testing of any nuclear explosive device by any State.”⁴¹³ Article 5 of the Pelindaba Treaty, Article 3 of Bangkok treaty have similar applications entrenched in Article 6 of the Treaty of Rarotonga.

2.2.2.3.2 *The Prohibition of Placement of Nuclear Weapons in the Space or Ocean*

The prohibition of placing in orbit around the earth any objects carrying nuclear weapons was proposed by the USA as an international verification of the testing of space objects which was intended to be modeled on the Antarctica Treaty. The draft treaties submitted by the USA and the USSR on 16 June 1966 appeased the international community as they declared the “intention not to station in outer space any objects carrying nuclear weapons.”⁴¹⁴ Consequently, the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (the Outer Space Treaty)⁴¹⁵ was approved by UNGA Resolution 1884 (XVIII) 19 December 1966. Article IV requires “States Parties to the Treaty” to “undertake not to place in orbit around the Earth any objects carrying nuclear weapons...”

⁴¹¹ It is important to note that the Tlatelolco does not have test-ban provisions because it was drafted before the test ban Treaties were adopted.

⁴¹² Article 6(a) of the Treaty of Rarotonga.

⁴¹³ Article 6(b) of the Treaty of Rarotonga.

⁴¹⁴ UNGA resolution 1884 (XVIII), Question of general and complete disarmament, adopted in the 1244th plenary meeting on 17 October 1963. <http://www.un-documents.net/a18r1884.htm> (accessed 15 July 2013).

⁴¹⁵ The Outer Space Treaty was signed by the United States, the United Kingdom, and the USSR on 27 January 1967 and entered into force on 10 October 1967. South Africa signed the treaty on 03/01/67 and deposited the ratification on 09/30/68. Hereafter referred to as the Outer Space Treaty.

The prohibition of any placement of nuclear weapons on the seabed and the ocean floor and in the subsoil thereof was examined by the UNGA in 1967 which underlined “the high seas beyond the limits of present national jurisdiction, and the use of their resources in the interest of mankind.”⁴¹⁶ The Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Sea-Bed and the Ocean Floor and in the Subsoil Thereof (Sea-Bed Treaty)⁴¹⁷ became the product of the international community aspiration to reserve “the seabed and the Ocean floor beyond the territorial waters exclusively for peaceful purposes.” Article I of the Sea-Bed Treaty requires States Parties to the Treaty to “undertake not to emplant or emplace on the seabed and the ocean floor and in the subsoil thereof beyond the outer limit of a sea-bed zone, as defined in article II, any nuclear weapons...”

The norms prohibiting placement of nuclear weapons in the ocean have been re-emphasised in the NWFZs treaties. For example Article 5 of the Treaty of Rarotonga requires states party to prevent “in its territory the stationing of any nuclear explosive device.”⁴¹⁸ Article 4 of the Pelindaba treaty and Article 3(1)(b) of the Bangkok treaty have similar applications entrenched in Article 5 of the Treaty of Rarotonga.

2.2.2.3.3 *The Establishment of NWFZs*

The establishment of NWFZs⁴¹⁹ has developed as “a regional approach to strengthen global nuclear non-proliferation and disarmament norms and consolidate international efforts

⁴¹⁶ Para 32 of Special report of the Conference of the Committee on Disarmament, Comprehensive Study of the Question of Nuclear-Weapon-Free Zones in All its Aspects, UNGA, Thirtieth session, Agenda item 44 (8 October 1975).

⁴¹⁷ Sea-Bed Treaty was opened for signature on 11 February 1971 and entered into force on 18 May 1972. Hereafter referred to as the Sea-Bed Treaty)

⁴¹⁸ Article 5(1) of the Treaty of Rarotonga.

⁴¹⁹ Article 1(1)(A) of the UNGA resolution 3472 B of 1975 defines a NWFZ as:

“...any zone recognized as such by the General Assembly of the United Nations, which any group of States, in the free exercises of their sovereignty, has established by virtue of a treaty or convention whereby:

- (a) The statute of total absence of nuclear weapons to which the zone shall be subject, including the procedure for the delimitation of the zone, is defined;

towards peace and security.”⁴²⁰ The genesis of NWFZs lies in the UNGA Resolution 2028 (XX) on 19 November 1965. Article 2(e) of the Resolution recognises “the right of any group of States to conclude regional treaties in order to ensure the total absence of nuclear weapons in their territories.” This has reflected in Article VII of the NPT which recognises “the right of any group of States to conclude regional treaties in order to assure the total absence of nuclear weapons in their respective territories.”⁴²¹ The establishment of NWFZs has been encouraged and considered as “an important disarmament measure.”⁴²² Throughout the 20th century four NWFZs have been established including the Treaty of Tlatelolco, the Treaty of Rarotonga, the Bangkok Treaty), and the Pelindaba Treaty. Add to that the call of the establishment of Middle East nuclear weapon free zone (MENWFZ).

2.2.2.3.3.1 The Treaty of Tlatelolco

This Treaty was opened for Signature on 14 February 1967⁴²³ as a leading example of “the establishment of militarily denuclearized zones” which “is closely linked with the maintenance of peace and security in the respective regions.”⁴²⁴

The treaty provides a definition of nuclear weapons as follows:

“...a nuclear weapon is any device which is capable of releasing nuclear energy in an uncontrolled manner and which has a group of characteristics that are appropriate for use for warlike purposes. An instrument that may be used for the transport or

(b) An international system of verification and control is established to guarantee compliance with the obligations deriving from that statute.”

See, UNGA resolution on 11 September 1975.

⁴²⁰ United Nations Office for Nuclear Disarmament Affairs (UNODA), Nuclear-Weapons-Free-Zones <http://www.un.org/disarmament/WMD/Nuclear/NWFZ.shtml> (accessed 15 July 2013).

⁴²¹ Article VII of the NPT.

⁴²² Para III.60 of the Final Document of the 10th Special Session of the UNGA on the Report of the Ad Hoc Committee which was adopted by resolution S-10/2 on 30 June 1978.

⁴²³ The Tlatelolco Treaty was entered into Force on 25 April 1969.

⁴²⁴ The preamble of the Treaty of Tlatelolco.

propulsion of the device is not included in this definition if it is separable from the device and not an indivisible part thereof.”⁴²⁵

These nuclear weapons have terrible effects which make military forces and civilian population suffer, indiscriminately and inexorably. They “constitute, through the persistence of the radioactivity they release, an attack on the integrity of the human species and ultimately may even render the whole earth uninhabitable.”⁴²⁶ Therefore, the Treaty of Tlatelolco is intended to establish measures which protect people “against possible nuclear attacks on their territories,” contribute “towards preventing the proliferation of nuclear weapons,” and form “a powerful factor for general and complete disarmament.”⁴²⁷

The Treaty of Tlatelolco does not deviate from the three legged approach of the NPT creating obligations on the contracting parties:

- To use nuclear materials and facilities exclusively for peaceful purposes.
- “To prohibit and prevent states party to the treaty from...testing, use, manufacture, production or acquisition... receipt, storage, installation, deployment and any form of possession of any nuclear weapons” in their respective territories.
- To establish a control system “for the purpose of verifying compliance with the obligations entered into by the Contracting Parties in accordance with Article 1...”⁴²⁸
- And to uphold IAEA safeguards.⁴²⁹

However, the Treaty of Tlatelolco does not ban nuclear tests as the Treaty of Rarotonga does. Instead it creates legal obligations on the “Contracting Parties to carry out explosions of nuclear devices for peaceful purposes...”⁴³⁰

⁴²⁵ Article 5 of the Treaty of Tlatelolco.

⁴²⁶ The preamble of the Treaty of Tlatelolco.

⁴²⁷ The preamble of the Treaty of Tlatelolco.

⁴²⁸ Article 12 of the Treaty of Tlatelolco.

⁴²⁹ Article 13 of the Treaty of Tlatelolco.

⁴³⁰ Article 18 of the Treaty of Tlatelolco.

2.2.2.3.3.2 *The Treaty of Rarotonga*

The Treaty of Rarotonga reaffirms “the importance of the ...NPT in preventing the proliferation of nuclear weapons and in contributing to world security.”⁴³¹ Further, the Treaty notes “that the prohibition of testing of nuclear weapons in the atmosphere or under water, including territorial waters or high seas, contained in the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water applies in the South Pacific.”⁴³²

The Treaty and its three protocols establish legal frameworks which are interwoven between legal obligations on states party and a call for NWSs “not to use or threaten to use nuclear explosive devices against any Party to the Treaty”⁴³³ and “not to test nuclear explosive devices within the zone established by the Treaty.”⁴³⁴ The legal obligations which emanate from the Treaty do not deviate from international norms governing nuclear energy development and its ramifications. They can be summarised as follows:

- The renunciation of nuclear explosive devices⁴³⁵ in line with articles 1 and 2 of the NPT.
- The prevention of testing of nuclear explosive devices⁴³⁶ in line with the international efforts to introduce restrictions on nuclear testing.
- The promotion of the non-proliferation system which is based on the NPT and the IAEA safeguards system.⁴³⁷
- The prevention of stationing of nuclear explosive devices in the ocean⁴³⁸ in line with the Sea-Bed Treaty.

⁴³¹ The preamble of the Treaty of Rarotonga.

⁴³² The preamble of the Treaty of Rarotonga.

⁴³³ Protocol 3 to the Treaty of Rarotonga

⁴³⁴ Protocol 3 to the Treaty of Rarotonga.

⁴³⁵ Article 3 of the Treaty of Rarotonga.

⁴³⁶ Article 6 of the Treaty of Rarotonga.

⁴³⁷ Article 4 of the Treaty of Rarotonga.

⁴³⁸ Article 5 of the Treaty of Rarotonga.

- The prevention of dumping⁴³⁹ of radioactive waste in the territorial zone including the territorial sea in line with the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter.⁴⁴⁰

2.2.2.3.3.3 *The Bangkok Treaty*

The Bangkok Treaty was opened for signature at the treaty conference in Bangkok on 15 December 1995 and entered into force on 28 March 1997. It has been considered an important component of the Zone of Peace, Freedom and Neutrality (ZOPFAN)⁴⁴¹ which contributes “towards strengthening the security of States within the Zone and preventing the proliferation of nuclear weapons and towards enhancing international peace and security as a whole.”⁴⁴²

The Bangkok Treaty creates similar normative rules to those in the Rarotonga Treaty. However, it goes further to include a provision on early notification of a nuclear accident,⁴⁴³ and also the establishment of the Commission for the Southeast Asian Nuclear-Weapon-Free Zone (SEANWFZ).⁴⁴⁴

2.2.2.3.3.4 *The Pelindaba Treaty*

The attempt to denuclearise Africa can be traced back to the UNGA Resolution 1652 (XVI) in 1961 which called all member states to:

⁴³⁹ Article 7 of the Treaty of Rarotonga.

⁴⁴⁰ Article XII of the Convention creates legal “measures to protect the marine environment against pollution caused by:” (d) “radio-active pollutants from all sources, including vessels.” “The Convention...was drawn up at the Inter-Governmental Conference on the Dumping of Wastes at Sea, held in London from 30 October to 10 November 1972.” <http://www.iaea.org/Publications/Documents/Infcircs/Others/inf205.shtml> (accessed 15 July 2013).

⁴⁴¹ The Bangkok Treaty recalls the Declaration of the Zone of Peace, Freedom and Neutrality (ZOPFAN) which was signed in Kuala Lumpur on 27 November 1971. See, the 1971 Zone of Peace, Freedom and Neutrality Declaration.

⁴⁴² The preamble of the Treaty of Rarotonga.

⁴⁴³ Article 6 of the Bangkok Treaty.

⁴⁴⁴ Article 8 of the Bangkok Treaty.

- a. refrain from carrying out or continuing to carry out in Africa nuclear tests in any form;
- b. to refrain from using the territory, territorial waters or air space of Africa for testing, storing or transporting nuclear weapons;
- c. to consider and respect the continent of Africa as a denuclearized zone.”⁴⁴⁵

The idea of a denuclearisation of Africa is based on “the original idea of nuclear-weapons-free Africa - the 1964 OAU Declaration on the Denuclearization of Africa.”⁴⁴⁶ In “the First Ordinary Session of the Assembly of the Organization of African Unity, in Cairo, UAR, from 17 to 21 July 1964, the Heads of African State and Government solemnly declared “their readiness to undertake in an International Treaty to be concluded under the auspices of the United Nations not to manufacture or acquire control of nuclear weapons.”⁴⁴⁷ The UNGA Resolution 45/56 on 4 December 1990 “reaffirms that the implementation of Declaration on the denuclearization of Africa”⁴⁴⁸ and “strongly renews its call that upon all states to consider and respect the continent of Africa and its surrounding areas as a nuclear-weapons-free zone.”⁴⁴⁹ In terms of the UNGA Resolution 46/34B, the Secretary-General was required to in consult with Organization of African Unity in order “to take appropriate action to enable the group of experts designated by the United Nations in cooperation with the Organization of African Unity to meet during 1992, in order to complete its work as indicated in paragraph 37 of its, and to submit the report of the group of experts to the General at its for seventh session.”⁴⁵⁰ Consequently, the Pelindaba Treaty was opened for signature on 11 April 1996 and entered into force on 15 July 2009.

Protocol II to the Pelindaba Treaty states that the Treaty was

⁴⁴⁵ UNGA resolution 1652 (XVI) on Consideration of Africa as a denuclearized zone, 1063rd plenary meeting (24 November 1961).

⁴⁴⁶ See, the Summary Report on Duty to Travel to Addis Ababa, 6-10 May 1991 by Jankowitsch who attended as an observer the meeting on the Implementation on the Denuclearisation of Africa.

⁴⁴⁷ Article 1 of the Denuclearization Of Africa (Organization Of African Unity Resolution 11(1), 1964) Adopted on 17 to 21 July 1964.

⁴⁴⁸ Article 2 of UNGA Resolution 45/56 of 1990.

⁴⁴⁹ Article 1 of UNGA Resolution 45/56 of 1990.

⁴⁵⁰ Article 4 UNGA resolution 46/34B of 1991.

“...negotiated and signed in accordance with the Declaration on the Denuclearization of Africa (AHG/Res. 11(1) of 1964, resolutions CM/Res. 1342(LIV) of 1991 and CM/Res. 1395(LVI)/Rev. 1 of 1992 of the Council of Ministers of the Organization of African Unity and United Nations General Assembly resolution 48/86 of 16 December 1993, constitutes an important measure towards ensuring the non-proliferation of nuclear weapons, promoting cooperation in the peaceful uses of nuclear energy, promoting general and complete disarmament, and enhancing regional and international peace and security.”

The Pelindaba Treaty is in line with the other NWFZs treaties as it creates a legal framework which prohibits testing of nuclear explosive devices⁴⁵¹ and prevents stationing them in the outer space or in the ocean.⁴⁵² However, it is possible to trace the development of nuclear normative rules in the text of the Treaty and its African particularities which can be summarised as follows:

- The requirement to declare any capability for the manufacture of nuclear explosive devices.⁴⁵³
- The requirement to dismantle and destroy of any nuclear device that it has manufactured prior to the coming into force of the Treaty.⁴⁵⁴
- The requirement “to destroy facilities for the manufacture of nuclear explosive devices or, where possible, to convert them to peaceful uses.”⁴⁵⁵
- The permission of the IAEA and “the Commission established in article 12 to verify the processes of dismantling and destruction of the nuclear explosive devices, as well as the destruction or conversion of the facilities for their production.”⁴⁵⁶
- Providing for adherence to the norms of the CPPNM.⁴⁵⁷

⁴⁵¹ Article 5 of the Pelindaba Treaty.

⁴⁵² Article 4 of the Pelindaba Treaty.

⁴⁵³ Article 3(a) of the Pelindaba Treaty.

⁴⁵⁴ Article 3(b) of the Pelindaba Treaty.

⁴⁵⁵ Article 3(c) of the Pelindaba Treaty.

⁴⁵⁶ Article 3(d) of the Pelindaba Treaty.

⁴⁵⁷ Article 10 of the Pelindaba Treaty.

- Providing for mechanisms intended to prohibition of armed attack on nuclear installations.⁴⁵⁸
- The establishment of the permanent nature of legal norms as it is reflecting the indefinite nature of the NPT.⁴⁵⁹

2.2.2.3.3.5 *The Central Asian Nuclear Weapon Free Zone (CANWFZ)*

The CANWFZ Treaty is a legally binding commitment by “the Republic of Kazakhstan, the Kyrgyz Republic, the Republic of Tajikistan, Turkmenistan and the Republic of Uzbekistan.”⁴⁶⁰ The treaty was signed on 8 September 2006 and entered into force on 21 May 2009. The Treaty is intended to establish a Central Asian Nuclear-Weapon-Free Zone which strengthens “the nuclear nonproliferation regime,” promotes “cooperation in the peaceful uses of nuclear energy,” promotes “cooperation in the environmental rehabilitation of territories affected by radioactive contamination”, and enhances “regional and international peace and security.”⁴⁶¹ The Treaty offers detailed definitions for nuclear weapons, stationing, nuclear materials, radioactive waste, and nuclear facilities.⁴⁶² Article 3 of the Treaty articulates the basic obligations which are in line with other NWFZs and the precept of the non-proliferation regime. Nevertheless, Article 5 of the Treaty obliges the parties to undertake,

“in accordance with the CTBT:

- (a) Not to carry out any nuclear weapon test explosion or any other nuclear explosion;
- (b) To prohibit and prevent any such nuclear explosion at any place under its jurisdiction or control;

⁴⁵⁸ Article 12 of the Pelindaba Treaty.

⁴⁵⁹ Article 6 of Protocol II and Article 6 of protocol III to the Pelindaba Treaty consider that the respective protocols are “of a permanent nature and shall remain in force indefinitely...” <http://www.iaea.org/Publications/Documents/Treaties//pelindaba.html> (accessed 15 July 2013).

⁴⁶⁰ Article 1.a of the CANWFZ .

⁴⁶¹ Para 4 of the CANWFZ .

⁴⁶² Article 1 of the CANWFZ .

- (c) To refrain from causing, encouraging, or in any way participating in the carrying out of any nuclear weapon test explosion or any other nuclear explosion.”

2.2.2.3.4 The Multilateral Export Control Regimes (MECRs)

The establishment of MECRs can be understood as a direct application of Article III.2 of the NPT which reads as follows:

“Each State Party to the Treaty undertakes not to provide: (a) source or special fissionable material, or (b) equipment or material especially designed or prepared for the processing, use or production of special fissionable material, to any non-nuclear-weapon State for peaceful purposes, unless the source or special fissionable material shall be subject to the safeguards required by this Article.”

The Australia Group, Missile Technology Control Regime (MTCR), Nuclear Suppliers Group (NSG), Wassenaar Arrangement (WA), and Zangger Committee are the main informal export control regimes. The function of these regimes supplements the non-proliferation regime⁴⁶³ by establishing “multilateral norms and standards among major suppliers” which govern the “transfer of sensitive military and WMD-related items.”⁴⁶⁴ Fundamentally, these standards are based upon the commitment of major suppliers of nuclear materials not to export “source or special fissionable material to any non-nuclear-weapon State for peaceful purposes unless the source or special fissionable material is subject to safeguards under an agreement with the IAEA.”⁴⁶⁵

⁴⁶³ Anderson B and Thagaard M “The 11th Commandments” (150-167) in Joyner D ed *Non-Proliferation Export Controls: Origins, Challenges, and Proposals for Strengthening* (2006) at 153.

⁴⁶⁴ Beck M and Gahlaut S “Introduction to nonproliferation export controls” (1-23) in Beck M, Cupitt R, Gahlaut S, and Jones s eds *To Supply or to Deny: Comparing Nonproliferation Export Controls in Five Key Countries* (2003) at 4.

⁴⁶⁵ Communications of 15 November 1999 received from member states regarding the export of nuclear material and of certain categories of equipment and other material, INFCIRC/209/Rev.2,IAEA (9 March 2000) at 2. <http://www.iaea.org/Publications/Documents/Infcircs/2000/infcirc209r2.pdf> (accessed 10 May 2013).

2.2.2.3.4.1 *The Zangger Committee*

In 1971 a number of nuclear supplier⁴⁶⁶ states held “a series of informal meetings in Vienna chaired by Professor Claude Zangger of Switzerland.”⁴⁶⁷ The states reached a common understanding on two issues:

1. The definition of what constitutes source or special fissionable material as entrenched in Article 3(2)(a) of the NPT and what are the “equipment or material especially designed or prepared for the processing, use or production of special fissionable material” which “shall be subject to the safeguards when exported “to any non-nuclear-weapon State...” as entrenched in article 3(2)(b) of the NPT.⁴⁶⁸
2. Establishing guidelines and standards which would regulate the export of source material and special fissionable material in order to comply with article 3(2) of the NPT.⁴⁶⁹

The Zangger Committee establishes the definition and the detailed list about source and special fissionable material which is required to be controlled by the NPT. This has a reference in a communiqué including memorandums A and B which was received on 22 August 1974 by the Director General of IAEA:

- Memorandum A defines source and special fissionable material and applies the safeguards on them when directly exported or retransferred.
- Memorandum B contains a list which is called the Trigger List because the export of listed items triggers IAEA safeguards.

⁴⁶⁶ This group of nuclear suppliers was known as the NPT Exporters Committee which became “the Zangger Committee after its first Chair, Claude Zangger.” See, MacLean F “Nuclear Export Controls” (32-37) No 40 (December 2008) *ESARDA Bulletin* at 32.

⁴⁶⁷ Zangger Committee “History” <http://www.zanggercommittee.org/History/Seiten/default.aspx> (accessed 10 May 2013).

⁴⁶⁸ MacLean “Nuclear Export Controls” at 32.

⁴⁶⁹ *Ibid.*

The Trigger List functions as an alert which requires the governments of the Zangger Committee to ensure the following:

- Imposing the application of safeguards in non-nuclear-weapon States which are not party to the NPT in order to prevent the “diversion of the safeguarded nuclear material from peaceful purposes to nuclear weapons or other nuclear explosive devices.”⁴⁷⁰
- Imposing a condition which prohibits the recipient state of the source or special fissionable material, or special fissionable material produced in or by the use thereof from diverting them to nuclear weapons or other nuclear explosive devices.⁴⁷¹
- Satisfy themselves that safeguards system will be applied on these materials under an agreement with the IAEA.⁴⁷²

2.2.2.3.4.2 *The NSG*

The NSG was created after India, which is a non-nuclear-weapon state, conducted its first nuclear detonation on 18 May 1974.⁴⁷³ The Indian nuclear test exposed the potential misuse of nuclear technology which is transferred for peaceful purposes. The NSG which comprises of 46 members and observers including the European Commission and the Chair of the Zangger Committee is intended to curb amongst other things the diversion of the transferred nuclear materials for peaceful purposes into military ends.⁴⁷⁴

The NSG member states adhere to guidelines for nuclear transfers which embodied in Communication Received from Certain Member States Regarding Guidelines for the Export of Nuclear Material, Equipment or Technology on 11 January 1978. These guidelines form

⁴⁷⁰ Para 3 of the Communication Received from Members Regarding the Export of Nuclear Material and of Certain Categories of Equipment and other Material (3 September 1974) IAEA, Information Circular INFCIRC/209. Hereafter referred to as the INFCIRC/209.

⁴⁷¹ Para 3(a) of INFCIRC/209.

⁴⁷² Para 3(b) of INFCIRC/209.

⁴⁷³ Indian first nuclear test was at Pokhran in 1974.

⁴⁷⁴ See, NSG <http://www.nuclearsuppliersgroup.org/Leng/03-member.htm> (accessed 10 May 2013).

the “fundamental principles for safeguards and export controls” which “apply to nuclear transfers to any non-nuclear-weapon State for peaceful purposes.”⁴⁷⁵

The guidelines establish control mechanisms over a Trigger List including an Annex which consists of part A and B.

- Part A deals with material and equipment including source or special fissionable material as defined in article XX of the Statute of the IAEA.⁴⁷⁶
- Part B sets common criteria for technology transfers. The IAEA safeguards are triggered when transferring any equipment or technology entrenched in annex A obliging the transferor government to maintain that:
 - (1) “IAEA safeguards apply to any facilities of the same type (i.e. if the design, construction or operating processes are based on the same or similar physical or chemical processes, as defined in the trigger list) constructed during an agreed period in the recipient country.”⁴⁷⁷
 - (2) “There should at all times be in effect a safeguards agreement permitting the IAEA to apply Agency safeguards with respect to such facilities identified by the recipient, or by the supplier in consultation with the recipient, as using transferred technology.”⁴⁷⁸

2.2.2.3.4.3 *The Wassenaar Arrangement (WA)*

The Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies comprises 33 founding member states.⁴⁷⁹ These states voluntarily have

⁴⁷⁵ Para 1 of the appendix of the Communication Received from Certain Member States Regarding Guidelines for the Export of Nuclear Material, Equipment or Technology on 11 January 1978” IAEA INFCIRC/254. Hereafter referred to as INFCIRC/254.

⁴⁷⁶ para 1 of Annex A IAEA INFCIRC/254.

⁴⁷⁷ para 5(b) of the appendix IAEA INFCIRC/254.

⁴⁷⁸ *Id.*

⁴⁷⁹ Government of the UK, Department for Business, Innovation and Skills “International non-proliferation and arms control regimes: overview about agreements, conventions and treaties which impact on the UK’s strategic export control policy and legislation” (Published 12 December 2012).

agreed to maintain domestic export controls which are implemented via national legislation on listed items.⁴⁸⁰ This means that these states should enact laws intended to prohibit further proliferation of nuclear weapons by means of a legislation which enables controls to be “imposed on the exportations of goods, the transfer of technology, the provision of technical assistance overseas and activities connected with trade in controlled goods; and for connected purposes.”⁴⁸¹

The Wassenaar Arrangement agreed to maintain control lists of both military and of dual-use goods and technologies.⁴⁸² The novel issue of the Arrangement lies in the requirement to “maintain non-proliferation policies and appropriate national laws” by the participant states.⁴⁸³ For example, “Argentina has implemented a strict control upon international transfers of certain materials, equipment, technology, technical assistance and services of a nuclear and missilistic nature.”⁴⁸⁴ Likewise, the United Kingdom’s implementation of the military goods controls agreed under the Wassenaar Arrangement is achieved through the Export Control Order 2008.⁴⁸⁵

<https://www.gov.uk/international-non-proliferation-and-arms-control-regimes#wassenaar-arrangement> (accessed 10 May 2013).

⁴⁸⁰ “How does the Wassenaar Arrangement work?” Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies <http://www.wassenaar.org/introduction/howitworks.html> (accessed 10 May 2013).

⁴⁸¹ Government of the UK, Department for Business, Innovation and Skills <https://www.gov.uk/international-non-proliferation-and-arms-control-regimes#zangger-committee> (accessed 10 May 2013).

⁴⁸² See, *The Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies: List of dual-use goods and technologies and munitions list*, WA-LIST (12) 1, (12-12-2012). <http://www.wassenaar.org/controllists/2012/WA-LIST%20%2812%29%201/WA-LIST%20%2812%29%201.pdf> (accessed 10 May 2013).

⁴⁸³ Deller N “The prevention of prosecution of terrorist acts: a survey of multilateral instruments” 414-449) in Shlman M and Silkenat J eds *The Imperial Presidency and the Consequences of 9/11* (2007) 1st ed at 435.

⁴⁸⁴ Racana R, Clein D, Rodríguez C, Nollmann C, Tellería D, and Moreno S “Approach of the nuclear regulatory authority of Argentina towards nuclear security” (73-84) in *Nuclear Security: Global Directions for the Future* (2005) Proceedings of an international conference London (16–18 March 2005) at 78.

⁴⁸⁵ See the UK Export Control Act of 2002 and the Export of Radioactive Sources (Control) Order 2006.

2.2.2.3.4.4 *The Missile Technology Control Regime (MTCR)*

The MTCR was established in 1987 as an informal and voluntary association of 34 countries which have a shared interest in building a regime to control the proliferation “of unmanned delivery systems capable of delivering weapons of mass destruction”⁴⁸⁶ i.e., nuclear. This can be construed within the objectives of the NPT which aspire to eliminate “from national arsenals of nuclear weapons and the means of their delivery.”⁴⁸⁷ The Tlatelolco Treaty defines nuclear weapons to include those instruments which “may be used for the transport or propulsion of the device not included in this definition if it is separable from the device and not an indivisible part thereof.” For example the nuclear war heads fixed to Ballistic missile and Cruise missile fall within the definition of article 5 of the Tlatelolco Treaty.⁴⁸⁸

The MTCR presents a regime which contributes to nuclear non-proliferation efforts by restricting the means of their delivery including “missiles, complete rocket systems, unmanned air vehicles, and related technology for those systems capable of carrying a 500 kilogram payload at least 300 kilometers, as well as systems intended for the delivery of weapons of mass destruction (WMD).”⁴⁸⁹

The MECRs deal with dual use items which fall within the definition of WDM. Although the ICJ in its opinion did not clearly include nuclear weapons within the definition of WDM,⁴⁹⁰ other legal instruments such as UNGA Resolution 60/70 Nuclear Disarmament refer to nuclear weapons as WDM. The Resolution recalls the following:

“...the United Nations Millennium Declaration, in which Heads of State and Government resolve to strive for the elimination of weapons of mass destruction, in particular nuclear weapons, and to keep all options open for achieving this aim,

⁴⁸⁶ MTCR “The Missile Technology Control Regime” <http://www.mtcr.info/english/> (accessed 10 May 2013).

⁴⁸⁷ The preamble of the NPT.

⁴⁸⁸ Article 1(c) of the Treaty of Rarotonga defines nuclear weapons similar to article 5 of the Tlatelolco.

⁴⁸⁹ MTCR “Objectives of the MTCR” <http://www.mtcr.info/english/objectives.html> (accessed 10 May 2013).

⁴⁹⁰ DeLupis I *The law of War* (2003) 2nd ed at 249.

including the possibility of convening an international conference to identify ways of eliminating nuclear dangers.”⁴⁹¹

Practically, the establishment MECRs has contributed to the international efforts intended to halt proliferation of nuclear weapons.⁴⁹² The UNSC adopted Resolution 1540 in 2004 in which decides

“that all States shall take and enforce effective measures to establish domestic controls to prevent the proliferation of nuclear, chemical, or biological weapons and their means of delivery, including by establishing appropriate controls over related materials and to this end shall:

- (c) Develop and maintain appropriate effective border controls and law enforcement efforts to detect, deter, prevent and combat, including through international cooperation when necessary, the illicit trafficking and brokering in such items in accordance with their national legal authorities and legislation and consistent with international law.”⁴⁹³

The European Council adopted Regulation (EC) No 1334/2000 of 22 June 2000 setting up a Community regime for the control of exports of dual-use items and technology. The Community has dealt with the export control policies within the Action Plan on Non-Proliferation of WMD which was adopted by Heads of State or Government of the EU adopted in June 2003.⁴⁹⁴

It is important to note that South Africa became a member of Zangger Committee on 21 October 1995, the NSG on 5 April 1995, Wassenaar Arrangement on 28 February 2006, and the MTCR on 13 September 1995.⁴⁹⁵ “Although South Africa is not a member of the

⁴⁹¹ The UNGA resolution 60/70 on nuclear disarmament which was adopted at the 60th session on 6 January 2006.

⁴⁹² Holum J “The proliferation of weapons of mass destruction: challenges and responses” (10-14) in Responding to the Challenge of Proliferation U.S. Foreign Policy Agenda (September 1999) Vol 4, no 2 An Electronic Journal of the United States Information Agency at 12.

⁴⁹³ Article 3 of UNSC resolution 1540.

⁴⁹⁴ Para 14 of regulation (EC) No 1334/2000.

⁴⁹⁵ See, NPC <http://www.thedti.gov.za/nonproliferation/ICPVersionpart2.htm>(accessed 20 August 2013).

Australia Group, the Australia Group controlled lists have been used as a basis to develop biological control lists and were published as such in the Government Gazette.”⁴⁹⁶ However,

“...the South African Council for the Non-Proliferation of Weapons of Mass Destruction decided to implement Australia Group-type controls under the Non-proliferation of Weapons of Mass Destruction Act, given the need to control the transfer of chemical and biological agents and toxins which are as yet not covered by the chemical and biological conventions.”⁴⁹⁷

The South African Government has demonstrated its commitment to the MECRs norms through legislations and regulations. For example, the Government Notice on “Declaration of Certain Missile Technology and Related Items as Controlled Goods and Control Measures Applicable To Such Goods” which is published in terms of Section 13 of the Non-Proliferation of Weapons of Mass Destruction Act of 1993 requires to “declare all items listed in the Missile Technology Control Regime (MTCR) Equipment and Technology Annex, dated 14 October 1999, as quoted in Schedule A to this notice, to be controlled goods.”⁴⁹⁸ This is in line with the UNSC requirements which

“...encourages States to take all appropriate national measures in accordance with their national authorities and legislation, and consistent with international law, to strengthen export controls, to control access to intangible transfers of technology and to information that could be used for weapons of mass destruction and their means of delivery, to prevent proliferation financing and shipments, and to secure sensitive materials.”⁴⁹⁹

⁴⁹⁶ *Ibid.*

⁴⁹⁷ South African Department of Defence, White Paper on the South African Defence Related Industries (December 1999). <http://www.info.gov.za/whitepapers/1999/defence.htm> (accessed 20 August 2013).

⁴⁹⁸ Para a of the title Trade and Industry Department; Government Notice on Declaration of Certain Missile Technology and Related Items as Controlled Goods and Control Measures Applicable To Such Goods (13 February 2003).

⁴⁹⁹ See, Presidential Statement by the UNSC President, Yukio Takasu of Japan, on Follow Up to September 2009 Security Summit at the UNSC 6753rd Meeting on 19 April 2012.

The UNSC appreciates the role of MTCRs as an integral mechanism which promotes “domestic controls to prevent the proliferation of nuclear.”⁵⁰⁰ Article 3(d) of the UNSC Resolution 1540 requires all states to

“Establish, develop, review and maintain appropriate effective national export and trans-shipment controls over such items, including appropriate laws and regulations to control export, transit, trans-shipment and re-export and controls on providing funds and services related to such export and trans-shipment such as financing, and transporting that would contribute to proliferation, as well as establishing end-user controls; and establishing and enforcing appropriate criminal or civil penalties for violations of such export control laws and regulations.”

2.2.2.3.5 *The Role of the UNSC in Preventing the Proliferation of Nuclear Weapons*

The UNSC has been involved in nuclear energy since the establishment of the UNAEC which was composed of “one representative from each of those States represented on the Security Council...”⁵⁰¹ The UNAEC was required to “make recommendations to the” UNSC which would “approve them as a procedural matter.”⁵⁰² Although the UNGA recommended dissolving the UNAEC in Article 2 of UNGA Resolution 502 (VI) of January 1952, it also recommended in Article 1 the establishment of the UNDC under the UNSC. The UNDC functioned “under the rules and procedure of the” UNAEC “with modification as the Commission” deemed “necessary.”⁵⁰³

Since the earliest regulations of nuclear energy, international peace and security aspects have interplayed in each and every aspect of nuclear energy development because of the risk of nuclear weapons proliferation. International peace and security is the paramount mandate of the UNSC which acts on peace and security as the “ultimate global authority,” while “carrying out its duties under this responsibility.”⁵⁰⁴

⁵⁰⁰ Article 3 of the UNSC resolution 1540.

⁵⁰¹ Article 3 of resolution 1 of the UNGA. Canada was represented as well in the UNAEC.

⁵⁰² Article 3 of resolution 1 of the UNGA.

⁵⁰³ UNG resolution 502(VI).

⁵⁰⁴ Article 24(1) of the UN Charter.

Article 39 of the UN Charter reads as follows:

“The Security Council shall determine the existence of any threat to the peace, breach of the peace, or act of aggression and shall make recommendations, or decide what measures shall be taken in accordance with Articles 41 and 42, to maintain or restore international peace and security.”

The UNSC has therefore the power to determine that a country’s nuclear programme constitutes a threat to peace or breach of the peace. In this case the UNSC makes “recommendations, or decides what measures shall be taken in accordance with Articles 41 and 42, to maintain or restore international peace and security.”⁵⁰⁵ Fundamentally, the UNSC has linked international peace and security in many occasions when passing its resolutions relating to nuclear noncompliance. For example in the case of South Africa the UNSC adopted Resolution 418 at its 2046th meeting, on 4 November 1977 which determined that “...the acquisition by South Africa of arms and related material constitutes a threat to the maintenance of international peace and security,”⁵⁰⁶ calling for all States to “refrain from any co-operation with South Africa in the manufacture and development of nuclear weapons.”⁵⁰⁷ The UNSC required a universal application of arms embargo against South Africa while “acting under chapter VII of the UN Charter.”⁵⁰⁸

The role of the UNSC in nuclear matters which related to the maintenance of international peace and security has been established by virtue of Article III.A.4 of the Statute of the IAEA which authorises the IAEA to:

“Submit reports on its activities annually to the General Assembly of the United Nations and, when appropriate, to the Security Council: if in connection with the activities of the Agency there should arise questions that are within the competence of the Security Council, the Agency shall notify the Security Council, as the organ bearing the main responsibility for the maintenance of international peace and

⁵⁰⁵ Article 39 of the UN Charter.

⁵⁰⁶ Article 1 of the UNSC resolution 418 on 4 November 1977.

⁵⁰⁷ Article 4 of the UNSC resolution 418.

⁵⁰⁸ The preamble of the UNSC resolution 418.

security, and may also take the measures open to it under this Statute, including those provided in paragraph C of Article XII.”

Further, the UNSC is involved whenever the IAEA safeguards are violated. The involvement of the UNSC is a statutory requirement which is established by Article XI.C of the Statute of the IAEA.⁵⁰⁹ Article XI.C obliges the Board of Governors of the IAEA to “report the non-compliance to all members and to the Security Council and General Assembly of the United Nations.”⁵¹⁰

2.2.2.3.5.1 *Violation of the IAEA Safeguards*

The Safeguards is an agreement concluded between the State and the IAEA “in accordance with Article III. 1,” whereby the State undertakes

“to accept Safeguards, in accordance with the terms of the Agreement, on all source or special fissionable material in all peaceful nuclear activities within its territory, under its jurisdiction or carried out under its control anywhere, for the exclusive purpose of verifying that such material is not diverted to nuclear weapons or other nuclear explosive devices.”⁵¹¹

In other words, the violation of the Safeguards implies that a NNWS has not honoured its commitments under the NPT. This can occur in many ways e.g. the failure to comply with paragraph 8 of part I of INFCIRC/153 (Corrected) which obliges a NNWS to provide the IAEA “with information concerning *nuclear material* subject to safeguards under the Agreement and the features of *facilities* relevant to safeguarding such material.” According to paragraph 18 of the same document, the Board, upon report of the Director General, may:

“decide that an action by the State is essential and urgent in order to ensure verification that *nuclear material* subject to safeguards under the Agreement is not diverted to nuclear weapons or other nuclear explosive devices the Board shall be

⁵⁰⁹ Jankowitsch-Prevor “The normative role of the International Atomic Energy Agency...” at 4.

⁵¹⁰ Article XI.C of the Statute of the IAEA.

⁵¹¹ Para 1 of INFCIRC/153 (Corr.) of 1972.

able to call upon the State to take the required action without delay, irrespective of whether procedures for the settlement of a dispute have been invoked.”⁵¹²

The IAEA Board of Governors calls upon the State which does not comply with conditions of the Safeguards “to remedy forthwith any non-compliance which it finds to have occurred.”⁵¹³ Anyways “the Board shall report the non-compliance to all members and to the Security Council and General Assembly of the United Nations.”⁵¹⁴

The UNSC’s powers and measures have been tested on many occasions including the South Africa’s nuclear weapons programme, Iraq's covert nuclear weapons program, the Libyan attempt to acquire nuclear technology, the Iranian nuclear ambitions, and the DPRK nuclear saga.

In its Resolution 1887 of 2009, the UNSC “emphasizes that a situation of non-compliance with non-proliferation obligations shall be brought to the attention of the Security Council, which will determine if that situation constitutes a threat to international peace and security, and emphasizes the Security Council’s primary responsibility in addressing such threats.”⁵¹⁵

2.2.2.3.5.1.1 *Iraq*

The case of Iraq represents the enforcement mechanisms of the nuclear non-proliferation regime which has contributed to the development of international nuclear law. The UNSC passed Resolution 687⁵¹⁶ which became the threshold legal vehicle⁵¹⁷ to reaffirm the

⁵¹² Para 18 of INFCIRC/153 (Corr.) of 1972.

⁵¹³ Article XII.C of the IAEA Statute.

⁵¹⁴ Article XII.C the IAEA Statute.

⁵¹⁵ The UNSC resolution 1887 on 24 September 2009.

⁵¹⁶ UNSC resolution 687 on 3 April 1991.

⁵¹⁷ UNSC resolution 1284, adopted on 17 December 1999, after recalling previous relevant resolutions on Iraq, including resolutions 661 (1990), 687 (1991), 699 (1991), 707 (1991), 715 (1991), 986 (1995), 1051 (1996), 1153 (1998), 1175 (1998), 1242 (1999) and 1266 (1999), the Council established the United Nations Monitoring, Verification and Inspection Commission (UNMOVIC) to replace the United Nations Special Commission (UNSCOM). Hereafter referred to as the UNMOVIC and UNSCOM respectively.

obligations of Iraq under the NPT.⁵¹⁸ The Resolution has established the following mechanisms:

1. The forming of a Special Commission (UNSCOM)⁵¹⁹ which was intended to assist and cooperate with the IAEA's activities related to Iraq's nuclear capabilities.⁵²⁰
2. The requirement for an unconditional agreement "not to acquire or develop nuclear weapons or nuclear-weapons-usable material or any subsystems or components or any research, development, support or manufacturing facilities related to the above."⁵²¹
3. The requirement for a declaration of the locations, amounts, and types of all items specified above which is required to be submitted to UNSG and the Director General of the IAEA.
4. The emplacement of all of Iraq's "nuclear-weapons-usable materials under the exclusive control, for custody and removal, of the" IAEA, "with the assistance and cooperation of the Special Commission."⁵²²
5. The requirement "to develop a plan for submission to the Security Council within forty-five days calling for the destruction, removal, or rendering harmless as appropriate of all items listed in paragraph 12 above."⁵²³
6. The UNSC passed Resolution 1284, adopted on 17 December 1999 establishing the UNMOVIC,⁵²⁴ which replaced the Special Commission, in order to "establish and implement a strengthened system of continuous monitoring and verification in Iraq."⁵²⁵

⁵¹⁸ Article 11 of UNSC resolution 687 of 1991.

⁵¹⁹ Article 9.i of UNSC resolution 687.

⁵²⁰ Article 12 and 13 of UNSC resolution 687.

⁵²¹ *Ibid.*

⁵²² Article 12 UNSC of resolution 687.

⁵²³ Article 13 of UNSC resolution 687.

⁵²⁴ The UNSC resolution 1284, adopted on 17 December 1999.

⁵²⁵ Kusumi R "Recent developments in the non-proliferation of nuclear weapons" (87- 102) in Petersen A and Pardo-Guerra J eds *Remember your humanity: international student/Young Pugwash Yearbook 2005* (2005) Vol 1 at 95

2.2.2.3.5.1.2 The DPRK

The case of DPRK is not identical to the Iraqi one. However, the UNSC has followed similar procedures to those implemented in the case of Iraq.

- The UNSC passed Resolution 825 of 1993⁵²⁶ calling “upon the DPRK to honour its non-proliferation obligations under the Treaty and comply with its safeguards agreement with the IAEA...”⁵²⁷
- The UNSC passed Resolution 1718⁵²⁸ establishing a Committee of the UNSC⁵²⁹ consisting of all the members of the Council.⁵³⁰ The function and establishment of this Committee is similar to the function and establishment of the UNSCOM created by UNSC Resolution 687. This indicates at standard procedures conducted by the UNSC utilising its powers under Chapter VII of the Charter and the statutory involvement in nuclear matters provided by the Statute of the IAEA.⁵³¹

The DPRK was requested by the IAEA to facilitate special inspections for the purpose of verification of the discrepancies of the DPRK’s initial report relating to its nuclear inventory. As a party to the NPT, the DPRK’s obligations to cooperate with the IAEA are based on Article III of the IAEA Statute.⁵³² Article III establishes a mechanism which allows the IAEA to

⁵²⁶ The UNSC resolution 825 on 11 May 1993.

⁵²⁷ Article 2 of The UNSC resolution 825.

⁵²⁸ The UNSC resolution 1718 on 14 October 2006.

⁵²⁹ According Rule 28 the UNSC “may appoint a commission or committee or a rapporteur for a specified question.” See, Provisional Rules of Procedure of the UNSC. “adopted by the Security Council at its 1st meeting and amended at its 31st, 41st, 42nd, 44th and 48th meetings, on 9 April, 16 and 17 May, 6 and 24 June 1946; 138th and 222nd meetings, on 4 June and 9 December 1947; 468th meeting, on 28 February 1950; 1463rd meeting, on 24 January 1969; 1761st meeting, on 17 January 1974; and 2410th meeting, on 21 December 1982. Previous versions of the provisional rules of procedure were issued under the symbols S/96 and Rev. 1-6.” UN, NY 1993 <http://www.un.org/docs/sc/scrules.htm> (accessed 12 April 2013).

⁵³⁰ Article 12 of resolution 1718.

⁵³¹ For further reading refer to Louka E *Nuclear weapons, justice and the law* (2011) at 145-151.

⁵³² The DPRK became a party on the 12th December 1985 and signed the Safeguards agreement with IAEA on 30 January 1993 which entered into force on 10 April 1993. Nevertheless, “on 10 January 2003, the DPRK announced its withdrawal from the NPT. On 9 October 2006 and 25 May 2009, the DPRK conducted tests of nuclear explosive devices.” See, Simpson J, Bowen W, Harries M, and Anstey I eds *NPT Briefing Book: 2013*

conduct inspections in NNWS “for the exclusive purpose of verification of the fulfilment of its obligations assumed under” the NPT “with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices.”⁵³³ Although the DPRK announced its withdrawal on 10 January 2003 from the NPT, the IAEA Board of Governors adopted on 2 February 2003 a resolution, which confirmed that “the Agency's Safeguards Agreement with the DPRK pursuant to the...NPT remains binding and in force and that it is essential and urgent that the DPRK enables the Agency to take the necessary measures to ensure verification of compliance with that Agreement.”⁵³⁴ Further, it was decided

“to report, as provided for in Article XII.C of the Statute, through the Director General, the DPRK’s non-compliance and the Agency’s inability to verify non-diversion of nuclear material subject to safeguards, to all Members of the Agency and to the Security Council and General Assembly of the United Nations; and in parallel stresses its desire for a peaceful resolution of the DPRK nuclear issue and its support for diplomatic means to that end.”⁵³⁵

The UNSC passed Resolution 1718⁵³⁶ “expressing its firm conviction that the international regime on the non-proliferation of nuclear weapons should be maintained and recalling that the DPRK cannot have the status of a nuclear-weapon state in accordance with the NPT.”⁵³⁷ Further, the UNSC Decides that:

“...the DPRK shall abandon all nuclear weapons and existing nuclear programmes in a complete, verifiable and irreversible manner, shall act strictly in accordance with the

Edition (2013) King's College, Centre for Science and Security Studies and James Martin Center for Nonproliferation Studies at 34.

⁵³³ Article III.1 of the NPT.

⁵³⁴ Paragraph C of the preamble of resolution of IAEA Board of Governors Report by the Director General on the Implementation of the NPT Safeguards Agreement between the Agency and the Democratic People's Republic Of Korea, IAEA Board of Governors, GOV/2003/14 (2 February 2003). http://www.iaea.org/newscenter/mediaadvisory/2003/med-advise_048.shtml (accessed 12 April 2013).

⁵³⁵ Article 5 of resolution of the IAEA Board of Governors, GOV/2003/14 (2 February 2003).

⁵³⁶ The UNSC resolution 1718 on 14 October 2006.

⁵³⁷ See the preamble of resolution 1718.

obligations applicable to parties under the Treaty on the Non-Proliferation of Nuclear Weapons and the terms and conditions of its International Atomic Energy Agency (IAEA) Safeguards Agreement (IAEA INFCIRC/403) and shall provide the IAEA transparency measures extending beyond these requirements, including such access to individuals, documentation, equipment and facilities as may be required and deemed necessary by the IAEA.”⁵³⁸

2.2.2.3.5.1.3 Iran

The Iranian nuclear programme includes main four locations at Arak, Bushehr, Isfahan and Natanz.⁵³⁹ In each of the four locations the IAEA Safeguards were violated and nuclear clandestine activities had been detected. The involvement of the UNSC in the Iranian case is based upon the report by the Board of Governors of the IAEA in accordance with Article XII.C of the IAEA Statute. On 4 February 2006 the IAEA Board of Governors adopted a Resolution on the Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran requesting “the Director General to report to the” UNSC “that these steps are required of Iran by the Board and to report to the Security Council all IAEA reports and resolutions, as adopted, relating to this issue.”⁵⁴⁰ The UNSC passed many resolutions including 1696 (2006), 1737 (2006), 1747 (2007), 1803 (2008), 1835 (2008), and 1887 (2009) 1929 (2010), 2049 (2012). The UNSC similar to the Iraqi case established the UNSC Committee “in accordance with rule 28 of its provisional rules of procedure” pursuant to resolution 1737.

Up to date the Iranian and the DPRK nuclear dilemma present continuous challenges to the international community and the UNSC. For example, the Report of the IAEA Director General on the Implementation of the NPT Safeguards Agreement and relevant provisions

⁵³⁸ Article 6 of resolution 1718.

⁵³⁹ Davis J and Pfaltzgraff Jr R *Anticipating a Nuclear Iran: Challenges for U.S. Security* (2014) at 166.

⁵⁴⁰ Para 2 of resolution of the IAEA Board of Governors on the Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran GOV/2006/14 (4 February 2006).

of the UNSC resolutions in the Islamic Republic of Iran on 21 February 2013⁵⁴¹ indicates unresolved issues which Iran has not fully dealt with and “implemented its binding obligations” in order “to establish international confidence in the exclusively peaceful nature of Iran’s nuclear programme.”⁵⁴²

Although, the intervention in Iraq and the role of UNMOVIC still provoke legal controversies which are beyond the scope of this thesis, it can be stated that the requirement to bring nuclear proliferation and nuclear security under control is evident and unquestioned.

2.2.2.3.5.2 Nuclear terrorism

The growing danger of an unauthorised transfer of nuclear technologies and expertise, development and any use of nuclear weapons, “illicit trafficking, the unlawful taking and use of nuclear material and the sabotage of nuclear material and nuclear facilities”⁵⁴³ by international terrorist groups and non-state actors pose the most serious threats to international security at the global, regional, and national level. It is noted “that acts of nuclear terrorism may result in the gravest consequences...”⁵⁴⁴ and have become a matter of increased national, regional and international concern.⁵⁴⁵

The legal frameworks dealing with nuclear terrorism have linked the legal measures intended for physical protection of nuclear materials to those intended for the suppression

⁵⁴¹ Report by the IAEA Director General on the Implementation of the NPT Safeguards Agreement and relevant provisions of the UNSC resolutions in the Islamic Republic of Iran on 21 February 2013 GOV/2013/6 (21 February 2013).

⁵⁴² *Ibid*, para A.3 of the introduction of GOV/2013/6.

⁵⁴³ The preamble of the Amendment to the CPPNM. See also, IAEA International Law Series No. 2 (2006) at 1.

⁵⁴⁴ See, the preamble of the ICSANT.

⁵⁴⁵ The UNSC resolution 1540, the Proliferation Security Initiative (PSI) (Proliferation Security Initiative was Launched on May 31, 2003, U.S <http://www.state.gov/t/isn/c10390.htm>) (accessed 18 June 2013), and the Global Initiative to Combat Nuclear Terrorism (GICNT) (On July 16, 2006, Presidents George W. Bush and Vladimir Putin jointly announced the GICNT) “reaffirmed the grave concern of the international community about the threats associated with proliferation issues and with illicit trafficking.” See, Cromboom O, Duinslaeger J, Enright T, K. Karlsruhe M, And Daures P “A multi-country project on combating illicit trafficking of nuclear materials” (489-508) in *Illicit Nuclear Trafficking: Collective Experience and the Way Forward* (2008) at 490.

of acts of nuclear terrorism. Consequently, the ICSANT⁵⁴⁶ provides the legal framework which is intended to combat nuclear terrorism.

Article 2 of the ICSANT describes nuclear offences and requires each state party to “adopt such measures as may be necessary:

- (a) To establish as criminal offences under its national law the offences set forth in article 2;
- (b) To make those offences punishable by appropriate penalties which take into account the grave nature of these offences.”⁵⁴⁷

In 2004 the UNSC, while acting under Chapter VII of the Charter of the UN, unanimously adopted Resolution 1540⁵⁴⁸ requiring:

“...all states, in accordance with their national procedures, shall adopt and enforce appropriate effective laws which prohibit any non-State actor to manufacture, acquire, possess, develop, transport, transfer or use nuclear, chemical or biological weapons and their means of delivery, in particular for terrorist purposes, as well as attempts to engage in any of the foregoing activities, participate in them as an accomplice, assist or finance them.”⁵⁴⁹

The emerging threat posed by non-state networks has stressed the non-proliferation regime which focuses only on the behaviour of states. “By creating obligations for States regarding non-State actors, UNSCR 1540 supplements the existing NPT and other nuclear non-proliferation treaty regimes.”⁵⁵⁰ The UNSC

“Decides to establish, in accordance with rule 28 of its provisional rules of procedure, for a period of no longer than two years, a Committee of the Security Council, consisting of all members of the Council, which will, calling as appropriate

⁵⁴⁶ According to article 24(1) the Convention was open for signature by all States from 14 September 2005 until 31 December 2006 at UN Nations Headquarters in New York.

⁵⁴⁷ Article 5 of ICSANT.

⁵⁴⁸ The UNSC resolution 1540.

⁵⁴⁹ Article 2 of resolution 1540.

⁵⁵⁰ The Opening Address of Ambassador P. Burian the Chairman 1540 Committee the UNSC New York 29-34 in *Illicit Nuclear Trafficking: Collective Experience and the Way Forward* (2008) at 30.

on other expertise, report to the Security Council for its examination, on the implementation of this resolution, and to this end calls upon States to present a first report no later than six months from the adoption of this resolution to the Committee on steps they have taken or intend to take to implement this resolution.”⁵⁵¹

The UNSC has thus empowered itself to influence the development of international law, particularly in matters pertaining to international peace and security. The provisions of Resolution 1540 require all members to implement the Resolution. This is complemented by a Committee which has oversight powers to ensure the adequacy of the implementation of the measures recommended by the Resolution. The legal basis of such approach lies in Article 39 of the UN Charter which bestows discretionary powers on the UNSC to determine what constitutes threat to peace and security. Consequently, the UNSC “shall make recommendations, or decide what measures shall be taken...” These recommendations and measures are compulsory on the members of the UN which are required to “agree to accept and carry” them out.⁵⁵² Of course, UNSC Resolution 1540 functions as a reviving mechanism which has revived nuclear terrorism related instruments propelling the transformation of normative rules to address nuclear terrorism concerns.⁵⁵³

2.2.2.3 The Cessation of the Nuclear Arms Race and Nuclear Disarmament

The cessation of the nuclear arms race at an early date and to nuclear disarmament is the third fundamental component of the nuclear bargain. Article VI of the NPT states the following:

“Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control.”

⁵⁵¹ Article 4 of the UNSC resolution 1540.

⁵⁵² Article 25 of the UN Charter. In this regard refer to Stoiber C “The United Nations Security Council and nuclear Law” (91-104) in *International Nuclear Law: History, Evolution and Outlook* (2010) at 92-93.

⁵⁵³ Jankowitsch-Prevor “The normative role of the International Atomic Energy Agency...” at 30.

The arm race of the cold war was subject to many legal instruments such as the Antarctic Treaty which was the first arms control agreement achieved on 1 December 1959 prohibiting “any measure of a military nature, such as the establishment of military bases and fortifications, the carrying out of military manoeuvres, as well as the testing of any type of weapon.”⁵⁵⁴ Article 5(1) of the Treaty prohibits “any nuclear explosions in Antarctica and the disposal there of radioactive waste material.”

The disarmament of nuclear weapons eventually became a pressing issue for the superpowers which tried to construct “a consensual, political and institutional barrier to further nuclear proliferation building on their intermittent negotiations since 1945 to limit their own nuclear arms race and engage in nuclear disarmament.”⁵⁵⁵ In the mid-1950s the USA and the USSR and some of their allies intensified nuclear disarmament negotiations in order to “halt the nuclear arms race, and then reverse it through the dismantlement of existing nuclear weapons.”⁵⁵⁶ However, these negotiations failed to establish comprehensive, global and binding nuclear disarmament obligations.

The conclusion of the NPT redirected the approaches towards nuclear disarmament creating a medium for direct bilateral negotiations between the USA and the USSR paving the way for the following agreements:

- The USA and the USSR signed the Strategic Arms Limitation Talks SALT I on 26 May 1972. SALT I consists of two agreements including the Treaty on the Limitation of Anti-Ballistic Missile Systems (the Anti-Ballistic Missile Treaty) and the Interim Agreement on Certain Measures with respect to the Limitation of Strategic Offensive Arms.
- The USA and the USSR signed SALT II on 18 June 1979 which assumed real reductions in strategic forces to 2,250 of all categories of delivery vehicles on both sides.
- The USA and USSR signed the Treaty on the Elimination of Their Intermediate-Range and Shorter-Range Missiles (the INF Treaty) on 8 December 1987.

⁵⁵⁴ Article 1(1) of Antarctic Treaty.

⁵⁵⁵ Simpson *et al* *NPT Briefing Book: 2012 Edition* at Part I – 3.

⁵⁵⁶ *Ibid* at Part I – 4.

- The USA and USSR signed the Treaty on the Reduction and Limitation of Strategic Offensive Arms (the START I Treaty) on 31 July 1991. The START I Treaty requires both countries to undertake to reduce their nuclear weapons from their current levels of between 10,000 and 11,000 weapons to between 8,000 and 9,000 weapons
- The USA and USSR signed verification Protocols to the 1974 Threshold Test-Ban Treaty and the 1976 Peaceful Nuclear Explosions Treaty on 1 June 1990.
- The USA and the Belarus, Kazakhstan, the Russian Federation and Ukraine, as successor States of the former USSR, signed the Lisbon Protocol to the START I Treaty on 23 May 1992 undertaking to adhere to the NPT as non-nuclear-weapon States in the shortest possible time.
- The USA and USSR signed the Treaty on Further Reduction and Limitation of Strategic Offensive Arms (the START II Treaty), by which they undertake to further significantly reduce their nuclear arsenals on 3 January 1993.⁵⁵⁷

It is obvious that the foregoing agreements have not led to the complete disarmament as prescribed in Article VI of the NPT. In its *Advisory Opinion on the Legality of the Threat or Use of Nuclear Weapons*, the ICJ⁵⁵⁸ articulated the UNSC Resolution 984⁵⁵⁹ of 1995 which reaffirms “the need for all States Parties to the Treaty on the Non-Proliferation of Nuclear Weapons to comply fully with all their obligations”⁵⁶⁰ Also, the UNSC urges

“all States, as provided for in Article VI of the Treaty on the Non-Proliferation of Nuclear Weapons, to pursue negotiations in good faith on effective measures relating to nuclear disarmament and on a treaty on general and complete disarmament under strict and effective international control which remains a universal goal.”⁵⁶¹

⁵⁵⁷ IAEA Publications “Factsheets and FAQs: nuclear non-proliferation chronology key events” http://www.iaea.org/Publications/Factsheets/English/npt_chrono.html (access 12 July 2013).

⁵⁵⁸ Para 103 of the *ICJ Nuclear Threat Advisory Opinion*.

⁵⁵⁹ The UNSC resolution 984 on 11 April 1995.

⁵⁶⁰ The preamble of the UNSC resolution 984.

⁵⁶¹ Article 8 of the UNSC resolution 984.

The question arises as to whether the UNSC is a decision maker in the context of disarmament. Who sits on the UNSC? Who are the veto powers? Who puts an issue on the UNSC agenda?

The UNSC called “for further progress on all aspects of disarmament to enhance global security,”⁵⁶² and welcomed “the nuclear arms reduction and disarmament efforts undertaken and accomplished by nuclear-weapon States, and underlining the need to pursue further efforts in the sphere of nuclear disarmament, in accordance with Article VI of the NPT.”⁵⁶³

As Article VI sits opposite Article IV and III of the NPT, the more compelling and rational aim would be to eliminate the dangers posed by nuclear weapons completely from the world and to provide a platform for nuclear technology to be used as “an ecologically clean source of electrical energy,”⁵⁶⁴ to the exclusion of all nuclear arms. The USA President Obama proposed a vision of a “world without nuclear weapons”. He “pledged to seek the peace and security of”⁵⁶⁵ of such world. In his Statement on the 40th Anniversary of the NPT Mr Obama remarked the following:

“Today, the threat of global nuclear war has passed, but the danger of nuclear proliferation endures, making the basic bargain of the NPT more important than ever: nations with nuclear weapons will move toward disarmament, nations without nuclear weapons will forsake them, and all nations have an ‘inalienable right’ to peaceful nuclear energy.”⁵⁶⁶

As the World strives to achieve the Millennium Development Goals, the “Sustainable Energy for All” initiative, launched in 2011, aims to provide universal access to modern energy.”⁵⁶⁷

⁵⁶² The preamble of the UNSC resolution 1887.

⁵⁶³ The preamble of The UNSC resolution 1887.

⁵⁶⁴ Schelling T *Strategies of Commitment and other Essays* (2006) at 319.

⁵⁶⁵ Garvey J *Nuclear Weapons Counterproliferation: A New Grand Bargain* (2013) at 11.

⁵⁶⁶ The White House, Office of the Press Secretary Statement by President Obama on the 40th Anniversary of the Nuclear Nonproliferation Treaty (5 March 2010).

⁵⁶⁷ Report of the Secretary-General, “A Life of Dignity for All: Accelerating Progress Towards the Millennium Development Goals and Advancing the United Nations Development Agenda Beyond 2015” (26 July 2013) the UNGA 68th session para. 64.

The UNGA adopted Resolution 65/151 on 16 February 2011 by which the “International Year of Sustainable Energy for All” was declared. The Resolution reiterates “the principles of the Rio Declaration on Environment and Development...” and recalls “the recommendations and conclusions contained in the Plan of Implementation of the World Summit on Sustainable Development (“Johannesburg Plan of Implementation”) concerning energy for sustainable development.”⁵⁶⁸ The Report of the World Summit on Sustainable Development cites access to energy for the poor “as a principal requirement for sustainable development,” taking into consideration “problems of ensuring safety in power generation, especially when working with nuclear energy.”⁵⁶⁹

2.2.2.4 The Peaceful Use of Nuclear Energy

The objective to develop nuclear power can be traced to the first UNGA Resolution which required the UNAEC to make proposal for “extending between all nations the exchange of basic scientific information for peaceful ends.”⁵⁷⁰ Although the UNAEC was suspended in 1952, the “Atoms for Peace” speech in 1953 by President Eisenhower revived the world’s commitment to deploy the useful cheap energy generated from fissile materials for industrial purposes. With the establishment of the IAEA, the deployment of nuclear energy as a “contribution to peace, health and prosperity throughout the world” became the main objective of the IAEA which became the broker of nuclear energy.⁵⁷¹

The legal acknowledgement of the economic development of nuclear power which requires “to develop research, production and use of nuclear energy for peaceful purposes” as an “inalienable right” for all states including NNWSs has been established by virtue of Article IV of the NPT. Article IV of the NPT resonates in many legal instruments including treaties e.g. NWFZs, UN resolutions, and informal arrangements. For example, the contracting parties to Pelindaba Treaty are

⁵⁶⁸ UNGA resolution 65/151 (16 February 2011).

⁵⁶⁹ Report of the World Summit on Sustainable Development, Johannesburg, South Africa, (26 August–4 September 2002).

⁵⁷⁰ Article 5(a) of the UNGA resolution 1 of 1946.

⁵⁷¹ Article II of the IAEA Statute.

“Desirous of taking advantage of article IV of the NPT, which recognizes the inalienable right of all States Parties to develop research on, production and use of nuclear energy for peaceful purposes without discrimination and to facilitate the fullest possible exchange of equipment, materials and scientific and technological information for such purposes.”⁵⁷²

The development of nuclear industry takes into account the associated risks namely nuclear weapons proliferation, potential radiological hazards, nuclear accidents, intentional commission of unlawful nuclear offences, and nuclear terrorism. The priority has been given to construct a regime which ensures non-proliferation of nuclear weapons, protects public health, safety, security and the environment. That is to say that, besides the legal norms ensuring non-proliferation of nuclear weapons, nuclear energy law also provides legal governance intended to maintain safety and security of nuclear installations. The Chernobyl and Fukushima showed that nuclear incidents may kill or contaminate people and other living beings, destroy the environment, and impact on other neighbouring countries.

Nuclear energy legal rules accompanied the developments of the nuclear industry development so as to complement the prevailing requirements for the safety and security of evolving nuclear activities. The main components of the legal frameworks protecting public health, safety, security and the environment include the Convention on Nuclear Safety, CPPNM, ICSANT, Nuclear Assistance Convention, Nuclear Early Notification Convention, Joint Convention on Safety Radioactive Waste. Added to these is the legal framework intended to remedy damages resulting from nuclear hazards which includes the Vienna Convention on Civil Liability for Nuclear Damage and the Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage.

2.2.2.4.1 Nuclear Safety

Nuclear safety considerations have been central to the nuclear industry. As early as 1955 the UNGA passed Resolution 913 (X),⁵⁷³ thereby establishing the Scientific Committee on the

⁵⁷² The preamble of Pelindaba Treaty.

⁵⁷³ The UNGA resolution 913 (X).

Effects of Atomic Radiation (UNSCEAR).⁵⁷⁴ The international community has always been aware of “problems relating to the effects of ionizing radiation upon man and his environment.”⁵⁷⁵ The bombardment of the two Japanese cities at the end of WWII created international anxiety and fear of the dispersal of nuclear radiation into the environment. This was accentuated by the nuclear tests carried out by France and the USA and became imminent in the entire nuclear industry post TMI, Chernobyl, and most recently Fukushima. The lessons learnt⁵⁷⁶ from these nuclear incidents and other experiences contributed to promote nuclear safety as a national responsibility in the context of enhanced global nuclear safety. Many elements have contributed to the development of a global nuclear safety regime including “international legal instruments, international mechanisms, and other governmental structures, as well as on organizational and administrative measures.”⁵⁷⁷ These interwoven legal norms are intended to ensure the protection of the health of population, property “and the sustainability of the environment in the process of peaceful nuclear activities.”⁵⁷⁸

The global nuclear safety regime is a legal construct based on a system of binding international instruments and standards developed and recommended by institutions such as the IAEA, Euratom, and UNSCEAR. This regime can be grouped into three categories:

- Binding normative rules emanating from international instruments such as the Convention on Nuclear Safety, Joint Convention on Safety of Radioactive Waste, Nuclear Assistance Convention, and Nuclear Early Notification Convention.

⁵⁷⁴ Article 1 of the UNGA resolution 913 (X).

⁵⁷⁵ Para. 1 of the preamble of resolution 913 (X).

⁵⁷⁶ For example “the impact of the Chernobyl disaster is most dramatically observed in the depth and magnitude of its lasting socio-psychological consequences.” Xue H *Transboundary Damage in International Law* (2003) at 23.

⁵⁷⁷ Timerbaev R and Loirysh A “International Co-operation in nuclear safety” (49-56) in Bergesen C, Parmann G, and Thommessen O eds *Yearbook of International Co-operation on Environment and Development, 1999/2000* (1999) 1st ed at 49.

⁵⁷⁸ *Ibid.*

- Ancillary normative rules stemming from the Nordic Mutual Emergency Assistance Agreement in Connection with Radiation Accidents,⁵⁷⁹ and the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter.⁵⁸⁰
- Standards including IAEA Safety Standards such as the Fundamental Safety Principles,⁵⁸¹ Safety of Nuclear Power Plants: Design,⁵⁸² and Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards: Interim Edition of 2011.⁵⁸³
- Codes of conduct including the Code of Conduct on the Safety and Security of Radioactive Sources,⁵⁸⁴ Guidance on the Import and Export of Radioactive Sources,⁵⁸⁵ and Code of Conduct on the Safety of Research Reactors.⁵⁸⁶

2.2.2.4.1.1 *The Role of the IAEA in Establishing an International Nuclear Safety Regime*

The IAEA plays a major role in nuclear safety as defined in Article III.A 6 which authorises the agency:

⁵⁷⁹ The Nordic Mutual Emergency Assistance Agreement in Connection with Radiation Accidents was signed on 17 October 1963. IAEA INFCIRC/49.

⁵⁸⁰ "The Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter was drawn up at the Inter-Governmental Conference on the Dumping of Wastes at Sea, held in London from 30 October to 10 November 1972." IAEA INFCIRC/205.

⁵⁸¹ Fundamental Safety Principles (2006) IAEA Safety Standards Series No. SF-1 http://www-pub.iaea.org/MTCD/publications/PDF/Pub1273_web.pdf (accessed 4 August 2013).

⁵⁸² Safety of Nuclear Power Plants: Design, Specific Safety Requirements, (2012) IAEA Safety Standards Series No. SSR-2/1 http://www-pub.iaea.org/MTCD/publications/PDF/Pub1534_web.pdf (accessed 4 August 2013).

⁵⁸³ Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, Interim Edition (Interim) General Safety Requirements Part 3 No. GSR Part 3 (2011) IAEA. http://www-pub.iaea.org/MTCD/publications/PDF/p1531interim_web.pdf (accessed 4 August 2013).

⁵⁸⁴ Code of Conduct on the Safety and Security of Radioactive Sources (2004)IAEAhttp://www-pub.iaea.org/MTCD/publications/PDF/code-2004_web.pdf(accessed 4 August 2013).

⁵⁸⁵ Guidance on the Import and Export of Radioactive Sources (March 2005) IAEA http://www-pub.iaea.org/MTCD/publications/PDF/Imp-Exp_web.pdf (accessed 4 August 2013).

⁵⁸⁶ Code of Conduct on the Safety of Research Reactors (2006) IAEA http://www-pub.iaea.org/MTCD/publications/PDF/CODEOC-RR_web.pdf (accessed 4 August 2013).

To establish or adopt, in consultation and, where appropriate, in collaboration with the competent organs of the United Nations and with the specialized agencies concerned, standards of safety for protection of health and minimization of danger to life and property (including such standards for labour conditions), and to provide for the application of these standards to its own operation as well as to the operations making use of materials, services, equipment, facilities, and information made available by the Agency or at its request or under its control or supervision; and to provide for the application of these standards, at the request of the parties, to operations under any bilateral or multilateral arrangements, or, at the request of a State, to any of that State's activities in the field of atomic energy.”⁵⁸⁷

The role of the IAEA in nuclear safety is to develop the safety standards and to apply these standards. The IAEA Department of Nuclear Safety and Security “formulated and implemented the IAEA’s Program on nuclear safety to fulfil statutory requirements, in cooperation with other departments within the IAEA, including the Department of Technical Cooperation.”⁵⁸⁸ As early as 1960 the Board of Governors approved the Agency’s Health and Safety Measures.⁵⁸⁹ The Board adopted Basic Safety Standards for Radioactive Protection in 1962 which went under revision in 1967. In 1982 the IAEA published Edition of Safety Series Number 9 which was sponsored by the IAEA, International Labour Organization (ILO), OECD Nuclear Energy Agency (OECD/NEA), and World Health Organization (WHO). In 1996 the IAEA published the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (the BSS) which was jointly sponsored by the Food and Agriculture Organisation of the United Nations (FAO), IAEA, ILO, OECD/NEA, PAHO, and WHO.

It is important to note that the IAEA safety standards only become obligatory on member states if the IAEA applies them to its own operations and at the request of the state. However, in the light of the Fukushima accident, the call focuses on supplementing the

⁵⁸⁷ Article III.A.6 of the IAEA Statute.

⁵⁸⁸ USA State Dep. *United States participation in the United Nations, report by the secretary to the congress for the year 2007* (2009) at 125.

⁵⁸⁹ The Agency's Health and Safety Measures (31 May 1960) IAEA INFCIRC/18 <http://www.iaea.org/Publications/Documents/Infcircs/Others/infcirc18.pdf> (accessed 17 July 2013).

Nuclear Safety Convention by “making the IAEA safety standards binding on Contracting Parties.”⁵⁹⁰ Under the auspices of the IAEA a Ministerial Conference on Nuclear Safety took place in Vienna from 20-24 June 2011 which adopted a declaration, thereby requesting the Director General to draft IAEA Action Plan on Nuclear Safety.⁵⁹¹

The IAEA Draft Action Plan on Nuclear Safety is intended “to define a programme of work to strengthen the global nuclear safety framework.”⁵⁹² This includes the establishment of the safety of future reactor designs; limiting radiation exposure, ensuring nuclear transport safety, the management of nuclear emergency preparedness and response, long term management of ageing nuclear power plants, preparing emerging nuclear energy countries, long term decommissioning solutions, and nuclear waste management.⁵⁹³

The Draft IAEA Action Plan on Nuclear Safety is part of the evolving process in developing and updating safety standards and programmes which are effective to the degree that they are properly applied by the industry. Legal rules establishing nuclear safety principles are designed to deal with safety as precautionary measures in order to prevent nuclear accidents and prepare emergency plans to deal with nuclear accidents in order to limit their impacts. This requires the establishment of regulatory frameworks which deal with safety and a regulatory body which enforces the safety principles and to instituting nuclear energy preparedness and international cooperation in the case of nuclear accident.

2.2.2.4.1.2 *The Establishment of Nuclear Legislation and Regulatory Framework*

The establishment and maintenance of “a legislative and regulatory framework to govern the safety of nuclear installations”⁵⁹⁴ is essential to “ensuring that the use of nuclear energy

⁵⁹⁰ Gioia A “Nuclear accidents and international law” (85-102) in Guttry A, Gestri M, and Venturini G *International Disaster Response Law* (2012) at 101.

⁵⁹¹ Draft IAEA Action Plan on Nuclear Safety (5 September 2011) IAEA, GOV/2011/59-GC(55)/14 <http://www.iaea.org/About/Policy/GC/GC55/Documents/gc55-14.pdf> (accessed 17 July 2013).

⁵⁹² Draft IAEA Action Plan on Nuclear Safety at 2.

⁵⁹³ The Nuclear Safety Review for the Year 2012, GC(56)/INF/2 at 1. http://www.iaea.org/About/Policy/GC/GC56/GC56InfDocuments/English/gc56inf-2_en.pdf (accessed 17 July 2013).

⁵⁹⁴ Article 7.1 of the Convention on Nuclear Safety.

is safe, well regulated and environmentally sound.”⁵⁹⁵ Two main conventions provide legal frameworks governing the safety of nuclear industry including the Convention on Nuclear Safety and the Joint Convention on Safety of Radioactive Waste. Article 19 of the latter Convention requires “each Contracting Party” to “establish and maintain a legislative and regulatory framework to govern the safety of spent fuel and radioactive waste management.”⁵⁹⁶ In the same context, the Convention on Nuclear Safety reaffirms that the nuclear safety requirement is the “responsibility of...the State having jurisdiction over a nuclear installation.”⁵⁹⁷ As part of the international agenda to “promote a high level of nuclear safety worldwide”⁵⁹⁸ and “effective nuclear safety culture,”⁵⁹⁹ States are required to establish legislative and regulatory frameworks which “provide for:

- (i) the establishment of applicable national safety requirements and regulations;
- (ii) a system of licensing with regard to nuclear installations and the prohibition of the operation of a nuclear installation without a licence;
- (iii) a system of regulatory inspection and assessment of nuclear installations to ascertain compliance with applicable regulations and the terms of licences;
- (iv) the enforcement of applicable regulations and of the terms of licences, including suspension, modification or revocation.”⁶⁰⁰

The requirement to “take, within the framework of...national law, the legislative, regulatory and administrative measures and other steps necessary for implementing its obligations under this Convention”⁶⁰¹ is intended to deal with hazards in the form of nuclear irradiation while benefiting from nuclear energy. As a general rule this requires a dual focus legal framework intended to deal with risks and benefits. This means that, the legal framework governing nuclear power plants are required to prohibit certain activities, authorise other activities, and define the responsibility for damages resulting from such activities. Logically,

⁵⁹⁵ Para (i) of the preamble of the Convention on Nuclear Safety.

⁵⁹⁶ Article 19.1 of the Joint Convention on Safety of Radioactive Waste.

⁵⁹⁷ Para (iii) of the preamble of the Convention on Nuclear Safety.

⁵⁹⁸ Para (ii) of the preamble of the Convention on Nuclear Safety.

⁵⁹⁹ Para (iv) of the preamble of the Convention on Nuclear Safety.

⁶⁰⁰ Article 7.2 of the Convention on Nuclear Safety.

⁶⁰¹ Article 4 of the Convention on Nuclear Safety.

this requires the development of nuclear regulatory framework to govern nuclear activities and a regulatory body with adequate powers to enforce the regulatory frame work. The IAEA Safety Standards places on the state the responsibility to adopt “within its national legal system of such legislation, regulations, and other standards and measures as may be necessary to fulfil all its national responsibilities and international obligations effectively, and for the establishment of an independent regulatory body.”⁶⁰²

2.2.2.4.1.2.1 The Establishment of a Nuclear Regulatory Body

The establishment of a nuclear regulatory body is crucial because there should be a person or an organisation responsible for the safety of nuclear installations. The culture of the establishment of a regulatory body to deal with nuclear energy matters can be traced to the McMahon Act of 1946, which prescribed the establishment of “an Atomic Energy Commission.”⁶⁰³ The requirement to establish a nuclear regulatory body is the role of the government. Principle 2 of IAEA Fundamental Safety Principles requires the establishment and sustainability of “an effective legal and governmental framework for safety, including an independent regulatory body...”⁶⁰⁴ Article 8 of the Convention on Nuclear Safety requires the contracting states to: “...establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 7, and provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities.” In the same vein Article 20 of the Joint Convention on Safety of Radioactive Waste requires the contracting Party to “establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 19, and provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities.”

2.2.2.4.1.2.2 The Function and the Responsibility of the Regulatory Body

The regulatory body undertakes “comprehensive and systematic safety assessments which are carried out before the construction and commissioning of a nuclear installation and

⁶⁰² Para 3.8 of the IAEA Safety Standards: Fundamental Safety Principles (2006) IAEA No. SF-1.

⁶⁰³ Section 2(a) of the McMahon Act.

⁶⁰⁴ International Basic Safety Standards (2011) Interim edition at 2.

throughout its life.” The regulatory body ensures that the assessments are well documented and, “subsequently updated in the light of operating experience and significant new safety information, and reviewed under the authority of the regulatory body.”⁶⁰⁵ Moreover, the regulatory body carries out “verification by analysis, surveillance, testing and inspection...to ensure that the physical state and the operation of a nuclear installation continue to be in accordance with its design, applicable national safety requirements, and operational limits and conditions.”⁶⁰⁶

According to the Joint Convention on Safety of Radioactive Waste, the regulatory body established by virtue of Article 20 is responsible for the implementation of the legislative and regulatory framework which “provide for:

- “(i) the establishment of applicable national safety requirements and regulations for radiation safety;
- (ii) a system of licensing of spent fuel and radioactive waste management activities;
- (iii) a system of prohibition of the operation of a spent fuel or radioactive waste management facility without a licence;
- (iv) a system of appropriate institutional control, regulatory inspection and documentation and reporting;
- (v) the enforcement of applicable regulations and of the terms of the licences;
- (vi) a clear allocation of responsibilities of the bodies involved in the different steps of spent fuel and of radioactive waste management.
- (vii) When considering whether to regulate radioactive materials as radioactive waste, Contracting Parties shall take due account of the objectives of this Convention.”⁶⁰⁷

To sum this up a regulatory body is required to establish safety requirements and regulations, enforce the “applicable regulations and...terms of licences, including

⁶⁰⁵ Article 4.i of the Convention on Nuclear Safety.

⁶⁰⁶ Article 4.ii of the Convention on Nuclear Safety.

⁶⁰⁷ Article 20 the Joint Convention on Safety of Radioactive Waste.

suspension, modification or revocation”⁶⁰⁸ and to grant licences to applicants which assume “the responsibility for the siting, design, construction, commissioning, operation or decommissioning of a nuclear installation.”⁶⁰⁹

2.2.2.4.1.2.3 *Radiation Protection*

The legal frameworks intended to establish radiation protection measures do so because “ionizing radiation can be detrimental to living organisms.”⁶¹⁰ When the ionizing radiation passes through the matter, including living tissue, it deposits energy which ultimately produces ionisation and excitation in the matter.⁶¹¹ For example, during the release of radionuclides at Chernobyl accident, individuals were severely exposed to ionizing radiation emanating from “iodine-131, caesium-134 and caesium-137” causing “the deaths, within a few weeks, of 30 workers and radiation injuries to over a hundred others.”⁶¹² In the context of the Fukushima accident the UNGA adopted Resolution 66/70 on Effects of atomic radiation which requires a continuous examination and compilation of “information about atomic and ionizing radiation and to analyze its effects on mankind and the environment.”⁶¹³

The Convention on Nuclear Safety and the Joint Convention on Safety of Radioactive Waste established a legal framework providing for the protection of the general public, workers, property, and the environment from the “exposure to ionizing radiation” which “arises

⁶⁰⁸ Article 7.2.iv of the Convention on Nuclear Safety. See, also, Article 19.2(v) of the Joint Convention on Safety of Radioactive Waste.

⁶⁰⁹ Article 2.iii of the Convention on Nuclear Safety.

⁶¹⁰ Stoiber *Handbook on nuclear law* at 45.

⁶¹¹ “The amount of energy deposited divided by the mass tissue exposed is called the absorbed dose and is usually measured in units known as milligrays (mGy).” See, Report of the UNSCEAR (2010), 57th session, includes Scientific Report: summery of low-dose radiation on health at 1. http://www.unscear.org/docs/reports/2010/UNSCEAR_2010_Report_M.pdf (accessed 23 July 2013).

⁶¹² UNSCEAR “The Chernobyl accident: UNSCEAR’s assessments of the radiation effects” <http://www.unscear.org/unscear/en/chernobyl.html> (accessed 23 July 2013).

⁶¹³ The preamble of the UNGA resolution 66/70 on 9 December 2011.

from...nuclear electricity generation” or “accidents such as the one at Chernobyl...and occupations that increase exposure to artificial or natural sources of radiation.”⁶¹⁴

- The Convention on Nuclear Safety requires each Contracting Party to
“take the appropriate steps to ensure that in all operational states the radiation exposure to the workers and the public caused by a nuclear installation shall be kept as low as reasonably achievable and that no individual shall be exposed to radiation doses which exceed prescribed national dose limits.”⁶¹⁵
- The Joint Convention on Safety of Radioactive Waste requires the “Each Contracting Party” to “take the appropriate steps to ensure that at all stages of spent fuel management, individuals, society and the environment are adequately protected against radiological hazards.”⁶¹⁶

2.2.2.4.1.3 *Emergency Preparedness and International Cooperation*

Nuclear safety measures and radiation protection principles are intended to minimise the nuclear and radiological emergencies and accidents. However, as the world witnessed at Chernobyl and Fukushima, accidents may nevertheless occur at the nuclear installations or during transport by air or water causing detrimental impact on people, property, and environment. The impact of nuclear incidents can transcend across other states. This requires national and international systems to respond to nuclear incidents in order “to reduce the risk of the emergency and mitigate their consequences.”⁶¹⁷

2.2.2.4.1.3.1 *Emergency Preparedness*

Both, the Convention on Nuclear Safety and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management deal with emergency preparedness. Article 16 of the Convention on Nuclear Safety requires that

⁶¹⁴ Report of the UNSCEAR (2010)...summary of low-dose radiation effects on health.

⁶¹⁵ Article 15 of the Convention on Nuclear Safety.

⁶¹⁶ Article 4 of the Joint Convention on Safety of Radioactive Waste.

⁶¹⁷ Stoiber *Handbook on nuclear law* at 75.

“each Contracting Party shall take the appropriate steps to ensure that there are on-site and off-site emergency plans that are routinely tested for nuclear installations and cover the activities to be carried out in the event of an emergency.” Article 25 of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management requires:

“1 Each Contracting Party shall ensure that before and during operation of a spent fuel or radioactive waste management facility there are appropriate on-site and, if necessary, off-site emergency plans. Such emergency plans should be tested at an appropriate frequency.

2 Each Contracting Party shall take the appropriate steps for the preparation and testing of emergency plans for its territory insofar as it is likely to be affected in the event of a radiological emergency at a spent fuel or radioactive waste management facility in the vicinity of its territory.”⁶¹⁸

The two conventions create legal obligations on states party to develop and implement the following:

- Emergency plans prepared to deal with on-site nuclear incidents.⁶¹⁹
- Emergency plans prepared to deal with off-site nuclear incidents.⁶²⁰
- Frequent test of the emergency plans.⁶²¹
- The examination of the appropriateness of emergency plans “at all stages of the licensing procedure, and especially during the design and construction of facilities and radiation equipment in order to make possible and facilitate countermeasures.”⁶²²

⁶¹⁸ Article 25 of the Joint Convention.

⁶¹⁹ See, article 16.1 of Convention on Nuclear Safety and article 25.1 of the Joint Convention on Safety of Radioactive Waste.

⁶²⁰ *Ibid.*

⁶²¹ Article 16.2 of Convention on Nuclear Safety and article 25.1 of the Joint Convention on Safety of Radioactive Waste.

⁶²² Stoiber *Handbook on nuclear law* at 75.

The Fundamental Safety Principles require the cooperation between the licensee, the employer, the regulatory body and appropriate branches of government in establishing, “in advance, arrangements for preparedness and response for a nuclear or radiation emergency at the scene, at local, regional and national levels and, where so agreed between States, at the international level.”⁶²³

2.2.2.4.1.3.2 *International cooperation*

The radioactive cloud caused by the Chernobyl accident extended over Belarus, the Russian Federation, Ukraine, and other European countries.⁶²⁴ The Chernobyl accident exposed serious deficiencies “in the framework of the international legal safeguards”⁶²⁵ resulting in two conventions intended to govern the transboundary effect of nuclear activities and international emergency response.

The Convention on Nuclear Safety and the Joint Convention on Safety of Radioactive Waste established a legal obligation to maintain transboundary emergency planning. Article 27 of the Joint Convention on Safety of Radioactive Waste requires “each Contracting Party involved in transboundary movement” to “take the appropriate steps to ensure that such movement is undertaken in a manner consistent with the provisions of this Convention and relevant binding international instruments.”

Nevertheless, the international emergency preparedness and response system is based on the Nuclear Assistance Convention and the Nuclear Early Notification Convention.⁶²⁶ The two conventions codify “the obligations of States in the nuclear field”⁶²⁷ and create obligations on states to inform and share information relating to nuclear accidents and to

⁶²³ Para 3.36 of the IAEA Safety Standards: Fundamental Safety Principles (2006) IAEA No. SF-1.

⁶²⁴ Report of the UNSCEAR (2010)...summary of low-dose radiation effects on health.

⁶²⁵ Peter Cameron “The Vienna Convention on Early Notification and Assistance” (19-32) in Peter Cameron et al eds Nuclear energy law after Chernobyl (1998) International Bar Association at 19.

⁶²⁶ Promptly after the Chernobyl accident the IAEA succeeded to bring these two instruments to light under its auspices in 1986. See, Jankowitsch-Prevor “The normative role of the International Atomic Energy Agency...” at 28.

⁶²⁷ Stoiber *Handbook on nuclear law* at 10.

help each other with the assistance of the IAEA and other international organisations in order to minimise radiological consequences.

On the one hand, in terms of the Nuclear Early Notification Convention, the international community desires “to strengthen further international co-operation in the safe development and use of nuclear energy.”⁶²⁸ The Convention applies “in the event of any accident involving facilities or activities of a State Party or of persons or legal entities under its jurisdiction or control.”⁶²⁹ The State party to the Convention is under the obligation to notify the states affected by a nuclear accident and the IAEA “of the nuclear accident, its nature, the time of its occurrence and its exact location where appropriate.”⁶³⁰ Further, the Convention requires the state to provide those States which are or may be physically affected by any nuclear accident as specified in article 1 “directly or through the Agency, and the Agency with such available information relevant to minimizing the radiological consequences in those States.”⁶³¹

On the other hand, the Nuclear Assistance Convention creates obligations on States Parties to cooperate between themselves and the IAEA...“to facilitate prompt assistance in the event of a nuclear accident or radiological emergency to minimize its consequences and to protect life, property and the environment from the effects of radioactive releases.” Further, the States “may agree on bilateral or multilateral arrangements or, where appropriate, a combination of these, for preventing or minimizing injury and damage which may result in the event of a nuclear accident or radiological emergency.”⁶³²

However, there is a call for strengthening the nuclear safety and emergency preparedness and international cooperation during nuclear accidents. In September 2000 the General Conference of the IAEA in Resolution GC(44)/RES/16:

“encouraged Member States to implement instruments for improving their response, in particular their contribution to international response, to nuclear or radiological

⁶²⁸ The preamble of the Notification Convention.

⁶²⁹ Article 1.1 of the Nuclear Early Notification Convention.

⁶³⁰ Article 2.a of the Nuclear Early Notification Convention.

⁶³¹ Article 2.b of the Nuclear Early Notification Convention.

⁶³² Article 1.2 of the Nuclear Early Notification Convention.

emergencies as well as to participate actively in the process of strengthening international, national and regional capabilities for responding to nuclear or radiological emergencies and to make those capabilities more consistent and coherent.”⁶³³

The lessons learnt from the Fukushima accident lead to the call “to strengthen nuclear safety, emergency preparedness and radiation protection of people and the environment worldwide.”⁶³⁴ For example, “the Gulf countries are concerned about safety and security and want to capture lessons from the Fukushima incident.”⁶³⁵ Other countries such as “Germany, Italy, and Switzerland have decided to phase out nuclear power.” The UK department of Energy and Climate Change (DECC) relies on recent polls showing that nuclear energy is still popular and “Britain needs a mix of energy sources to ensure a reliable supply of electricity including nuclear power and renewable.” Nevertheless, the DECC is required to focus on “new safety and security, non-proliferation, emergency planning, managing radioactive waste.”⁶³⁶

2.2.2.4.2 Nuclear Security

Nuclear security is a widespread concept which interfaces with nuclear safety and non-proliferation of nuclear weapons and occupies a central point in nuclear law.⁶³⁷ Nuclear safety and security generate two cultures which are required to “coexist and...reinforce each other in order to achieve “the common objective of limiting risk.”⁶³⁸

⁶³³ IAEA *Response and Assistance Network: Incident and Emergency Centre* (2010) IAEA at 3.

⁶³⁴ Draft IAEA Action Plan on Nuclear Safety at 1.

⁶³⁵ Sharma A, Sultan N, and Weir D “Going nuclear in the GCC countries: rational, challenges, and prolitics” (59-68) in Ramady M ed *The GCC Economies: Stepping up to Future Challenges* (2012) at 67.

⁶³⁶ Great Britain: Parliament, House of Commons: Science and Technology Committee *Devil's Bargain? Energy Risks and the Public* (first report of session 2012-13) at 45.

⁶³⁷ Nuclear security culture: implementing guide (2008) IAEA Nuclear Security Series No. 7 at 6. See also, Findlay T *The Future of Nuclear Energy to 2030 and its Implications for Safety, Security and Nonproliferation* (2010) at 15.

⁶³⁸ Nuclear security culture: implementing guide (2008) at 6.

Legal framework governing nuclear security focuses on the malicious acts involving nuclear matters which constitute potential threats to nuclear security. These acts involve thefts and losses, unlawful possession and trafficking, illegal disposal, criminal and unauthorised use of nuclear and other radioactive materials, and terrorist attacks on nuclear facilities or by way of nuclear explosive device. Therefore, nuclear security may be defined as a process which involves “the prevention and detection of, and response to, theft, sabotage, unauthorised access, illegal transfer or other malicious acts involving nuclear or other radioactive substances or their associated facilities.”⁶³⁹

The legal frameworks regulating nuclear security include binding and non-binding normative rules. The nuclear binding rules are mainly based on the CPPNM and its Amendment, the UNSC resolutions 1373 and 1540, Supplementary Guidance on the Import and Export of Radioactive Sources, and ICSANT. The non-binding normative rules which contribute to the nuclear security regime include those commitments contemplated in the in the precepts of the MECRs regimes and the IAEA Nuclear Security Series framework which comprises four tiers of publications including Nuclear Security Fundamentals, Recommendations, Implementing, Guides, and Technical Guidance.

2.2.2.4.2.1 *The CPPNM*

The CPPNM establishes the legal framework which protects nuclear materials intended for peaceful domestic use, storage, and the international transportation of such nuclear materials.⁶⁴⁰ It establishes measures to protect the confidentiality of information relating to the physical protection of nuclear material.⁶⁴¹ Further, it establishes deterrent measures by requiring State Parties to make the offences described in Article 7 of the Convention “punishable by appropriate penalties which take into account their grave nature.”⁶⁴² Article 7 describes the following actions as offences:

“1. The intentional commission of:

⁶³⁹ Nuclear security culture: implementing guide (2008) at 3.

⁶⁴⁰ Article 2 of the CPPNM

⁶⁴¹ Article 6 of the CPPNM.

⁶⁴² Article 7.2 of the CPPNM.

- (a) an act without lawful authority which constitutes the receipt, possession, use, transfer, alteration, disposal or dispersal of nuclear material and which causes or is likely to cause death or serious injury to any person or substantial damage to property;
- (b) a theft or robbery of nuclear material;
- (c) an embezzlement or fraudulent obtaining of nuclear material;
- (d) an act constituting a demand for nuclear material by threat or use of force or by any other form of intimidation;
- (e) a threat:
 - i. to use nuclear material to cause death or serious injury to any person or substantial property damage, or
 - ii. to commit an offence described in sub-paragraph (b) in order to compel a natural or legal person, international organization or State to do or to refrain from doing any act;
- (f) an attempt to commit any offence described in paragraphs (a), (b) or (c); and
- (g) an act which constitutes participation in any offence described in paragraphs

(a) to (f) shall be made punishable offence by each State Party under its national law.”

2.2.2.4.2.2 *The Amendment to the CPPNM*

The State Parties to the CPPNM have debated as to whether the physical protection during international transport provided for by the Convention required amendment in order to broaden its scope. In 2005 the CPPNM Review Conference adopted the Amendment by consensus.

The Amendment to CPPNM interlinks the physical protection of nuclear facilities with the protection of public health, safety, the environment and national and international security and extends its protection to additional list of items by inserting the following to paragraphs after paragraph (c) of the CPPNM:

- (d) “nuclear facility” means a facility (including associated buildings and equipment) in which nuclear material is produced, processed, used, handled, stored or disposed of, if damage to or interference with such facility could lead to the release of significant amounts of radiation or radioactive material;
- (e) “sabotage” means any deliberate act directed against a nuclear facility or nuclear material in use, storage or transport which could directly or indirectly endanger the health and safety of personnel, the public or the environment by exposure to radiation or release of radioactive substances.”

The Amendment to the CPPNM is intended to “achieve and maintain worldwide effective physical protection of nuclear material used for peaceful purposes and of nuclear facilities used for peaceful purposes; to prevent and combat offences relating to such material and facilities worldwide; as well as to facilitate co-operation among States Parties to those ends.”⁶⁴³ However, the Amendment to the CPPNM requires to be entered into force in order to strengthen the international nuclear security regime.

2.2.2.4.2.3 *The International Convention for the Suppression of Acts of Nuclear Terrorism (ISCANT)*

It is clear that the CPPNM is limited to “nuclear material used for peaceful purposes” “while in domestic use, storage and transport” and does not cover nuclear installations or nuclear material of a military nature. New factors emerged after the cold war and “a great deal of fissionable material which is “unaccounted for, mainly from the former USSR”⁶⁴⁴ exposed international security to nuclear threats by terrorists and non-state actors. The work of the UN Ad Hoc Committee established by the UNGA Resolution 51/210 on 17 December 1996⁶⁴⁵ became relevant. In terms of Article III.9 the UNGA Resolution 51/210 the international community:

⁶⁴³ Article 1A of the Amendment to the CPPNM.

⁶⁴⁴ Advisory Library of International Law, the International Convention for the Suppression of Acts of Nuclear Terrorism New York, 13 April 2005. <http://untreaty.un.org/cod/avl/ha/icsant/icsant.html> (access 20 August 2013).

⁶⁴⁵ UNGA resolution 51/210 on 17 December 1996.

“Decides to establish an Ad Hoc Committee, open to all States Member of the United Nations or members of specialized agencies or of the International Atomic Energy Agency, to elaborate an international convention for the suppression of terrorist bombings and, subsequently, an international convention for the suppression of acts of nuclear terrorism, to supplement related existing international instruments, and thereafter to address means of further developing a comprehensive legal framework of conventions dealing with international terrorism.”

The Ad-Hoc Committee finalised the draft of the international convention for the suppression of acts of nuclear terrorism at its 35th meeting on 1 April 2005 and recommended to the UNGA the adoption of the “draft resolution.”⁶⁴⁶ The UNGA adopted the International Convention for the Suppression of Acts of Nuclear Terrorism and requested the UN Secretary General “to open the Convention for signature at United Nations Headquarters in New York from 14 September 2005 to 31 December 2006” and called “upon all States to sign and ratify, accept, approve or accede to the Convention.”⁶⁴⁷

The ISCONT recalls the UNGA Resolution 51/210 and notes “that acts of nuclear terrorism may result in the gravest consequences and may pose a threat to international peace and security.” It also notes “that existing multilateral legal provisions do not adequately address those attacks.”⁶⁴⁸ The ICSANT extends the definition of nuclear material contemplated in Article 1 of the CPPNM to include radioactive material, nuclear facilities, nuclear explosive devices or radioactive dispersal devices, State or government facility, and Military forces of a State.⁶⁴⁹ Further, It also introduces the legal framework to define nuclear offences⁶⁵⁰ and requires State parties to “adopt such measures as may be necessary, including, where

⁶⁴⁶ Para 3 of UNGA resolution A/59/766 requires the establishment of “measures to eliminate international terrorism: Report of the Ad Hoc Committee established by General Assembly resolution 51/210 of 17 December 1996.” The resolution was adopted at the UNGA 59th session on 4 April 2005.

⁶⁴⁷ UNGA resolution 59/290 adopted on the report of the Ad Hoc Committee established by General Assembly resolution 51/210 of 17 December 1996, Fifty-ninth session, Agenda item 148, 91st plenary meeting 13 April 2005.

⁶⁴⁸ The preamble of the Nuclear ICSANT.

⁶⁴⁹ Article 1 of the ICSANT.

⁶⁵⁰ Article 2 of the ICSANT.

appropriate, domestic legislation, to ensure that criminal acts within the scope of this Convention...are punished by penalties consistent with their grave nature.”⁶⁵¹

2.2.2.4.2.4 UNSC Resolutions 1373 and 1540

It is noticeable the UNSC has extended its powers relating to nuclear non-proliferation and adopted many resolutions in particular after the New York World Trade Centre. The UNSC passed Resolution 1373 on 28 September 2001. Resolution 1373 requires all States to “prevent and suppress the financing of terrorist acts”⁶⁵² and to coordinate “efforts on national, subregional, regional and international levels in order to strengthen a global response to illegal movement of nuclear” ... “materials.”⁶⁵³

Further, the UNSC while acting under Chapter VII of the UN Charter passed Resolution 1540 on 28 April 2004 which affirms “that the proliferation of nuclear, chemical and biological weapons and their means of delivery constitutes a threat to international peace and security.”⁶⁵⁴ The UNSC established the UNSC Committee (1540 Committee)⁶⁵⁵ to oversee the implementation of the Resolution.⁶⁵⁶ The UNSC continued extending the mandate of the 1540 Committee.⁶⁵⁷ In 2011 the UNSC adopted Resolution 1977 which extends the mandate of the 1540 Committee until 2021.⁶⁵⁸ Added to that the UNSC passed Resolution 1887 in 2009 which reaffirms “that proliferation of weapons of mass destruction, and their means of

⁶⁵¹ Article 6 of the ICSANT.

⁶⁵² Article 1.a of resolution 1373

⁶⁵³ Article 4 of resolution 1373

⁶⁵⁴ Para. 1 of the UNSC Resolution 1540 of 2004. The resolution was adopted by the UNSC “at its 4956th meeting, on 28 April 2004.”

⁶⁵⁵ Hereafter referred to as the 1540 Committee.

⁶⁵⁶ Article 4 of resolution 1540 of 2004.

⁶⁵⁷ In 2006 the UNSC extended “the mandate of the 1540 Committee for a period of two years.” See, article 4 of Resolution 1673 of 2006 which was adopted by the UNSC “at its 5429th meeting, on 27 April 2006.” In terms of article 6 of the UNSC Resolution 1810 of 2008 the mandate of the 1540 Committee was extended again until 25 April 2011. The Resolution 1810 was adopted the UNSC “at its 5877th meeting, on 25 April 2008.”

⁶⁵⁸ Article 2 of Resolution 1977 of 2011. The resolution was adopted by the UNSC “at its 6518th meeting, on 20 April 2011.”

delivery, constitutes a threat to international peace and security,”⁶⁵⁹ calling “upon States Parties to the NPT to comply fully with all their obligations and fulfil their commitments under the Treaty.”⁶⁶⁰

Resolution 1540 recognises:

“that most States have undertaken binding legal obligations under treaties to which they are parties, or have made other commitments aimed at preventing the proliferation of nuclear...weapons, and have taken effective measures to account for, secure and physically protect sensitive materials, such as those required by the Convention on the Physical Protection of Nuclear Materials and those recommended by the IAEA Code of Conduct on the Safety and Security of Radioactive Sources.”⁶⁶¹

The Resolution requires “all States to take additional effective measures to prevent the proliferation of nuclear...weapons and their means of delivery.”⁶⁶² The UNSC has established its Committee in order to ensure the implementation of its Resolution.⁶⁶³

The international nuclear security regime is also supported by the NWFZs, the export control regimes, and the IAEA security guidelines. “The strategy of establishing NWFZs is generally seen as both non-proliferation and security enhancing for the regions themselves.” Jo-Ansie van Wyk states that

“The UNGA maintained that the objective of a NWFZ is to provide a legally binding instrument between two or more states to establish a specific region as free from nuclear weapons; and to institute a series of verification and compliance mechanisms and negative security guarantees by all nuclear weapons states (NWS).”⁶⁶⁴

⁶⁵⁹ The preamble of UNSC Resolution 1887 of 2009. The resolution was adopted by the UNSC at its 6191st meeting, on 24 September 2009.

⁶⁶⁰ Article 2 of UNSC resolution 1887.

⁶⁶¹ The preamble of resolution 1540.

⁶⁶² *Ibid.*

⁶⁶³ Article 4 of resolution 1540.

⁶⁶⁴ Van Wyk J “No nukes in Africa: South Africa, the denuclearisation of Africa and the Pelindaba Treaty” (263-297) Vol 57, no 2 (November 2012) *Historia* at 266.

That is true to certain extent, but the Tlatelolco and the Bangkok treaties focus on security relating to the non-proliferation of nuclear weapons and the impact of that on the security of the respective regions. Examining nuclear security in the context of limiting the risk accompanying nuclear industry development, the Pelindaba Treaty is the more relevant source of regulation. Article 10 of the Treaty reads as follows:

“Each Party undertakes to maintain the highest standards of security and effective physical protection of nuclear materials, facilities and equipment to prevent theft or unauthorized use and handling. To that end each Party, *inter alia*, undertakes to apply measures of physical protection equivalent to those provided for in the Convention on Physical Protection of Nuclear Material and in recommendations and guidelines developed by IAEA for that purpose.”

The IAEA has been spreading a culture of nuclear security, as an international responsibility,⁶⁶⁵ by strengthening the international legal framework⁶⁶⁶ and establishing effective national nuclear security norms in order to facilitate the peaceful use of nuclear energy. This has been evolving through the IAEA Nuclear Security Series publications which are prepared and reviewed “by experts from Member States (who assist the IAEA Secretariat in drafting the publications) and the Nuclear Security Guidance Committee (NSGC), which reviews and approves draft publications.”⁶⁶⁷ These publications can be categorised as follows:

- Nuclear Security Fundamentals containing objectives, concepts and principles.
- Recommendations presenting best practices that should be adopted by Member States.
- Implementing Guides which providing further technical elaboration of recommendations.

⁶⁶⁵ Para 27 of the Report by the Director General Nuclear Security Plan 2010-2013 (17 August 2009) IAEA GOV/2009/54-GC(53)/18.

⁶⁶⁶ *Illicit Nuclear Trafficking: Collective Experience and the Way Forward* (2008) at 3.

⁶⁶⁷ IAEA Nuclear Security Series. http://www-ns.iaea.org/security/nuclear_security_series.asp?l=35 (access 20 August 2013).

- Technical Guidance comprising reference manuals, training guides, and service guides.⁶⁶⁸

The IAEA has developed Nuclear Security Standards through publications which “help States to meet the requirements set out in binding international legal instruments. By the end of 2012 the IAEA has issued eighteen publications dealing with nuclear security.”⁶⁶⁹ Although IAEA Nuclear Security Standards publications give guidance to States, they are legally non-binding documents.

The role of the IAEA will increase in nuclear security on basis of the 2005 Amendment to the CPPNM because the amendment “confers a number of additional functions on the Agency, which were set out in GOV/2005/51 and approved by the Board of Governors.”⁶⁷⁰ The Proposed Amendments to the CPPNM promote the IAEA Nuclear Security Standards relating to “design, maintenance and improvement of systems of physical protection of nuclear material in international transport”⁶⁷¹ and “the design, maintenance and improvement of its national system of physical protection of nuclear material in domestic use, storage and transport and of nuclear facilities.”⁶⁷²

The requirement to strengthen nuclear security worldwide became the focus of the “International Conference on Nuclear Security: Enhancing Global Efforts” in Vienna, Austria from 1–5 July 2013. In his address to the said Conference, the IAEA Director General, Yukiya Amano, stressed the enduring threat of nuclear or other radioactive material falling into the hands of those who might use it for malicious acts and the “to remain vigilant against credible threats.”⁶⁷³ It seems that the international nuclear security regime is still in

⁶⁶⁸ Report by the Director General on Nuclear Security-Measures to Protect Against Nuclear Terrorism GOV/2006/46-GC(50)/13 (16 August 2006).

⁶⁶⁹ IAEA Nuclear Security Achievement 2002-212 (2012) IAEA at 10 <http://www.iaea.org/Publications/Booklets/NuclearSecurity/nsachievements0312.pdf> (access 20 August 2013).

⁶⁷⁰ *Implementation of the IAEA Nuclear Security Plan 2006–2009* (2008) at 3.

⁶⁷¹ Article 4 of the Amendment to the CPPNM.

⁶⁷² Article 5 of the Amendment to the CPPNM.

⁶⁷³ See, IAEA Director Genral Yukiya Amano at the International Conference on Nuclear Security: Enhancing Global Efforts Vienna, Austria (1–5 July 2013).

progress and to strengthen the regime is also dependent on states attitude towards normative rules. For example, the IAEA Nuclear Security Fundamentals: Objective and Essential Elements of a State's Nuclear Security Regime⁶⁷⁴ which incorporates the "Fundamental Principles of Physical Protection of Nuclear Material and Nuclear Facilities" into Article 2A.3 of the Amendment to the CPPNM is intended to strengthen the global nuclear security regime. Although the Amendment to the CPPNM has not entered into force yet, it is pertinent that the IAEA has incorporated the nuclear security requirement in its Nuclear Security Series Publications which attempt to establish a nuclear security regime comprised of the following:

- The legislative and regulatory framework and administrative systems and measures governing the nuclear security of nuclear material, other radioactive material, associated facilities and associated activities;
- The institutions and organizations within the State responsible for ensuring the implementation of the legislative and regulatory framework and administrative systems of nuclear security;
- Nuclear security systems and nuclear security measures for the prevention of, detection of and response to nuclear security events."⁶⁷⁵

2.2.2.4.3 Nuclear liability

The requirement to compensate persons for injuries and other damages caused by nuclear accidents resulted in the development of nuclear liability law. Such law is intended to ensure suitable financial protection against the consequences of ionising radiation resulting from nuclear hazards, provide basic and guaranteed access to compensation, protect nuclear industry from potentially devastating liability in case of a large-scale accident, and to establish legal framework governing jurisdiction.

⁶⁷⁴ Nuclear Security Fundamentals: Objective and Essential Elements of a State's Nuclear Security Regime, IAEA Nuclear Security Series No. 20 (2013)

⁶⁷⁵ Nuclear Security Fundamentals: Objective and Essential Elements of a State's Nuclear Security Regime (2013) at 13.

The nuclear liability and coverage regime is mainly based on the following five fundamental instruments:

1. The 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy (the Paris Convention).⁶⁷⁶ The Paris Convention has been amended by Protocol 28 January 1964 to harmonies the convention with the 1963 Vienna Convention.
2. The 1963 Brussels Convention Supplementary to the Paris Convention (the Brussels Supplementary Convention)
3. The 1963 Vienna Convention on Civil Liability for Nuclear Damage.⁶⁷⁷
4. The 1988 Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention.
5. The 1997 Convention on Supplementary Compensation for Nuclear Damage.

These conventions outline the key principles of the international nuclear liability framework based on a strict liability regime. This means that, liability is imposed on the operator of nuclear installations which caused the nuclear damage regardless of fault.

2.2.2.4.3.1 The scope of nuclear liability regime

The scope of nuclear liability regime is limited to nuclear damages resulting from nuclear material,⁶⁷⁸ radioactive products or waste,⁶⁷⁹ nuclear installation,⁶⁸⁰ and “such other installations in which there are nuclear fuel or radioactive products or waste as the Board of Governors of the “IAEA “shall from time to time determine.”⁶⁸¹ Nuclear damages as defined

⁶⁷⁶ See, “Convention on Third Party Liability in the Field of Nuclear Energy of 29th July 1960, as amended by the Additional Protocol of 28th January 1964 and by the Protocol of 16th November 1982.” http://www.oecd-nea.org/law/nlparis_conv.html (access 20 August 2013).

⁶⁷⁷ The Vienna Convention on Civil Liability for Nuclear Damage was adopted on 21 May 1963 and was opened for signature on the same day. It entered into force on 12 November 1977, i.e. three months after the date of deposit with the Director General of the fifth instrument of ratification, in accordance with Article XXIII. <http://www.iaea.org/Publications/Documents/Infcircs/1996/inf500.shtml> (access 20 August 2013).

⁶⁷⁸ Article I.1.h of the Vienna Convention on Civil Liability for Nuclear Damage.

⁶⁷⁹ Article I.1.i of the Vienna Convention on Civil Liability for Nuclear Damage.

⁶⁸⁰ Article I.1.j of the Vienna Convention on Civil Liability for Nuclear Damage.

⁶⁸¹ Article 1.b.iv of the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage.

in Article I.f of the Convention on Supplementary Compensation for Nuclear Damage include the following:

- “(i) loss of life or personal injury;
- (ii) loss of or damage to property; and each of the following to the extent determined by the law of the competent court –
- (iii) economic loss arising from loss or damage referred to in sub-paragraph (i) or (ii), insofar as not included in those sub-paragraphs, if incurred by a person entitled to claim in respect of such loss or damage;
- (iv) the costs of measures of reinstatement of impaired environment, unless such impairment is insignificant, if such measures are actually taken or to be taken, and insofar as not included in sub-paragraph (ii);
- (v) loss of income deriving from an economic interest in any use or enjoyment of the environment, incurred as a result of a significant impairment of that environment, and insofar as not included in sub-paragraph (ii);
- (vi) the costs of preventive measures, and further loss or damage caused by such measures;
- (vii) any other economic loss, other than any caused by the impairment of the environment, if permitted by the general law on civil liability of the competent court.”

2.2.2.4.3.2 *The liability of operator*

The liability of a nuclear installation is a strict liability, which means that the operator “is held liable, regardless of fault.”⁶⁸² Consequently, a claimant does not need to prove negligence part of the operator. The proof required is to demonstrate “that such damage has been caused by a nuclear incident –

- (i) in his nuclear installation; or
- (ii) involving nuclear material coming from or originating in his nuclear.”⁶⁸³

⁶⁸² Stoiber *Handbook on nuclear Law* at 174.

⁶⁸³ Article II of the Vienna Convention on Civil Liability for Nuclear Damage.

The liability regime has developed to hold the operator of a nuclear installation liable exclusively. Article II.5 of the Vienna Convention on Civil Liability for Nuclear Damage states the following:

“Except as otherwise provided in this Convention, no person other than the operator shall be liable for nuclear damage. This, however, shall not affect the application of any international convention in the field of transport in force or open for signature, ratification or accession at the date on which this Convention is opened for signature.”

The interpretation of Article II of the Vienna Convention on Civil Liability for Nuclear Damage indicates that all those involved in nuclear installations infrastructure such as designers, builders or suppliers are exempted from liability. The *Exposé des Motifs* of the 1982 Paris Convention suggests that “all liability is channelled onto one person, namely the operator of the nuclear installation where the nuclear incident occurs. Under the Convention, the operator - and only the operator - is liable for nuclear incidents at installations and no other person is liable.”⁶⁸⁴

This is motivated as follows:

“Two primary factors have motivated in favour of this channelling of all liability onto the operator as distinct from the position under the ordinary law of torts. Firstly, it is desirable to avoid difficult and lengthy questions of complicated legal cross-actions to establish individual cases who is legally liable. Secondly, such channelling obviates the necessity for all those who might be associated with the construction or operation of a nuclear installation other than the operator himself to take out insurance also, and thus allows a concentration of the insurance capacity available.”⁶⁸⁵

⁶⁸⁴ Article 15 of the *Exposé des Motifs*, Revised text of the *Exposé des Motifs* of the Paris Convention, approved by the OECD Council (16 November 1982). http://www.oecd-nea.org/law/nlparis_motif.html (accessed 23 July 2013).

⁶⁸⁵ *Ibid.*

In order to cover the liability or nuclear damage under the Vienna Convention on Civil Liability for Nuclear Damage, the operator is “required to maintain insurance or other financial security...in such amount, of such type and in such terms as the”⁶⁸⁶ “competent public authority specifies.”⁶⁸⁷ The competent public authority guarantees “the payment of claims for compensation for nuclear damage which have been established against the operator...”⁶⁸⁸

The strict liability of the operator “is not subject to the classic exonerations such as force majeure, Acts of God or intervening acts of third persons, whether or not such acts were reasonably foreseeable and avoidable.” However, the operator may be exonerated on the following basis:

- The damage resulted from gross negligence of the victim or an act or an omission with intent to cause damage by him/her.⁶⁸⁹
- The “damage caused by a nuclear incident directly due to an act of armed conflict, hostilities, civil war or insurrection.”⁶⁹⁰
- The “damage caused by a nuclear incident by a nuclear incident directly due to a grave natural disaster of an exceptional character.”⁶⁹¹

Nuclear liability regime introduces limitations on the liability of the operator in amount and in time, does not discriminate between victims, and reserve jurisdiction for the State in which the nuclear incident occurs:

- The Vienna Convention on Civil Liability for Nuclear Damage prescribes the liability limit not less than US\$5 million. Article IV.6 of the same Convention reads as follows:

“Any Installation State may provide by legislation that sub-paragraph (b) of paragraph 5 of this Article shall not apply, provided that in no case shall the

⁶⁸⁶ Article VII.1 of the Vienna Convention on Civil Liability for Nuclear Damage.

⁶⁸⁷ Article 10.a of the Exposé des Motifs, Revised text of the Exposé des Motifs of the Paris Convention.

⁶⁸⁸ *Ibid.*

⁶⁸⁹ Article IV.2 of the Vienna Convention on Civil Liability for Nuclear Damage.

⁶⁹⁰ *Id.* Article IV.3.a.

⁶⁹¹ *Id.* Article IV.3.b.

liability of the operator in respect of nuclear damage, other than nuclear damage to the means of transport, be reduced to less than US \$5 million for any one nuclear incident.”

The 1998 Protocol to Amend the Vienna Convention raises the liability limit up to 300 million Special Drawing Rights (SDRs). Article 7.1 of the Protocol states that “the liability of the operator may be limited by the Installation State for any one nuclear incident, either –

(a) to not less than 300 million SDRs...”

The limitation of nuclear liability in amount means that the operator is “required to maintain insurance or other financial security covering his liability for nuclear damage in such amount, of such type and in such terms as the Installation State shall specify.”⁶⁹² Consequently, the Installation State can accept responsibility as insurer of last resort, providing that “the necessary funds to the extent that the yield of insurance or other financial security is inadequate to satisfy such claims...”⁶⁹³

- The limitation of liability in time means that “rights of compensation under” Vienna Convention on Civil Liability for Nuclear Damage shall be extinguished if an action is not brought within ten years from the date of the nuclear incident.”⁶⁹⁴
- Compensation for nuclear damage does not accept “any discrimination based upon nationality, domicile or residence.”⁶⁹⁵
- The jurisdiction in nuclear liability has been kept for the State in which the nuclear incident occurs. Article XI.1 preserves jurisdiction over actions under Article II”...for “the courts of the Contracting Party within whose territory the nuclear incident occurred.” Of course this concentration of procedures within a single court is intended to create legal certainty, minimise the cost of the operator, and exclude

⁶⁹² *Id.* Article VII.1.

⁶⁹³ *Id.* Article VII.1.

⁶⁹⁴ *Id.* Article VI.1.

⁶⁹⁵ *Id.* Article XIII.

“the possibility that victims of nuclear incidents will seek to submit their claims in States in which their claims are more likely to receive favourable treatment.”⁶⁹⁶

2.3 CONCLUSION

Although the international nuclear energy regime perpetuates “nuclear apartheid” as it was termed by Shane J. Maddock, and contains many discrepancies, it provides for nuclear global governance. Nuclear energy law is unique, but it nevertheless is part of international law. As Article 38(1) of the Statute of the ICJ defines the sources of international law, international nuclear energy law sources its origin from:

- International conventions, treaties, and agreements. These kind of legal instruments form a fundamental component of international nuclear energy law. For example, legal normative rules governing nuclear safety are provided for in the Conventions on Nuclear Safety, Safety of Radioactive Waste, Nuclear Assistance, Nuclear Early Notification e and many others.
- International custom, as evidence of a general practice accepted as law. Settled practice (*usus*) and the *opinion juris sive necessitatis* are the two components required to establish custom. The practice of the UNSC in dealing with nuclear diversion has been constant and uniform. The UNSC established commissions in the case of Iraq, Islamic Republic of Iran, and the DPRK, to report to the UNSC and UNGA. This practice evolved into a process of harmonisation of nuclear legal systems worldwide. In practical terms, the UNSC passes a resolution and establishes a commission to oversee the progress in any states in adhering to the resolution. In most cases the UNSC requires all states to adjust their laws in a manner which gives effect to the norms stemming from the resolution. For example, UNSC 1540 Resolution requires all states to adopt legislation to prevent the proliferation of nuclear weapons and their means of delivery, and establish appropriate domestic controls over related materials to prevent their illicit trafficking. In terms of Article 4 of Resolution 1540 the UNSC has established the 1540 Committee in order to “report to the Security Council for its examination, on the implementation of this

⁶⁹⁶ Stoiber *Handbook on nuclear law* at 116.

resolution.”⁶⁹⁷ The mandate of the 1540 Committee has been extended several times, by Resolution 1673 on 27 April 2006, Resolution 1810 on 25 April 2008, and Resolution 1977 on 20 April 2011.

- The general principles of law recognised by civilised nations inform the international nuclear energy law significantly. For example, the establishment of the USA Atomic Energy Commission by the McMahon Act became a prototype for commissions worldwide. The establishment of a commission or a regulatory body becomes a general principle of nuclear law which can be found in Article 8 of the Convention on Nuclear Safety and Article 20 of the Joint Convention on Safety of Radioactive Waste.
- The judicial decisions do not have binding force. However, the *ICJ Nuclear Threat Advisory Opinion* ICJ findings are generally accepted as persuasive legal authority.
- In the context of juristic works and authoritative writings, it should be noted that numerous review conferences and peer review mechanisms on nuclear energy law and governance function as a process of inspiring and guiding the formation legal normative rules. In these *fora* specialist academics contribute to the identification of legal lacunae and propose solutions. For example, many writers and policy makers contributed to the Proceedings of the International Conference held in Edinburgh in 2007 on *Illicit Nuclear Trafficking: Collective Experience and the Way Forward*.⁶⁹⁸ Usually, these writers identify the loopholes in various legal systems and make recommendations which later inform e.g. the 1540 Committee. Consequently, the juristic works in nuclear energy norms have had a significant impact on the development of nuclear energy law.
- “Soft law” too became a very important component of nuclear energy law. The IAEA has been developing standards to maintain frameworks for the best practice in the nuclear industry. These standards become a source of law particularly when a treaty or an instrument with authority such as the Draft IAEA Action Plan requires the adoption of the IAEA Standards. The Draft IAEA Action Plan requires “member States to utilize as broadly and effectively as possible the IAEA Safety Standards in an open, timely and transparent manner. The IAEA Secretariat (is) to continue providing

⁶⁹⁷ Article 4 of the UNSC resolution 1540.

⁶⁹⁸ *Illicit Nuclear Trafficking: Collective Experience and the Way Forward* (2008).

support and assistance in the implementation of IAEA Safety Standards.” Igor Khripunov and Carlton Stoiber propose that the balance between the soft and the hard law elements of the nuclear legal framework should allow for the non-binding norms to gradually be effectively implemented. That is to say, the balance between soft law and hard law may allow the IAEA Nuclear Security Series Publications to supplement the imperfect nuclear security regime which is dependent on treaties that require long time of negotiations.⁶⁹⁹

The most important aspect is that international nuclear energy regime is the driving force behind the domestic nuclear energy regimes. The enforcement of international nuclear energy law has involved the UNSC who utilised its powers under Chapter VII of the UN Charter. UNSC resolutions such as Resolution 1540, are binding in nature and thus influence the domestic legal systems of all states.

⁶⁹⁹ Khripunov I and Stoiber C “Nuclear security and nuclear counter terrorism: streamlining and updating the legal framework” (1-17 in Khripunov I and Nikonov D *Legal Framework for Strengthening Nuclear Security and Combating Nuclear Terrorism* (2012) at 4.

CHAPTER III

SOUTH AFRICA'S NUCLEAR ENERGY REGIME

3.1 INTRODUCTION

South Africa's nuclear energy initiatives originate in the 1944 British Government's query about uranium deposits for supplying the on-going nuclear weapons programmes of the UK and the USA⁷⁰⁰ South Africa conducted a survey which revealed the existence of large deposits of low-grade ore.⁷⁰¹ A programme of cooperation between South Africa, the UK and the USA was established to process the uranium which was "extracted as a by-product of gold mining operations."⁷⁰²

South Africa soon embarked on a legislative process in order to regulate nuclear energy industry. The Uranium Committee was established and the Atomic Energy Act of 1948 which established the Atomic Energy Board (AEB)⁷⁰³ was promulgated.⁷⁰⁴ In July 1957 South Africa signed a 50-year bilateral agreement for nuclear collaboration with the USA. This agreement was part of the USA "Atoms for Peace" programme. In terms of the agreement the USA provided South Africa with the Safari-1 reactor and highly enriched uranium (HEU) fuel for the reactor.⁷⁰⁵ This played a central role in advancing the nuclear industry of the country.

South Africa's nuclear industry was based on processing uranium ore into yellowcake and selling it internationally. However, the Government of South Africa had had further

⁷⁰⁰ The British Chancellor of the Exchequer sent a telegram to the then South Africa Prime Minister General Jan Smuts inquiring about uranium deposits needed for Manhattan project. See, Fig *Uranium Road: Questioning South Africa's Nuclear Direction* (2005) at 38.

⁷⁰¹ It was estimated that South Africa had 25% of the total uranium reserves in the then non-communist world. See Van Vuuren R *Nuclear Non-Proliferation: The South Africa experience in global context* (December 2003) A dissertation submitted for the Degree of Masters in International Politics University of South Africa at 164.

⁷⁰² Anglogold Ashanti, Economic Performance: Case studies-South Africa http://www.anglogoldashanti.co.za/subwebs/informationforinvestors/reporttosociety05/values_bus_principles/economic/ep_cs_sa_4_3.htm (24 October 2013).

⁷⁰³ Hereafter referred to as the AEB.

⁷⁰⁴ Fraser A *Chain Reaction: Twenty Years of Nuclear Research and Development* (1979) at 5.

⁷⁰⁵ *Ibid* at 8.

ambitions and mandated the AEB to initiate research at the Pelindaba Nuclear Research Centre.⁷⁰⁶ Meanwhile an “indigenously constructed reactor (also known as Pelinduna, Pelindaba-Zero or Safari-2) located at Pelindaba” went critical in 1967.⁷⁰⁷

The indigenous nuclear technology of South Africa commenced with the intention to develop knowledge systems intended for the “mining industry, to excavate harbours and underground cavities for oil storage”⁷⁰⁸ as well as a military programme. South Africa tested a scale model of a gun-type device using non-nuclear material as a projectile in 1974⁷⁰⁹ and in 1977 the AEB managed to manufacture a full-scale nuclear explosive device based on a gun-type design.⁷¹⁰

South Africa required a delivery system which ostensibly was based on “large-calibre artillery.” Some analysts view “the 155 mm G-5 towed and G-6 self-propelled howitzers developed in the 1970s as potential delivery systems for nuclear weapons.”⁷¹¹ The intention of South Africa was to develop a limited number of nuclear weapons for deterrent purposes,⁷¹² but the proposition was opposed by the international community and actually strengthened the international resolve to impose sanctions against South Africa. The UNGA Resolution 37/69 of 1982 reflected the position of the international community which was “gravely concerned that ...South Africa... continued to acquire nuclear-weapons capability,

⁷⁰⁶ Stumpf W “South Africa’s nuclear weapons program: from deterrence to dismantlement” (3-8) (December 1995/January 1996) *Arms Control Today* at 3.

⁷⁰⁷ Albright D “South Africa’s secret nuclear weapons” (May 1994) *ISIS Report* at 4. See also, Moore J “The development of South Africa’s nuclear capability: South Africa and nuclear proliferation” (1987) *St. Martin’s Press* at 83-84.

⁷⁰⁸ IAEA Director General “The Denuclearization of Africa” GC(XXXVII)/1075 (9 September 1993). See also, Liberman P “The rise and fall of the South African bomb” Vol 26, no 2 (Fall 2001) *International Security* at 50.

⁷⁰⁹ Albright “South Africa’s secret nuclear weapons” at 6.

⁷¹⁰ Hibbs M “South Africa’s secret nuclear program: the dismantling” (24 May 1993) *Nuclear Fuel* at 9. See, also Reiss M “South Africa: castles in the air” (7-44) in *Bridled Ambition: Why Countries Constrain their Nuclear Capabilities* (1995) at 10.

⁷¹¹ Para 109 of the Report of the Secretary-General, South Africa’s Nuclear-Tipped Ballistic Missile Capability Department for Disarmament Affairs UN (1991).

⁷¹² President P.W. Botha confirmed that South Africa’s nuclear program is intended to develop only seven fission devices. See, Baeckmann “Nuclear verification in South Africa...” at 45.

thus posing an ever increasing threat to international community.”⁷¹³ The UNGA Resolution 37/69 established for comprehensive sanctions and requested:

“...States members of the international agencies and organizations, particularly the members of the European Communities, the parties to the General Agreement of Tariffs and Trade and the members of the International Monetary Fund and the World Bank, to take the necessary steps to deny all assistance and commercial facilities to the racist regime of South Africa.”⁷¹⁴

As the pressure on South Africa mounted and in anticipation of a fundamental transformation in South African, on 16 September 1988 IAEA Director General Hans Blix received a letter expressing South Africa’s readiness to accede to the NPT, on condition that it would still be allowed to market its uranium production, subject only to IAEA safeguards. The decision of South Africa to abandon its nuclear capability in the mid of 1988 was encouraged by the diminishing threat posed by the USSR and the agreements ending the conflict between South Africa and Cuba and its allies in Angola and Northern Namibia, by providing for Namibian independence.⁷¹⁵ The ending of the Angolan/Namibian conflict improved South Africa’s sense of security, rendering nuclear weapons irrelevant.⁷¹⁶ The developments created a suitable platform for Mr. F. W. de Klerk to become elected on 14 September 1989 as a President who proposed a complete plan for the dismantling of South Africa’s the nuclear weapons programme, together with the abandonment of “apartheid”.⁷¹⁷

South Africa signed the NPT on 10 July 1991 as a non-nuclear-weapon state, allowing the IAEA to inspect the country’s nuclear weapon manufacturing facilities to verify the

⁷¹³ The preamble of the UNGA Resolution 37/69B of 1982.

⁷¹⁴ Article 7 of the UNGA Resolution 37/69C of 1982.

⁷¹⁵ Pabian F “South Africa’s nuclear weapon program: lessons for U.S. nonproliferation policy” (1-19) (Fall 1995) *Nonproliferation Review* at 6.

⁷¹⁶ Albright D “Nuclear Rollback: Understanding South Africa's Denuclearization Decision” in Schneider B and Dowdy W *Pulling Back from the Nuclear Brink: Reducing and Countering Nuclear Threats* (1998) at 81-82.

⁷¹⁷ Reiss “South Africa: castles in the air” (1995) at 18.

compliance of the country, including by examining the scope and history of the nuclear program and its eventual dismantling.⁷¹⁸ “Once the IAEA completed the verification of the termination of South Africa’s nuclear weapons programme in 1993, South Africa engaged in norm compliance through, inter alia, restructuring its nuclear regulatory environment...”⁷¹⁹ “Following verification of the termination of the programme by the IAEA, South Africa’s nuclear diplomacy changed from a defence orientation to one that focuses on the peaceful uses of nuclear energy, nuclear non-proliferation and nuclear disarmament.”⁷²⁰ Consequently, the emerging identity of South Africa demonstrates conformity with the non-proliferation regime which identifies the country as “a responsible producer, possessor and trader of advanced nuclear technology.”⁷²¹

South Africa’s attainment of the status of a norm abiding identity is a derivative of the country’s constitutional dispensation. The adherence of South Africa to the NPT and overcoming apartheid ended the isolation of the country allowing for the reception of the entire construct of the international nuclear regime. Unlike the previous constitutions, South Africa’s Constitution, Act 108 of 1996 incorporates operative provisions which define the place of international law in the country’s legal system.⁷²² In the Constitutional Court judgment in *Glenister v President of the Republic of South Africa and Others*⁷²³ the Court found that the “provisions of our Constitution demonstrate that international law has a special place in our law which is carefully defined by the Constitution.”⁷²⁴ Moreover, South African courts are required to be “aware of applicable international law standards” and

⁷¹⁸ For further reading refer to Baeckmann “Nuclear verification in South Africa...”

⁷¹⁹ Van Wyk J “Nuclear diplomacy as niche diplomacy: South Africa's post-apartheid relations with the International Atomic Energy Agency” (179-200) Vol 19, no 2 (2012) *South African Journal of International Affairs* at 195.

⁷²⁰ Van Wyk J “South Africa’s Nuclear Future” (1- 35) Occasional Paper 150 (June 2013) *South African Institute of International Affairs (SAIIA)* at 18.

⁷²¹ Van Wyk J “Nuclear diplomacy as niche diplomacy...at 195. South Africa “has been lauded especially for its bridge-building role at various conferences of the NPT.” See, Van Wyk “South Africa’s Nuclear Future” at.18.

⁷²² Dugard J *International Law: A South African Perspective* (2012) at 50.

⁷²³ (CCT 48/10) [2011] ZACC 6; 2011 (3) SA 347 (CC); 2011 (7) BCLR 651 (CC) (17 March 2011). Hereafter referred to as the *Glenister*.

⁷²⁴ Para 97 of the *Glenister*.

remain under a duty to consider which interpretations best advance the values and transformative commitments of the Constitution in the current political, economic and social context of South Africa.⁷²⁵

South Africa thereby became constitutionally obliged to rationalise and adjust the development of nuclear energy usage in its modern political, economic and social context, while observing modern international law obligations and checks and balances.

The current political and socio-economic issues in the context of South Africa's nuclear development revolve around the electrification programme intended to achieve the MDGs. The achievement of the MDGs is possible only through a substantial expansion of the electricity supply infrastructure, taking into consideration environmental factors and the availability of resources. Other legal regimes such as those established by the constitutionally enshrined socio-economic rights system as well as environmental rights and law, contribute equally to the new position and future development of South Africa's nuclear energy regime. Thus the South African nuclear energy regime retains a special character and embodies different layers of norms including those hard legal rules which create binding legal obligations on the States, and evolving soft norms and principles which are ready to be transformed to hard law, eventually taking their place in the municipal legal order.

This chapter describes South Africa's adherence to the international nuclear regime through the examination of the nature of nuclear energy law, the place of nuclear energy law in South Africa's legal order, and the South Africa's nuclear energy governance which ensures non-proliferation of nuclear weapons, maintains safety and security, regulates nuclear liability and promotes sustainable development while using nuclear energy for peaceful purposes.

⁷²⁵ Liebenberg S "Socio-economic rights: revisiting the reasonableness review/minimum core debate" (303-330) In Woolman S and Bishop M eds *Constitutional Conversations* (2008) at 324.

3.2 THE NATURE OF NUCLEAR ENERGY LAW

The nature of nuclear energy law is based on the distinctive principles which characterise the legal norms dealing with nuclear energy. Nuclear energy law takes its place within the legal hierarchy of the legal systems worldwide. Binding and non-binding nuclear norms have developed with the intention to realise safety, security, and non-proliferation of nuclear weapons through the following legal dynamics:

Firstly: Achieving all the benefits of nuclear energy by accelerating and enlarging “the contribution of atomic energy to peace, health and prosperity throughout the world.”⁷²⁶

This is viewed within the context of the objectives of the international community focusing on “promoting social progress and better standards of life” by employing “international machinery for the promotion of the economic and social advancement of all peoples.”⁷²⁷

Article 55 of the UN Charter reads as follows:

“With a view to the creation of conditions of stability and well-being which are necessary for peaceful and friendly relations among nations based on respect for the principle of equal rights and self-determination of peoples, the United Nations shall promote:

- a) higher standards of living, full employment, and conditions of economic and social progress and development;
- b) solutions of international economic, social, health, and related problems; and international cultural and educational co-operation; and
- c) universal respect for, and observance of, human rights and fundamental freedoms for all without distinction as to race, sex, language, or religion.”

The development of nuclear energy by all states falls within “the principle of equal rights and self-determination of peoples”⁷²⁸ and “promoting international co-operation in the economic, social, cultural, educational, and health fields, and assisting in the realization of

⁷²⁶ Article II of the IAEA Statute.

⁷²⁷ The preamble of the UN Charter.

⁷²⁸ Article 1.2 of the UN Charter.

human rights and fundamental freedoms for all without distinction as to race, sex, language, or religion.”⁷²⁹

Secondly: The dual-use nature of fissionable materials and nuclear technologies and the devastating effect of a nuclear attack have influenced the nuclear energy law-making process in developing an independent legal construct focusing on the non-proliferation of nuclear weapons. This has engaged the UNSC to involve directly in enforcing the IAEA Safeguards and to act under Chapter VII of the UN Charter in many occasions in order to maintain international peace and security.

Thirdly: The development of nuclear power to generate nuclear energy requires establishing a legal framework which regulates the safety of nuclear power plants through measures relating to “planning, siting, design, manufacturing, construction, commissioning and operation.”⁷³⁰ Moreover, the development of nuclear energy law has been partially formulated as a result of the development of nuclear technologies and nuclear incidents. For example, post Chernobyl proposals contemplated the requirement of “a compulsory international safety regime to be adopted.”⁷³¹ In other words, the accident exposed deficiencies in the legal frameworks governing the safety of nuclear power plants. Promptly, a fresh legal framework was introduced including the Nuclear Early Notification Convention and the Nuclear Assistance Convention. Next, these two conventions became the “the prime legal instruments that establish an international framework to facilitate the exchange of information and the prompt provision of assistance in the event of a nuclear accident or radiological emergency.”⁷³²

Fourthly: In many cases the industry did not wait for the long negotiations required to conclude treaties dealing with nuclear development, and developed safety standards or security standards which emerged as non-binding norms. For example, the IAEA with the help of other organisations such as FAO, ILO, IMO, OECD, NEA, PAHO, UNEP, and WHO

⁷²⁹ Article 13.b of the UN Charter.

⁷³⁰ Para 2.2 of IAEA Fundamental Safety Principles of 2006.

⁷³¹ Reyners “Regulations and control by international organisations in the context of nuclear accident...” at 1.

⁷³² IAEA “Nuclear safety and security: legal basis” <http://www-ns.iaea.org/conventions/emergency.asp?s=6&l=38#2> (accessed 24 October 2013).

developed safety standards including Safety Fundamentals, General Safety Requirements, and General Safety Guides. These standards have been developed “by means of an open and transparent process for gathering, synthesizing and integrating the knowledge and experience gained from the actual use of nuclear energy technologies and from the application of the safety standards, including knowledge of emerging trends and issues of regulatory importance.”⁷³³ The safety standards are reviewed and updated by the IAEA in order to cover emerging nuclear problems relating to operation of nuclear installations, fuel cycle facilities, research reactors, radioactive waste disposal facilities, mining milling and fabrication of nuclear fuel, and transport of radioactive materials. In the same vein, the IAEA has developed the Nuclear Security Series which publicises non-binding norms. States are encouraged to adopt them in order to implement and maintain the nuclear security regime “including any obligations and commitments they might have as parties to international instruments.”⁷³⁴

Fifthly: The commercial activities relating to nuclear energy have developed codes of conduct, guide lines, standards, and established practices intended to limit the danger of the dual nature of nuclear energy development. Many states which have the capacity to export nuclear materials, services, and technologies have adhered to export control arrangements such as Zangger Committee, NSG, WA. The norms emanating from these informal arrangements have been codified in certain countries such as the Export Control Order of 2008 in the UK and the NPWMDA in South Africa. Section 4 of the NPWMDA establishes the South African Council for Non-Proliferation of Weapons of Mass Destruction which is mandated to “protect the interests, carry out the responsibilities and fulfil the obligations of the Republic with regard to non-proliferation” in “behalf of the State.”⁷³⁵ The Act defines controlled goods which “may contribute to the design, development, production, deployment, maintenance or use of weapons of mass destruction”⁷³⁶ in order to

⁷³³ IAEA Safety Standards for protecting people and the environment IAEA <http://www-ns.iaea.org/standards/default.asp?s=11&l=90&w=2> (accessed 24 October 2013).

⁷³⁴ Para 1.8 of Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities Nuclear Security Series No. 13 (INFCIRC/225/Revision 5) 2011.

⁷³⁵ Section 6(1) of the NPWMDA.

⁷³⁶ Section 13(1) of the NPWMDA.

restrict the exportation of such goods.⁷³⁷ The norms emanating from export control arrangements can be categorised in the soft law category. But once they are incorporated in legislation they become binding law, classified as hard law.⁷³⁸

3.2.1 The Hard Nature of Nuclear Energy Law

The risks accompanying the development of nuclear energy including proliferation of nuclear weapons and nuclear incidents require international legal binding obligations which are precise and institutionally constructed in a manner that allows for delegation of authority in order to interpret, implement and verify compliance with these obligations. It is clear that normative rules governing nuclear energy have been compelled to follow two main directions including those norms governing international peace and security and those governing the safe use of nuclear energy for peaceful purposes. In both domains nuclear norms are intended to reduce risks, conflicts and set up a platform to “resolve problems of incomplete contracting,”⁷³⁹ and mechanisms to ensure compliance. Since President Eisenhower’s suggestion to administer the circulation of fissile materials through an international agency, nuclear energy law began evolving in a distinctive regime-building process.⁷⁴⁰

The body of nuclear energy law and of the nuclear non-proliferation regime, as explained earlier, consists of the following:

- Principles relating to the nuclear non-proliferation regime.
- Norms in the form of the prohibition of proliferation of nuclear weapons.

⁷³⁷ Section 13 of the NPWMDA.

⁷³⁸ For further reading, the UK Strategic Export Control Lists: the consolidated list of strategic military and dual-use items that require export authorisation (March 2013). “These lists summarise the text from the appropriate strategic export control legislation (excluding any Sanctions Orders) that was in force on the 20 March 2013 for UK exports.”

⁷³⁹ Abbott K and Snidal D “Hard and soft law in international governance” (421–456) Vol 54, no 3 (Summer 2000) *International Organization* at 422.

⁷⁴⁰ Further details about Eisenhower’s proposal can be found in Fischer D *History of the International Atomic Energy Agency: The First Forty Years* (1997) at 9-12.

- Rules pertaining to the peaceful nuclear energy development including safety, security and liability.
- Decision making procedures such as those taken at the UNSC or at the IAEA in order to implement the collective shared interest of the international community.⁷⁴¹
- Standards and codes of conduct regulating the industrial development of nuclear power.⁷⁴²

The international community used the international law making as the preferred instrument for the prevention of horizontal nuclear weapons proliferation. The resulting norms are embodied in important treaties, in particular the NPT and the IAEA Statute. The UNSC ultimately oversees the proper application and regular modernisation of these norms.

In the case of South Africa, It is clear that the application of the Safeguards reflected the desire of the international community to verify the compliance with nuclear weapons proliferation prohibition that became binding on the country at the moment it acceded to the NPT.

South Africa signed the NPT, accepted the Comprehensive Safeguards, and signed the Protocol Additional to the Agreement between the Government of South Africa and the IAEA. The South African Additional Protocol is based on the 1997 Model Additional Protocol INFCIRC/540 (Corrected), which is an updated version of the Comprehensive Safeguards INFCIRC/153 (Corrected), intended to express the shared-interest of the “international community to further enhance nuclear non-proliferation by strengthening the effectiveness and improving the efficiency of the Agency's safeguards system.”⁷⁴³

The signing of the Safeguards is viewed as part of the compliance of South Africa which immediately allowed it to enjoy the benefits arising from Article IV of the NPT, the IAEA's

⁷⁴¹ Roger K. Smith regards that principles, norms, rules, and decision-making procedure are the fundamental components of a regime. See, Smith R “Explaining the non-proliferation regime: anomalies for contemporary international relations theory” (253-281) Vol 41, no 2 (Spring 1987) *International Organization* at 256.

⁷⁴² For example, standards and codes which can be found in the IAEA Safety Standards Series and Nuclear Security Series.

⁷⁴³ The preamble of the Protocol Additional to the Agreement between the Government of South Africa and the Agency.

assistance and other covenants such as the Nuclear Assistance Convention. However, the international agreements concluded between South Africa and the IAEA do not imply that agencies and intergovernmental actors become producers of normative rules and regulatory frameworks.

Some commentators focus on the role of agencies, organisations, and the non-state and intergovernmental actors which are “motivated by moral or social concerns, as the source of international norms.”⁷⁴⁴ They interpret international agreements in a manner which displays the embodied shared norms and understanding and also they seek to “understand covenants as operating through persuasion, imitation and internalization...”⁷⁴⁵ If this view is applied to South Africa, it can explain how the country in a paradigm shift succeeded to move from a Pariah state to a rehabilitated and constructively engaging state which proved the ability to “modify intersubjective understandings of appropriate behaviour, interests, and even identities.”⁷⁴⁶ The new approach of the country as manifested in a Statement by South Africa’s Ambassador K. J. Jele during the 2000 NPT Review Conference; he stated that “South Africa continues to see the non-proliferation obligations of the NPT as one of its most important international commitments.”⁷⁴⁷

Nuclear energy anarchy after the WWII was overcome by mechanisms which functioned as a dynamic system capable of enforcing compliance by introducing high-cost-defaulting-consequences.⁷⁴⁸ For example, the IAEA Statute contemplates mechanisms by which the interpretive authority is granted to the ICJ. Article XVII of the IAEA Statute settles disputes “concerning the interpretation or application of this Statute which is not settled by negotiation” by way of referring them “to the International Court of Justice in conformity with the Statute of the Court, unless the parties concerned agree on another mode of

⁷⁴⁴ Abbott “Hard and soft law in international governance” at 425.

⁷⁴⁵ *Ibid.*

⁷⁴⁶ *Ibid* at 424-425.

⁷⁴⁷ Statement by Ambassador K. J. Jele on 8 April 1997, Nuclear Files http://www.nuclearfiles.org/menu/library/treaties/non-proliferation-treaty/prepcom/trty_npt_prepcom_1997_statement-southafrican_1997-04-08.htm(24 October 2013).

⁷⁴⁸ Abbott “Hard and soft law in international governance” at 422. See also, Veerle H “Hybrid Norms in International Law” (February 13, 2009) *LSE Legal Studies Working Paper* No. 6/2009 at 18.

settlement.”⁷⁴⁹ Thereby the defaulter faces high costs imposed by the powers given to the Board of Governor to suspend the defaulter, or even greater cost imposed by the UNSC, including isolation and sanctions. In the case of South Africa, when the country violated its international commitments and pursued a clandestine nuclear power expansion, it lost its seat on the Board of Governors of the IAEA to Egypt in 1977 and in 1979 the IAEA “rejected South Africa’s Credentials.”⁷⁵⁰ Further example relating to the high cost of non-compliance can be found in the cases of Iraq, Iran, and DPRK. The cost of defaulting on nuclear commitments has been demonstrated by the various sanctions taken under chapter VII.⁷⁵¹

The credibility of the policy transformation into binding rules under international law varies according to the values of the institutions when first established. During the establishment of the NPT, the international community contemplated international peace and security and drawn compliance linkages with the UNSC oversight function, through Article XII.c of the IAEA Statute. Together with the verification mechanisms entrenched in the Safeguards which are anchored in the NWFZs treaties, the norms of the NPT are predestined to represent hard legal commitments imposing great cost on violators, thus deterring them from defaulting.

The effectiveness of international legalisation was further demonstrated in the enactment of domestic legislation intended to fight nuclear weapons proliferation or for the preservation of safety principles. For example, the South African Nuclear Energy Act domesticated the legal frameworks which were derived from the nuclear non-proliferation normative rules. In its preamble, the Act states that it is intended “to provide for responsibilities for the implementation and application of the Safeguards Agreement and any additional protocols entered into by the Republic and the...IAEA...in support of the Nuclear Non-Proliferation Treaty acceded to by the Republic...”⁷⁵² The Act designates Chapter III to define the “Minister’s responsibilities concerning the Republic’s international

⁷⁴⁹ Article XVII of the IAEA Statute.

⁷⁵⁰ Deon Geldenhuys *Isolated States: A Comparative Analysis* (1990) 1st ed at 183.

⁷⁵¹ See, above page at 105- 112.

⁷⁵² See, the preamble of the Nuclear Energy Act.

obligations with regard to nuclear non-proliferation.”⁷⁵³ Then the Act links an operative provision with the NPC in order to frame “codes of conduct aimed at non-proliferation” in the context of “exportation of source, special nuclear or restricted material or nuclear-related equipment and material.”⁷⁵⁴

The incorporation of legal provisions regulating the exportation of source, special nuclear or restricted material, or nuclear-related equipment and material, is not unique and exclusive to South Africa. It can likewise be found in the UK’s “Export Control Order 2008.” It is clear that such legislation resulted from the development of the informal arrangement of the MECRs. It is well-known that the adherence to the MECRs does not create binding obligations because these obligations are soft law commitments. However, soft law commitments can evolve “overtime into hard international law as much of the soft law of today becomes part of the hard law of tomorrow.”⁷⁵⁵ For example, “the soft Antarctic recommendations give rise to new, hard law that is legally binding on all” Antarctica Treaty Contracting Parties “to protect and preserve Antarctic environment.”⁷⁵⁶

Another example of a codification of non-binding guidance is the incorporation of the MECRs trigger lists in legislation such as in the case of the UK National Radioactive Sources List (Schedule referred to in Article 2 of Export of Radioactive Sources (Control) Order of 2006) which incorporates these trigger lists, thus demonstrating how “soft law may develop over time and harden into hard law, just as customary international law has been codified and Progressively Developed In Treaty Law.”⁷⁵⁷

⁷⁵³ Chapter III of the Nuclear Energy Act.

⁷⁵⁴ Section 35 of the Nuclear Energy Act.

⁷⁵⁵ Kobrin S “Globalisation, transnational cooperation and future of global governance” (249-272) in Scherer A and Palazzo G eds *Handbook Of Research On Global Corporate Citizenship* (2008) at 263-264.

⁷⁵⁶ Shine C “The legal effect of Antarctic recommended measures” (163-195) in Shelton D ed *Commitment and Compliance: The Role of Non-Binding Norms in the International Legal System* (2000) 1st ed at 181.

⁷⁵⁷ Shaffer G and Pollack M “Hard versus soft law in international security” (1147-1241) Vol 52 (2011) *Boston College Law Review* at 1157.

3.2.2 The Soft Nature of Nuclear Energy Safety Law

The IAEA Statute authorises the IAEA to establish standards of safety.⁷⁵⁸ These safety standards are required to be developed with the competent organs of the UN and other agencies. The wording of Article III.6 of the IAEA Statute is open and does not identify specific and clear rules which guarantee the safety of nuclear installations through designing, licensing, operating and regulating these installations. It simply provides for principles with qualitative objectives which allow the IAEA to establish guidelines through quantifiable measures that are clear and precise. The totality of these measures on “the protection of human life and health and the environment against exposure to radiation is detailed and technically complex.”⁷⁵⁹ That is why “the most recent Conventions dealing essentially with safety – whether of nuclear installations or of the management and storage of radioactive waste and spent fuel – are drafted in the most general terms.”⁷⁶⁰ It is impractical to deal with the more quantifiable measures during convention proceedings or in the UNSC because such *fora* do not have the technical expertise to provide comprehensive standards regulating the safety of nuclear installations. Therefore, the IAEA Statute leaves considerable room for the IAEA and other organisations to develop “specific standards to avoid ambiguity.”⁷⁶¹

The IAEA has been developing Safety standards while cooperating with many agencies.⁷⁶² For example, the IAEA Fundamental Safety Standards has been jointly sponsored by Euratom, FAO, ILO, International Maritime Organization (IMO), OECD, NEA, PAHO, UN Environment Programme (UNEP), and WHO. The IAEA Fundamental Safety Standards of

⁷⁵⁸ Article III.6 of the IAEA Statute.

⁷⁵⁹ Fundamental Safety Principles of 2006 at viii.

⁷⁶⁰ Boustany K “The development of nuclear law-making or the art of legal ‘evasion’” (39-53) (1998) *Nuclear Law Bulletin* at 39.

⁷⁶¹ Fundamental Safety Principles of 2006 at viii.

⁷⁶² Standards are not unique to the nuclear industry. Many industries such as oil, gas, mining, electricity, computing, telecommunications, etc. “are subject to panoply of international codes, guidelines and standards...” See, Wälde T “International standards: a professional challenge for natural resources and energy lawyers” (219-248) in IBastida E, Wälde T, Warden-Fernández J eds *International And Comparative Mineral Law And Policy: Trends and Prospects* (2005) at 233.

2006 “are not legally binding on Member States but may be adopted by them, at their own discretion, for use in national regulations in respect of their own activities.”⁷⁶³ The non-binding norms that appear in the IAEA safety standards are referred to in many documents. For example, the requirements of the International Basic Safety Standards on the Radiation Protection and Safety of Radiation Sources “are in addition to and not in place of other applicable requirements, such as those of relevant binding conventions and national regulations.”⁷⁶⁴ However, “in cases of conflict between the requirements of these Standards and other applicable requirements, the government or the regulatory body, as appropriate, shall determine which requirements are to be enforced.”⁷⁶⁵ However, the Fundamental Safety Standards are “binding on the IAEA in relation to its operations and on States in relation to operations assisted by the IAEA.”⁷⁶⁶ The IAEA Safety of Nuclear Power Plants: Design of 2007 No. SSR-2/1 (which supersedes the IAEA Safety of Nuclear Power Plants: Design No. NS-R-1 of 2000) refers to “IAEA safety standards, which support the implementation of binding international instruments and national safety infrastructures” which will be “a cornerstone of a global nuclear safety regime” which “is in place and is being continuously improved.”⁷⁶⁷ Likewise, the IAEA Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards: Interim Edition of 2011 requires that “international conventions contain requirements similar to those in the IAEA safety standards” shall be made “binding on contracting parties.”⁷⁶⁸

The sources indicate a preference for “soft” law regulation, “designed as a way station to harder legalization.”⁷⁶⁹ Such arrangements facilitate the incorporation of norms in national

⁷⁶³ IAEA Safety of Nuclear Power Plants: Design Requirements Safety Standards Series No. NS-R-1 (September 2000) at 2.

⁷⁶⁴ Para 2.3 of the IAEA Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards: Interim Edition of 2011.

⁷⁶⁵ *Ibid* para 2.4.

⁷⁶⁶ Fundamental Safety Principles of 2006 at viii.

⁷⁶⁷ The IAEA Safety of Nuclear Power Plants: Design of 2007 No. SSR-2/1 at vii.

⁷⁶⁸ The IAEA Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards: Interim Edition of 2011 at xi.

⁷⁶⁹ Abbott “Hard and soft law in international governance” at 423.

legislation; many of which already contain similar norms,⁷⁷⁰ resulting in the creation of integral systems which supplement each other in a manner which allows for the diffusion of related norms able to overcome the barriers of traditional sovereignty of states and provides a platform for international customary law to develop.⁷⁷¹

3.2.3 The Place of Nuclear Law in the National Legal System

The development of nuclear law has maintained its international nature since the UNGA's first "nuclear" resolution. Although the New Zealander Act and the McMahon Act were municipal legislation, the management of the development of nuclear energy and its associated risks has been the core business of the international community because many of these risks can cause transboundary damages and pose threats to international peace and security.

The transboundary damages issue is illustrated by the USA nuclear tests which carried out on the Marshal Islands and the Chernobyl accident which both caused damages to non-nationals. It is only logical that

"The responsibility of a State in international law for damage caused in its territory to the person or property of foreigners must be distinguished from the responsibility which under its laws or constitution such state may have towards its nationals or inhabitants of its territory. In particular, a State cannot escape its responsibility under international law, if such responsibility exists, by appealing to the provisions of its municipal law."⁷⁷²

⁷⁷⁰ Kiss A "Commentary and Conclusions" (223-243) in Shelton D ed *Commitment and Compliance: The Role of Non-Binding Norms in the International Legal System* (2000) 1st ed at 240.

⁷⁷¹ Wetherall A "Normative Rule Making at the IAEA: Codes of Conduct" (71-93) Issue 75 (2005) *Nuclear Law Bulletin* at 77-78. See also, Boustany "The development of nuclear law-making or the art of legal 'evasion'" at 41.

⁷⁷² Gancia-Amador F, Louis Bruno Sohn L, and Baxter R eds *Recent Codification of the Law of State Responsibility for Injuries to Aliens* (1974) 1st ed Springer at 19.

National law is fundamentally territorial law and interlinked with sovereignty which conditions the operation of international law in accordance with the consent of the state. This means that, only those obligations which are entrenched in treaties to which the state is a contracting party, are binding on that state, because “every treaty in force is binding upon the parties to it”⁷⁷³ and cannot extend to “create either obligations or rights for a third State without its consent.”⁷⁷⁴

However, international law is not static and has evolved moving away from the classical notion of sovereignty which was based on the rigid norms of Westphalia into an era of interdependency, international cooperation, and interference in the state sovereignty on the basis of humanitarian intervention and the responsibility to protect.⁷⁷⁵ “The devastations of war provided the catalyst for the first serious attempt to crack the Westphalian notion of sovereignty.”⁷⁷⁶ The international community supported limiting the exercise of sovereignty on the basis of the responsibility of the state to adhere “to minimum humanitarian norms and a capacity to act effectively to protect citizens from acute threats to their security and well-being that derive from adverse conditions within a country.”⁷⁷⁷ This has triumphed in the coming into force of the Rome Statute to create the International Criminal Court as an expression of an international culture of considering humanitarian norms a collective responsibility, “focusing on...the moral conscience of humanity.”⁷⁷⁸ Humanitarian intervention is not the only modern state practice limiting sovereignty. The collective self-defence norms entrenched in Article 51 of the UN Charter have developed

⁷⁷³ Article 26 of the Vienna Convention on the Law of Treaties of 1969.

⁷⁷⁴ Article 34 of the Vienna Convention on the Law of Treaties.

⁷⁷⁵ Maogoto J and Kindiki K “A people betrayed-the Darfur crisis and international law: rethinking Westphalian sovereignty in the 21st century” (1-28) Vol 19, issue 2 (2007) *Bond Law Review* at 11.

⁷⁷⁶ Jackson Nyamuya Maogoto “Transforming Westphalian sovereignty: human rights & international justice as a transitional crucible” 1-34 (2005) *Notre Dame Law Review* at 4.

⁷⁷⁷ MP Ferreira-Snyman quotes Falk in her argument to establish the notion of the “emergence of the concept of responsible sovereignty.” See, Ferreira-Snyman M “The evolution of state sovereignty: a historical overview” (1-28) Vol 12, no 2 (2006) *Fundamina* at 19.

⁷⁷⁸ Kusano H “Interplay of norms and politics” (123-142) in Dietrich M, Bettina Scholden, and Sepp D eds *International Intervention in the Post-Cold War World: Moral Responsibility and Power Politics* (2004) M. E. Sharp at 130.

particularly in the post-cold war era to create legitimate expectations of all members of human society to preserve international peace and security. The ICJ regards that the seabed, Antarctica, Latin America and the Caribbean, the Pacific, Africa, and the outer space are subject to a universal commitment in a growing “human rights era” which requires “that the legal expectations of all members of human society, official and non-official, be duly taken into account.”⁷⁷⁹ In moving “away from the heavy emphasis on individual sovereignty which marked international society as it earlier existed,”⁷⁸⁰ the ICJ raised a question as to whether the “sovereignty of a State...entitles it to embark on a course of action which could effectively wipe out the existence of all States by ending civilization and annihilating mankind.” The Court contextualised the Permanent Court of International Justice which reconciled the sovereignty of “acting state with the ‘co-existing independent communities’, with a consequential duty to respect the sovereignty of other States.”⁷⁸¹

The consideration of the concept of sovereignty in the context of nuclear energy law serves as a contextualisation of the legal imperatives which are of international origin and require practical application inside the territories of states. In other words, the effectiveness of nuclear emerging norms is dependent on the degree of incorporation by municipal legal regime which is not “*hortus conclusus*” any longer and must give due regard to the new environment of “awareness of the responsibility of each State as a member of a more cohesive and comprehensive system based on cooperation and interdependence.”⁷⁸² This process of incorporation must provide for the institutionalisation of norms and the creation of platforms where international organisations are able to function as agents of cooperation in “seeking to reflect a collective judicial conscience and respond to the social necessities of states organised as a community.”⁷⁸³

The emerging nuclear norms have been applied by states according to two methods allowing for the development of systems of norms regulating the use of nuclear energy:

⁷⁷⁹ The ICJ *Nuclear Threat Advisory Opinion* at 900.

⁷⁸⁰ *Ibid* at 868.

⁷⁸¹ *Ibid* at 867.

⁷⁸² *Ibid* at 868.

⁷⁸³ Kritsiotis D “Imagining the international community” (961-992) Vol 13, no 4 (2002) *European Journal of International Law* at 969.

- States such as Belgium and Austria have allowed “legal issues emerging in connection with research and utilization of nuclear power” to be “settled in a way that in the first place earlier provisions have been adapted to the changed conditions, or supplemented when necessary.”⁷⁸⁴
- States such as the, Canada, Germany, Sweden, Switzerland, UK and USA have introduced “special provisions to bring under regulation problems associated with nuclear energy.”⁷⁸⁵

In both ways, “nuclear law...incorporates the rules of public and private international law, civil, administrative, criminal and labour law.”⁷⁸⁶ That is to say, nuclear energy law has to “take its place within the normal legal hierarchy applicable in most States.”⁷⁸⁷ Carlton Stoiber identifies four levels consisting legal hierarchy including the constitutional level, the statutory level, regulations, and industrial standards.⁷⁸⁸ In general, nuclear law has to evolve gradually because generating electricity from nuclear energy involves myriad of issues that are difficult to reconcile

- Promoting access to affordable and clean energy which is constitutionally relevant objective, and must be regulated by legislation and administrative procedures.
- Adverse impacts on peoples’ lives, property and the environment which are constitutionally protected and must equally be regulated by legislation, administrative procedures and standards.

For example, Article 90 of the Federal Constitution of the Swiss Confederation states that “the Confederation is responsible for legislation in the field of nuclear energy.”⁷⁸⁹ The origin of this Article can be traced to the mid-1950s when nuclear energy emerged as appropriate new technology able “to cover the increasing demand for electricity without having to use

⁷⁸⁴ Haraszti *Questions of international law...* at 87.

⁷⁸⁵ *Ibid.*

⁷⁸⁶ *Ibid* 92

⁷⁸⁷ Stoiber *Handbook on nuclear law* at 3.

⁷⁸⁸ *Ibid* at 3-4.

⁷⁸⁹ Federal Constitution of the Swiss Confederation of 18 April 1999 (Status as of 3 March 2013).

fossil fuels for generating it.”⁷⁹⁰ The implementation of a nuclear programme required a “legislative framework intended “to ensure safety and radiation protection and that such a legislation should be established exclusively at the federal level.”⁷⁹¹ Accordingly, Article 24 was introduced into the Swiss constitution and approved by vote of the Swiss population in 1957. Article 24 stipulated that the legislation on the use of nuclear energy and on radiological protection be enacted exclusively at the federal (national) level. Consequently, the Atomic Energy Act was enacted in 1959. The hierarchy of the Swiss legal system governing nuclear energy consists of four consecutive levels including the Federal Constitution, Federal Laws, Federal Ordinances, and Guidelines.

3.3.4 The Place of Nuclear Law in South Africa’s Municipal Legal System

The South African nuclear regime demonstrates the intention of the country to adhere to the international nuclear regime. On 6 August 1996, President Nelson Mandela announced that in achieving the objectives of the CTBT through multilateral negotiations, South Africa intended to sign the treaty as soon as possible because “the treaty would not only establish an internationally legally binding obligation on the states which signed and ratified it but also establish a norm in international law from which no state could escape.”⁷⁹² Of course this is a general paradigm shift in the policy of South Africa from a pariah state to a rehabilitated state. The political transformation that paved the way for this development can be traced in the 1991 Report of the Secretary-General on South Africa's Nuclear-Tipped Ballistic Missile Capability which predicted the potential “change in the unacceptable social and political structures created in South African society” which would alter the “previous motivations of South Africa's reliance on force and military.”⁷⁹³ At the time, “the Government of South Africa...declared its resolve to dismantle the apartheid system with

⁷⁹⁰ Implementation of the obligations of the Convention on Nuclear Safety, the first Swiss report in accordance with Article 5

⁷⁹¹ *Ibid.*

⁷⁹² See statement by K.J. Jele at the General Assembly on 9 September 1996, GA/9081.

⁷⁹³ Report of the Secretary-General, South Africa's Nuclear-Tipped Ballistic Missile Capability Department for Disarmament Affairs United Nations New York, 1991 at vi.

the final aim of achieving a totally new and just constitutional dispensation that would assure equal rights and opportunities for all.”⁷⁹⁴

The South African new approach towards nuclear energy rejected the concept of nuclear weapons. Article 200(2) of the Constitution restricts the objects of the South African Defence Force to “defend and protect the Republic, its territorial integrity and its people in accordance with the Constitution and the principles of international law regulating the use of force.”

The new constitutional dispensation values human life and human dignity and guarantees a set of human rights which are irreconcilable with the development of nuclear weapons. For example, during proceedings of Truth and Reconciliation Commission on Armed Forces Hearing held in Cape Town on 8 October 1997 the Chairperson stated that:

“Now the: ‘revolutionary war’. I think one must accept the fact that there was a total rejection within the feeling of especially the Western world but I think in mankind, that the destruction of civilians and the number of casualties, considering the destructiveness of nuclear weapons was a fact no longer acceptable to mankind.”⁷⁹⁵

However, South Africa has never expressed the intention to relinquish nuclear power option “as part of a balanced energy mix for” the country.⁷⁹⁶ The country inherited the Koeberg power station which “has operated safely and cleanly.”⁷⁹⁷ At the *Nuclear debate* Tony Stott favoured a nuclear power option because Koeberg became “part of the community” and

⁷⁹⁴ Report of the Secretary-General, South Africa's Nuclear-Tipped Ballistic Missile Capability Department for Disarmament Affairs United Nations New York, 1991 at vi.

⁷⁹⁵ Truth and Reconciliation Commission on Armed Forces Hearing, South African Defence Forces held in Cape Town on 8 October 1997, day 2. <http://www.justice.gov.za/trc/special/forces/sadf.htm> (accessed 26 October 2013).

⁷⁹⁶ Sturmpf W “The creation of national wealth through technology: the Atomic Energy Corporation's 2000 Plus Plan, historical development of the Atomic Energy Corporation” (25-37) in *Nuclear Debate: The Proceedings of a Conference on Nuclear Policy for a Democratic South Africa* at 37. Hereafter referred to as the *Nuclear debate*.

⁷⁹⁷ Stott T “The role of nuclear power in meeting South Africa’s electricity demands” (53- 73) in *Nuclear debate* at 64.

“has resulted in employment opportunities for many people, men and women of all races.” Further, “the surrounding communities have developed and will continue to develop.”⁷⁹⁸ The policy documents such as the 1998 White Paper on Energy policy and the 2008 Nuclear Energy Policy can be viewed as a continuation of the policy of South Africa to leave the door open for further investigation of nuclear energy option. The IRP and the NDP express the country’s commitment to build a fleet of nuclear power plants in order to meet the soaring electricity demand.

Fundamentally, nuclear energy development is subject to the justification of facilities and activities principle. In other words the proposed 9.6 GW fleet of nuclear power plants which gives “rise to radiation risks” should “yield an overall benefit.”⁷⁹⁹ Logically, in assessing the benefits and risks of these power plants all balancing factors including safety, security, non-diversion, the security of supply, the reliability and diversity of electricity supply infrastructure, the availability of energy resources, the affordability of access to electricity, and the adverse impact of electricity supply infrastructure on the environment must be taken into consideration. The balancing all these factors lies in the process of reconfiguration of the legal normative rules within the entire legal system in order to achieve the objects of various norms regulating the use of nuclear energy.

The configuration of nuclear law in the legal system of South Africa varies from e.g. the Swiss model. This is due to the different legal systems and different experiences of the two countries. The South African Atomic Energy Act was introduced in 1948. But it was not guided by constitutional precepts at the time, and the 1996 Constitution does not give express guidance on nuclear energy. Five levels of regulation characterise the South African nuclear energy law:

Firstly: On the constitutional level, the supremacy of the legal principles giving the country’s political and social institutions and power relations “participatory and egalitarian directions.”⁸⁰⁰ The supremacy of the Constitution institutionalises norms⁸⁰¹ relating to

⁷⁹⁸ *Ibid.*

⁷⁹⁹ IAEA Fundamental Safety Principles (2006) at 10.

⁸⁰⁰ Mwaniki M *Multilingualism and the Public Sector in South Africa* (2012) 1st ed at 69.

human rights,⁸⁰² as well as development and establishes structural “intergovernmental relations,”⁸⁰³ while defining the role of all institutions in development and democracy.⁸⁰⁴

The Constitution also reserves a special place for international law in the South African legal system.⁸⁰⁵ The Constitution contains operative provisions which carefully define the impact of international law on South Africa:

- Interpretive and application impact:
 - The courts are required to consider international law while interpreting “the Bill of Rights.”⁸⁰⁶
 - The courts are required to “choose any reasonable interpretation of the legislation that is consistent with international law over any alternative interpretation that is inconsistent with international law,” “when interpreting any legislation.”⁸⁰⁷
- Legislative impact: Section 231 categorises international agreements according to their nature consequently their status in the law of South Africa is as follows:
 - An international agreement requires approval by resolution in both the National Assembly and the National Council of Provinces to be binding in South Africa.⁸⁰⁸
 - “An international agreement of a technical, administrative or executive nature, or an agreement which does not require either ratification or accession, entered into by the national executive, binds the Republic without approval by the National Assembly and the National Council of Provinces, but must be tabled in the Assembly and the Council within a reasonable time.”⁸⁰⁹

⁸⁰¹ Mwalimu C *Seeking Viable Grassroots Representation Mechanisms in African Constitutions: Integration of Indigenous and Modern Systems of Government in Sub-Saharan Africa* (2009) at 210.

⁸⁰² Chapter 2 of the Constitution.

⁸⁰³ Section 41 of the Constitution.

⁸⁰⁴ Section 152 of the Constitution.

⁸⁰⁵ Para 97 of the *Glenister*.

⁸⁰⁶ Section 39(1)(b) of the Constitution.

⁸⁰⁷ Section 231(5) of the Constitution.

⁸⁰⁸ Section 231(2) of the Constitution.

⁸⁰⁹ Section 231(3) of the Constitution.

- “Any international agreement becomes law in the Republic when it is enacted into law by national legislation; but a self-executing provision of an agreement that has been approved by Parliament is law in the Republic unless it is inconsistent with the Constitution or an Act of Parliament.”⁸¹⁰
- “The Republic is bound by international agreements which were binding on the Republic when this Constitution took effect.”⁸¹¹
- “Customary international law is law in the Republic unless it is inconsistent with the Constitution or an Act of Parliament.”⁸¹²

Secondly: The South African legal system has been described as “a hybrid system...consisting of Roman, Dutch law and English law.”⁸¹³ Common law enjoys legal recognition, as confirmed by the constitutional requirement to develop the “common law” and “customary law”,⁸¹⁴ in the absence of legislation.⁸¹⁵ Nevertheless, all institutions and regulatory frameworks “are created and function only under the Constitution of South Africa.”⁸¹⁶

Thirdly: The statutory level comprising those specific laws which are enacted by the “parliament in order to establish other necessary bodies and to adopt measures relating to the broad range of activities affecting national interests.”⁸¹⁷ Normally, these legislative instrument promote the constitutional principles as contained in the Promotion of Administrative Justice Act (PAJA)⁸¹⁸ which is intended

⁸¹⁰ Section 231(4) of the Constitution.

⁸¹¹ Section 231(5) of the Constitution.

⁸¹² Section 232 of the Constitution.

⁸¹³ Church J, Schulze C, and Strydom H *Human Rights from a Comparative and International Law Perspective* (2007) at 51.

⁸¹⁴ Section 39(2) of the Constitution.

⁸¹⁵ Section 8(3)(a) of the Constitution.

⁸¹⁶ Mwalimu C *Seeking Viable Grassroots Representation Mechanisms in African Constitutions: Integration of Indigenous and Modern Systems of Government in Sub-Saharan Africa* (2009) at 210.

⁸¹⁷ Stoiber *Handbook on nuclear law* at 3.

⁸¹⁸ Act 3 of 2002.

“to give effect to the right to administrative action that is lawful, reasonable and procedurally fair and to the right to written reasons for administrative action as contemplated in section 33 of the Constitution of the Republic of South Africa, 1996; and to provide for matters incidental thereto.”⁸¹⁹

A relevant example can be found in the NNRA which:

“gives effect to the Constitution by setting out mechanisms for the protection of the people, environment and property, thereby enhancing the quality of life, providing for the enjoyment of a right to life, clean environment and the right to health as enshrined in the Bill of Rights. The NNR regulatory mandate seeks to give effect to the true enjoyment and fulfilment of these rights by providing a mechanism for an environment that is underpinned by nuclear safety.”⁸²⁰

More than that, the NNRA contemplates the NPT stipulation which became “law in the Republic when” it was “enacted into law by national legislation” in 1999.⁸²¹ The NNRA is a result of the direct application on section 231(4) of the Constitution. The Nuclear Energy Act 131 of 1993 was intended

“To provide for the continued existence of the Atomic Energy Corporation of South Africa, Limited, and of the Council for Nuclear Safety and for the management thereof; to determine the objects, powers and functions of that Corporation and that Council; to provide for the implementation of the Nuclear Non-Proliferation Treaty and the Safeguards Agreement; to regulate the licensing of nuclear activities; to amend the Hazardous Substances Act, 1973, so as to amend a certain definition; and to provide for matters connected therewith.”

The Nuclear Energy Act 131 of 1993 incorporated the international agreement which stemmed from the NPT and the Safeguards of the IAEA in the transformative period. Although the Interim Constitution was adopted on 27 April 1994 and the Nuclear Energy Act

⁸¹⁹ See, the title of PAJA.

⁸²⁰ NNR “Strategic Plan of the National Nuclear Regulator 2012–2017” (2012) at 1.

⁸²¹ Section 231(4) of the Constitution.

was published in the Government Gazette on 6 October 1993, it reflects the political intention to ensure that South Africa had adopted a (nuclear) norm abiding identity.

Fourthly: Regulatory frameworks at the level of regulatory bodies such as such as the NNR which is an expert body intended to regulate “...nuclear activities” as specified in the NNRA. For example, the safety standards and regulatory practices made by the Minister of Energy on the basis of the recommendation of the board of director⁸²² which governs the NNR.⁸²³

Fifthly: The non-mandatory guidance instruments such as the Fundamental Safety Principles which normally contain “recommendations designed to assist persons and organizations in meeting the legal requirements.”⁸²⁴

The legal framework that characterises South Africa’s nuclear law interfaces with and impacts on many non-nuclear legal relations. Thus it was found in *Earthlife Africa (Cape Town) v Director General Department of Environmental Affairs and Tourism and Another*⁸²⁵ that the applicable legislation relating to the construction of “a demonstration model 110 MegaWatt class pebble bed modular reactor (PBMR) at the site of its Koeberg Nuclear Power Station near Cape Town...includes” NEMA; the Nuclear Energy Act, the NNRA; “as well as a number of regulations, treaties and policies that fall under the jurisdiction of different government departments, all containing their own unique processes and requirements.”⁸²⁶

The development of nuclear power should take place in the context of the country’s energy policy which promotes the objectives contemplated in relevant legislations and policy documents guided by the constitutional values relating to socio-economic rights and sustainable development. That is to say, the legal construct governing nuclear energy development is required to bring all the variables under control by establishing a regulatory

⁸²² Section 36(1) of the NNRA.

⁸²³ Section 8(1) of the NNRA.

⁸²⁴ Stoiber *Handbook on nuclear law* at 3.

⁸²⁵ (7653/03) [2005] ZAWCHC 7; 2005 (3) SA 156 (C) [2006] 2 All SA 44 (C) (26 January 2005) at para 14. Hereafter referred to as the *Earthlife Africa*.

⁸²⁶ The *Earthlife Africa* at para 17.

framework capable of bringing the objectives of the nuclear energy development programme in line with the objectives of the country's energy policy. Inevitably, this impacts on many "national legal requirements in non-nuclear fields such as the protection of environment and the universal access to affordable, reliable and modern electricity, sustainable development, and etc. Article 2 of the National Energy Act specifies the following objectives:

- “(a) ensure uninterrupted supply of energy to the Republic;
- (b) promote diversity of supply of energy and its sources;
- (c) facilitate effective management of energy demand and its conservation;
- (d) promote energy research;
- (e) promote appropriate standards and specifications for the equipment, systems and processes used for producing, supplying and consuming energy;
- (f) ensure collection of data and information relating to energy supply, transportation and demand;
- (g) provide for optimal supply, transformation, transportation, storage and demand of energy that are planned, organised and implemented in accordance with a balanced consideration of security of supply, economics, consumer protection and a sustainable development;
- (h) provide for certain safety, health and environment matters that pertain to energy;
- (i) facilitate energy access for improvement of the quality of life of the people of Republic;
- (j) commercialise energy-related technologies;
- (k) ensure effective planning for energy supply, transportation and consumption;
and
- (l) contribute to sustainable development of South Africa's economy.”

In short, South Africa's nuclear energy law is part of the state's "general legal system,"⁸²⁷ which is "a closely interwoven framework"⁸²⁸ within "the normal legal hierarchy applicable" including the constitution, common law, legislations, regulations, and voluntary standards.

3.3 SOUTH AFRICA'S LEGAL GOVERNANCE OF NUCLEAR ACTIVITIES

South Africa's nuclear governance is intended to govern nuclear activities taking place in the nuclear sector of the country which consists of the following principal institutions:

- The NNR which has a statutory mandate to oversee safety regulation of nuclear installations at sites such as "Necsa's Pelindaba site, Vaalputs Radioactive Waste Disposal Facility, the Koeberg Nuclear Power Station, certain mines and other small users/operators."
- Necsa which undertakes and promotes research and development in the fields of nuclear energy, radiation sciences and technology, medical-isotope manufacturing, nuclear liabilities management, waste management and decommissioning. Necsa's reactor-produced radioisotopes are exported to more than 50 countries.
- Eskom is responsible for electricity generation and owns the Koeberg nuclear power station. It is a government-owned public entity, which reports to the Minister of Public Enterprises.
- The DoE which plays a leading governance role in nuclear technology and safety. The Minister of Energy is the executive authority responsible for overseeing the Necsa and the NNR.
- The Department of Health Directorate: Radiation Control issues licences for: Group III hazardous substances (electronic product generating X-rays, other ionising beams, electrons, neutrons or other particle radiation or non-ionising radiation); and Group IV hazardous substances (radioactive material outside a nuclear installation, which does not form part of, or is used or intended to be used, in the nuclear fuel cycle, and which is used or intended to be used for medical, scientific, agricultural, commercial or industrial purposes).

⁸²⁷ Stoiber *Handbook on nuclear law* at 5.

⁸²⁸ *The Earthlife Africa* at para 14.

- The Nuclear Fuels Corporation (NUFCOR) is responsible for Uranium ore refinement and export. It is privately owned by AngloGold.
- iThemba Laboratories is responsible for medical isotopes and medical applications. This public entity falls under the Department of Science and Technology.

Nuclear energy governance is a matrix of legal normative rules including public and private law intended to regulate nuclear and ionising radiation related activities. These legal rules construct a legal environment which is universally relevant and required to meet the aspiration of many UN organs resolutions, conventions, treaties and bilateral and multilateral agreements. The objectives of the nuclear energy governance can be summarised in the overall objective of preserving the non-proliferation regime whilst at the same time promoting safe and secure nuclear industry which is able to ensure sustainable development in a constrained carbon economy.

3.3.1 South Africa’s Nonproliferation of Nuclear Weapons Regime

South Africa’s non-proliferation of nuclear weapons commitments has commenced after the country acceded to the NPT in 1991. These commitments are anchored in the Pelindaba Treaty⁸²⁹ which requires South Africa to undertake:

- “(a) Not to conduct research on, develop, manufacture, stockpile or otherwise acquire, possess or have control over any nuclear explosive device by any means anywhere;
- (b) Not to seek or receive any assistance in the research on, development, manufacture, stockpiling or acquisition, or possession of any nuclear explosive device;
- (c) Not to take any action to assist or encourage the research on, development, manufacture, stockpiling or acquisition, or possession of any nuclear explosive device.”⁸³⁰

The NPT and the Pelindaba Treaty impose three obligations on South Africa including not to develop nuclear weapons, not to receive nuclear weapons, and not export nuclear weapons.

⁸²⁹ South Africa ratified the Treaty on 27 March 1998.

⁸³⁰ See, Article 3 of the Pelindaba Treaty.

These commitments are subject to inspection and verification by the IAEA which is empowered by Article XII of the IAEA Statute, Article III.1 of the NPT, Article 9.a of the Pelindaba Treaty, and affected by the Safeguards Agreement and the additional Protocol concluded between the IAEA and South Africa.⁸³¹

The NPT, the Pelindaba Treaty, the IAEA Safeguards, South Africa's policy, legislation, Cabinet decisions, the UNSC resolutions, international treaties, Agreements and MECRs that South Africa is party to form the South Africa's non-proliferation regime. Nonetheless, two main pieces of legislations ensure the non-proliferation of nuclear weapons namely the Nuclear Energy Act and the NPWMDA. The two pieces of legislations establish interlinked mechanisms augmented by the Minister of Energy and the NPC.

The Nuclear Energy Act establishes and defines the responsibilities of the Minister of Energy concerning South Africa's international obligations with regard to nuclear non-proliferation. Article 33(1) of the Nuclear Energy Act reads as follows:

“The Minister acts as the national authority of the Republic for the purposes of the implementation and application of the Safeguards Agreement and any additional protocols in order to timeously detect and identify nuclear material intended to be used for peaceful nuclear activities and deter the diversion of such nuclear material to the manufacture of nuclear weapons or other nuclear explosive devices or for use in connection with any other purpose that is unknown.”

⁸³¹ South Africa is party to many treaties which forbid the country develop nuclear weapons such as the Outer Space Treaty (South Africa acceded on 10 October 1963), the Sea-Bed (South Africa ratified on 14 November 1973), the CPPNM (South Africa signed the Convention on 18 May 1981), the Nuclear Assistance Convention (South Africa ratified on 10 August 1987), the Early Notification Convention (South Africa ratified the Convention on 10 August 1987), Convention on Nuclear Safety (South Africa ratified on 24 December 1996), the Pelindaba Treaty (South Africa ratified the Treaty on 27 March 1998), the CTBT (South Africa ratified on 30 March 1999, noting that the Treaty is as yet not in force), Agreement between the Republic of South Africa and the Preparatory Commission for the CTBT Organization on the Conduct of Activities including Post-certification Activities, relating to International Monitoring Facilities for the CTBT (South Africa signed on 20 May 1999), the ICSANT (South Africa signed the Convention on 14 September 2005) etc.

The Minister is required to liaise with IAEA continuously⁸³² holding “negotiations on subsidiary arrangements under the Safeguards Agreement.”⁸³³ In the context of implementation Safeguards Agreement which requires the country to declare nuclear facilities, the Minister allows verification by the IAEA, furnishes and updates information regarding the design of nuclear installations and sites,⁸³⁴ provides “reports required by or in terms of the Safeguards Agreement and the subsidiary arrangements thereunder,”⁸³⁵ “requests for exemption from or termination of safeguards relating to nuclear material,”⁸³⁶ and supports the inspectors of the IAEA.⁸³⁷ Beside these measures which meet Article XII of the IAEA Statute, South Africa’s non-proliferation regime is affected by the establishment of the NPC by the NPMWDA.⁸³⁸ Section 5 of the NPMWDA states the following:

“The objects of the Council are, subject to the Import and Export Control Act, 1963 (Act No.45 of 1963), the Armaments Development and Production Act, 1968 (Act No. 57 of 1968),and the Nuclear Energy Act, 1982 (Act No. 92 of 1982), and in co-operation and consultation with Armscor and the Atomic Energy Corporation (acting as the national authority with regard to the implementation of the Safeguards Agreement between the Republic and the International Atomic Energy Agency for the application of the safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons), to control, register and inspect controlled goods, and to verify the import, export, re-export, transit and end-use of controlled goods.”

This has been amended by the Nuclear Energy Act which replaced the Atomic Energy Corporation by the then Minister of Minerals and Energy.⁸³⁹ This means that after the separation of the DMA, the Minister of Energy is the designated national authority to carry out the implementation of the Safeguards Agreement..., control, register and inspect

⁸³² Section 2(a) of the Nuclear Energy Act.

⁸³³ Section 2(a)(i) of the Nuclear Energy Act.

⁸³⁴ Section 2(a)(ii) of the Nuclear Energy Act.

⁸³⁵ Section 2(a)(iii) of the Nuclear Energy Act.

⁸³⁶ Section 2(a)(iv) of the Nuclear Energy Act.

⁸³⁷ Section 2(a)(v) of the Nuclear Energy Act.

⁸³⁸ Section 4(1) of the NPMWDA.

⁸³⁹ See, section 3 of the schedule of the Nuclear Energy Act.

controlled goods, and to verify the import, export, re-export, transit and end-use of controlled goods.”⁸⁴⁰

The relation between the Minister and NPC is structured by the consultation which the Council is required to give to the Minister “on any matter affecting the proliferation of weapons of mass destruction”⁸⁴¹ including grant “authorisations required for acquisition or possession of, and certain activities relating to, nuclear material, restricted material and nuclear-related equipment and material”⁸⁴² and exportation of source, special nuclear or restricted material or nuclear-related equipment and material.”⁸⁴³

The NPC follows an Internal Compliance Programme which is linked to the industry and thereby becomes “the first line of defence in any country’s non-proliferation control system.”⁸⁴⁴ The process of non-proliferation control requires the integration, coordination, and administration of Government Departments and institutions which are involved directly or indirectly in the implementation and enforcement of South Africa’s policy and legislation on Non-proliferation of nuclear weapons. This cooperative governance of non-proliferation control can be found in e.g. committees such as the Nuclear and Missile Dual-Use Committee and the Non-Proliferation Control Committee. Generally, these committees consist of representatives various stakeholders from the following entities:

“Non-Proliferation Secretariat (NPS); the Department of Foreign Affairs (DFA); the Directorate Conventional Arms Control (DCAC); the Safeguards Division of the South African Nuclear Energy Corporation (NECSA); the South African Secret Service (SASS); the National Intelligence Agency (NIA); Defence Intelligence (DI); the Department of Minerals and Energy (DME);⁸⁴⁵ and the South African Military Health Services of the

⁸⁴⁰ Section 3 of the schedule of the Nuclear Energy Act.

⁸⁴¹ Section 33(2)(e) of the Nuclear Energy Act.

⁸⁴² Section 34(1) and (2)) of the Nuclear Energy Act.

⁸⁴³ Section 35 of the Nuclear Energy Act.

⁸⁴⁴ The NPC, Non-proliferation information guide: information guide on South African non-proliferation policy, legislation, mechanisms, processes and procedures <http://www.thedti.gov.za/nonproliferation/ICPVersionpart2.htm> (27 October 2013).

⁸⁴⁵ This has changed after the separation of the DME. The representative must be from the DE.

Department of Defence (SAMHS).The Departments of Health (DOH) and Agriculture (DOA) attend when required.”⁸⁴⁶

The NPC applies the guidelines of the MECRs including:

- The Zangger Committee: South Africa became a member on 21 October 1995.
- The Nuclear Suppliers Group (NSG): South Africa became a member on 5 April 1995.
- The Missile Technology Control Regime (MTRC): South Africa became a member in 13 September 1995.
- The Hague Code of Conduct against Ballistic Missile Proliferation: South Africa became a member on 28 February 2006.

The Minister and the NPC control the transfer of restricted material and nuclear-related equipment and material to another country in order to ensure the peaceful nature of such transfers. Section 35(1) the Nuclear Energy Act prohibits any person to export any source material, special nuclear material or restricted material or any nuclear-related equipment and material from the Republic” without “the written authorisation of the Minister” who is required to consult with

“the South African Council for the Non-Proliferation of Weapons of Mass Destruction on any matter affecting the proliferation of weapons of mass destruction and duly taken into account the provisions of the Nuclear Non-proliferation Treaty, the Safeguards Agreement and the Republic’s obligations under any other treaty or international agreement with another state, may grant any authorisation required by subsection (1) after application made to the Minister in the manner as prescribed for that purpose.”⁸⁴⁷

The South Africa’s nonproliferation of nuclear weapons regime represents a complete reception of the entire international non-proliferation regime placing it within the statutory

⁸⁴⁶ The South African Council for the Non- Proliferation of Weapons of Mass, Non Proliferation Information Guide: Information Guide on South African Non Proliferation Policy, Legislation, Mechanisms, Processes and Procedures <http://www.thedti.gov.za/nonproliferation/ICPVersionpart2.htm> (27 October 2013).

⁸⁴⁷ Section 35(2) of the Nuclear Energy Act.

level in the national legal hierarchy regardless the “softness” or “hardness” of the legal norms.

3.3.2 South Africa’s Nuclear Safety Regime

Laws dealing with nuclear safety generally regulate aspects involving nuclear permission, commissioning including siting, design, construction, operation, the availability of adequate financial and human resources, the assessment and verification of safety, quality assurance and emergency preparedness, insurance, nuclear accidents or radiological emergencies, nuclear emergency, international nuclear cooperation in nuclear emergency, nuclear transporting, nuclear trading, nuclear decommissioning, nuclear waste management and nuclear protection of persons, properties and environment.

South Africa is party to two main conventions which regulate nuclear safety namely, the Convention on Nuclear Safety⁸⁴⁸ and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.⁸⁴⁹ Both conventions take into consideration the CPPNM, the Nuclear Assistance Convention, the Early Notification Convention,⁸⁵⁰ “the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter as amended (1994) and other relevant international instruments.”⁸⁵¹

The Convention on Nuclear Safety requires the state to establish and maintain a legislative and regulatory framework to govern the safety of nuclear installations,⁸⁵² designate a regulatory body⁸⁵³ which ensures that the license holder, who is entrusted by the safety of relevant nuclear installations, meets its responsibility,⁸⁵⁴ and to prioritise safety,⁸⁵⁵ by

⁸⁴⁸ South Africa signed the Convention on September, 20 1994, ratified it on December, 24 1996 and entered it into force on March, 24 1997.

⁸⁴⁹ The convention entered into force on 13 Feb 2007.

⁸⁵⁰ Para. vi of the preamble of the Convention on Nuclear Safety.

⁸⁵¹ Para. xiii of the preamble of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

⁸⁵² Article 7 of the Convention on Nuclear Safety.

⁸⁵³ Article 8 of the Convention on Nuclear Safety.

⁸⁵⁴ Article 9 of the Convention on Nuclear Safety.

enhancing financial and human resources,⁸⁵⁶ quality assurance,⁸⁵⁷ assessment and verification of safety,⁸⁵⁸ in order to keep radiation exposure to the workers and public in all operational states under the Prescribed National Dose Limits.⁸⁵⁹

3.3.2.1 The Establishment of the Legislative Frame Work

South Africa promulgated the first Atomic Energy Act in 1948, followed by the Nuclear Installations Act of 1963. Both acts were replaced by the Atomic Energy Act of 1967 which established the AEB. In 1982 the Nuclear Energy Act established the Council for Nuclear Safety (CNS)⁸⁶⁰ and the Atomic Energy Corporation, Limited (AEC).⁸⁶¹ The Nuclear Energy Act 131 of 1993 “provided for the continued existence of the AEC and the CNS “for the management thereof; to determine the objects, powers and functions of that Corporation and that Council; to provide for the implementation of the Nuclear Non-Proliferation Treaty and the Safeguards Agreement; to regulate the licensing of nuclear activities; to amend the Hazardous Substances Act.”⁸⁶²

Generally speaking, the precepts of nuclear safety rules are to regulate nuclear activities in a manner intended to create a safe environment for authorised nuclear activities, eliminate or minimise nuclear incidents, and deploy emergency measures during nuclear incidents in order to bring the impact of nuclear radiation on people, property, and environment under control. This means that many laws including the Constitution, PAJA, NEMA, the Nuclear Energy Act, the Hazardous Substances Act, the National Radioactive Waste Disposal Institute Act,⁸⁶³ the Disaster Management Act,⁸⁶⁴ the National Environmental Management: Air

⁸⁵⁵ Article 10 of the Convention on Nuclear Safety.

⁸⁵⁶ Article 11 of the Convention on Nuclear Safety.

⁸⁵⁷ Article 13 of the Convention on Nuclear Safety.

⁸⁵⁸ Article 14 of the Convention on Nuclear Safety.

⁸⁵⁹ Article 15 of the Convention on Nuclear Safety.

⁸⁶⁰ Section 24 of the Nuclear Energy Act 92 of 1982.

⁸⁶¹ Section 2 of the Nuclear Energy Act 92 of 1982.

⁸⁶² The title of the Nuclear Energy Act 131 of 1993.

⁸⁶³ 53 of 2008.

⁸⁶⁴ 57 of 2002.

Quality Act,⁸⁶⁵ the Labour Relations Act,⁸⁶⁶ the Occupational Health and Safety Act,⁸⁶⁷ the State of Emergency Act,⁸⁶⁸ and others contribute rules to the nuclear safety regime. Nevertheless, the cornerstone of the current framework regulating nuclear safety is the NNRA which is premised on Article 7 of the Convention on Nuclear Safety that requires the establishment and maintenance of a legislative and regulatory framework which provides “for:

- (i) the establishment of applicable national safety requirements and regulations;
- (ii) a system of licensing with regard to nuclear installations and the prohibition of the operation of a nuclear installation without a licence;
- (iii) a system of regulatory inspection and assessment of nuclear installations to ascertain compliance with applicable regulations and the terms of licences;
- (iv) the enforcement of applicable regulations and of the terms of licences, including suspension, modification or revocation.”⁸⁶⁹

The NNRA provides for national safety requirements and regulations intended to govern the construction and operation of nuclear installations. It replaces the Nuclear Energy Act 131 of 1993 which had regulated the activities of both Necsa and the CNS. The NNRA is the cornerstone of the nuclear safety regime of the country which “addresses and comprehensively complies with the provisions of Article 7 of the Convention on Nuclear Safety,”⁸⁷⁰ and it is structured as follows:

- Chapter 2 establishes the NNR as a nuclear regulatory body and as successor of CNS, and its objects and functions.
- Chapter 3 contains provisions intended to regulate activities which require a nuclear authorisation and conditions of authorisation.

⁸⁶⁵ 39 of 2004

⁸⁶⁶ 66 of 1995

⁸⁶⁷ 85 OF 1993

⁸⁶⁸ 86 of 1995.

⁸⁶⁹ 5th National Report by South Africa for the Convention on Nuclear Safety (September 2010) at 14.

⁸⁷⁰ 3rd National Report by South Africa for the Convention on Nuclear Safety (August 2004) at 19.

- Chapter 4 details provisions which deal with liability for nuclear damage and financial security.
- Chapter 5 provides for the formation of “regulations regarding safety standards and regulatory practices” based upon recommendation by the NNR.⁸⁷¹ Further, it deals with safety and emergency measures, and the powers and duties of inspectors, and duties regarding nuclear accidents and incidents.

3.3.2.2 The NNR

The NNR operates within the following national legislative and regulatory frameworks:

- The Constitution
- The NNRA.
- Nuclear Energy Act.
- Public Finance Management Act⁸⁷²
- National Treasury Regulations.
- National Radioactive Waste Disposal Institute Act.
- Promotion of Access to Information Act⁸⁷³
- Promotion of Administrative Justice Act⁸⁷⁴
- The NNR may enter into co-operative governance agreements to give effect to the principles of co-operative government and intergovernmental relations as contemplated in the regulations in terms of section 6(3) of the NNRA and in terms of section 239 of the Constitution.

The establishment of the NNR as a regulatory body is required by the Convention on Nuclear Safety. Article 8.2 of the Convention requires “each Contracting Party” to “take the appropriate steps to ensure an effective separation between the functions of the regulatory body and those of any other body or organization concerned with the promotion or utilization of nuclear energy.”

⁸⁷¹ Section 36(1) of the NNRA.

⁸⁷² 1 of 1999

⁸⁷³ 2 of 2000

⁸⁷⁴ 3 of 2000

The NNRA establishes the NNR as “a juristic person to be known as the National Nuclear Regulator, comprising aboard, a chief executive officer and staff...”⁸⁷⁵ The NNR is a successor of the CNS. Therefore, the NNRA incorporates an operative provision, thereby “all assets, rights, liabilities and obligations of the CNS can be passed to the NNR.”⁸⁷⁶

The NNR is intended to achieve the following objects:

1. The establishment safety standards and regulatory practices which provide for the protection of persons, property and the environment against nuclear damage.⁸⁷⁷
2. The establishment of safety control through granting nuclear authorisation based on the evaluation of siting, design and construction, “operation, manufacture of component parts, and decontamination, decommissioning and closure of nuclear installations.”⁸⁷⁸
3. The implementation of a system of compliance inspections which is intended to “provide assurance of compliance with the conditions of nuclear authorisations.”⁸⁷⁹
4. The fulfilment of “national obligations in respect of international legal instruments concerning nuclear safety.”⁸⁸⁰
5. The establishment of nuclear emergency planning.⁸⁸¹
6. The establishment for financial in order fulfil any nuclear liability.⁸⁸²

Although there are three other commissions in South Africa dealing with aspects of nuclear energy including the National Radioactive Waste Disposal Institute established by section 3 of the National Radioactive Waste Disposal Institute Act, Necsa established by section 3 of the Nuclear Energy Act, and the NPC established by section 4 of the NPWMDA, the NNR is required to be independent while carrying out its functions.

⁸⁷⁵ Section 3 of NNRA.

⁸⁷⁶ Section 4(1) of the NNRA.

⁸⁷⁷ Section 5(a) of the NNRA.

⁸⁷⁸ Section 5(b) and (b)(i) of the NNRA.

⁸⁷⁹ Section 5(d) of the NNRA.

⁸⁸⁰ Section 5(e) of the NNRA.

⁸⁸¹ Section 5(f) of the NNRA.

⁸⁸² Section 29(2)(b) of the NNRA.

The NNRA establishes the NNR as an autonomous body In order to be able to carry out its mandate without undue influence being brought upon it through two mechanisms:

Firstly: the NNR is financially independent and its funding provisions consist of:

- “Money appropriated by Parliament.”⁸⁸³
- Fees paid to the NNR in respect of nuclear authorisations as prescribed in suction 28 of the NNRA.”⁸⁸⁴
 - “Any application for the granting of a nuclear authorisation;”⁸⁸⁵
 - “An annual nuclear authorisation fee.”⁸⁸⁶
- Donations or contributions received by the NNR.⁸⁸⁷

Secondly: the NNRA establishes a relationship between the NNR and the Minister based on the requirement to give the Minister recommendations on the following issues:

- Fees payable to the NNR in respect of “any application for the granting of a nuclear authorization,”⁸⁸⁸ and “an annual nuclear authorisation fee.”⁸⁸⁹
- “Financial security by holder of nuclear installation licence.”⁸⁹⁰
- “Safety standards and regulatory practices.”⁸⁹¹
- “Regulations on the development surrounding any nuclear installation to ensure the effective implementation of any applicable emergency plan.”⁸⁹²

These recommendations are important and help the Minister to make, by notice in the Gazette, plans or regulations regarding the aforementioned issues. The NNR has the

⁸⁸³ Section 17(1)(a)of the NNRA.

⁸⁸⁴ Section 17(1)(b)of the NNRA.

⁸⁸⁵ Suction 28(a) of the NNRA.

⁸⁸⁶ Suction 28(b) of the NNRA.

⁸⁸⁷ Section 17(1)(c)of the NNRA.

⁸⁸⁸ Section 28(a) of the NNRA.

⁸⁸⁹ Section 28(b) of the NNRA.

⁸⁹⁰ Section 29 of the NNRA.

⁸⁹¹ Section 36 of the NNRA.

⁸⁹² Section 38(4) of the NNRA.

capacity to make these recommendations because of the expertise placed within its structure. The NNR consists of the Board of Directors and the Chief Executive Officer who is appointed by the Minister to ensure that the functions of the NNR are performed in accordance with the NNRA, the Public Entities Act,⁸⁹³ and the Public Finance Management Act.⁸⁹⁴ The Chief Executive Officer is assisted by qualified personnel from various structures of the NNR including the Assessment Group, the Corporate Support Services, the Nuclear Technology and Natural Sources Division, the Power Reactor Division, and Regulatory Strategy Development Division.

3.3.2.2.1 *Licensing*

The siting, construction, operation, decontamination, and decommissioning of a nuclear installation is restricted to those who obtain a licence.⁸⁹⁵ The licence is a legal document issued to the applicant by the NNR which grants the authorisation to perform specified nuclear activities or to have the responsibility for the siting, design, construction, commissioning, operation or decommissioning of a nuclear installation.

The applicant for nuclear licence can be “any person wishing to site, construct, operate, decontaminate or decommission a nuclear installation.”⁸⁹⁶ The applicant “may apply in the prescribed format to the chief executive officer for a nuclear installation licence and must furnish such information as the board requires.”⁸⁹⁷ The chief executive officer may establish “standard conditions applicable to one or more categories of certificates of registration.”⁸⁹⁸ Further, the chief executive officer may impose any condition in a nuclear installation which is deemed necessary “to ensure the protection of persons, property and the environment against nuclear damage,⁸⁹⁹ or provides for the rehabilitation of the site.”⁹⁰⁰ All these

⁸⁹³ 93 of 1992.

⁸⁹⁴ 1 of 1999.

⁸⁹⁵ Section 20(1) of the NNRA.

⁸⁹⁶ Section 21(1) of the NNRA.

⁸⁹⁷ Section 21(1) of the NNRA.

⁸⁹⁸ Section 23(1) of the NNRA.

⁸⁹⁹ Section 23(2)(a) of the NNRA.

⁹⁰⁰ Section 23(2)(b) of the NNRA.

conditions can be amended by the chief executive officer⁹⁰¹ and he or she notifies the licensee⁹⁰² and submits the amendments to the Board for ratification.⁹⁰³

The chief executive officer may request the applicant for a nuclear authorisation⁹⁰⁴ “to serve a copy of the application upon”⁹⁰⁵ “every municipality affected” by that application,⁹⁰⁶ or other body or person.⁹⁰⁷ Further, he or she may “publish a copy of the application in the Gazette and two newspapers circulating in the area of every such municipality.”⁹⁰⁸ For example, the requirement to submit a comprehensive environmental impact assessment required for the intended nuclear power plant needs the approval of the Department of Environmental Affairs according to Regulation 32 of Government Notice R.385, promulgated in terms of section 24 of NEMA.

The licensee is under the obligation to perform the following:

1. Displaying the copies of the license “at all time”...“at such places and in such languages and form as determined by the chief executive officer to ensure public access to the conditions specified in the authorisation.”⁹⁰⁹
2. The implementation of “an inspection programme to ensure compliance with all conditions of the nuclear authorisation.”⁹¹⁰
3. “Provide any information or monthly return as required by the chief executive officer.”⁹¹¹
4. The establishment of “a public safety information forum as prescribed in order to inform the persons living in the municipal area in respect of which an emergency

⁹⁰¹ Section 23(3)(a) of the NNRA.

⁹⁰² Section 23(3)(b) of the NNRA.

⁹⁰³ Section 23(3)(c) of the NNRA.

⁹⁰⁴ Section 21(3) of the NNRA.

⁹⁰⁵ Section 21(3)(a) of the NNRA.

⁹⁰⁶ Section 21(3)(a)(i) of the NNRA.

⁹⁰⁷ Section 21(3)(a)(ii) of the NNRA.

⁹⁰⁸ Section 21(3)(b) of the NNRA.

⁹⁰⁹ Section 26(1) of the NNRA.

⁹¹⁰ Section 26(2) of the NNRA.

⁹¹¹ Section 26(3) of the NNRA.

plan has been established in terms of section 38(1) on nuclear safety and radiation safety matters.⁹¹²

3.3.2.2.2 Emergency Planning and Preparedness

The NNRA establishes safety and emergency measures in line with Article 16 of the Convention on Nuclear Safety and Article 25 of the Joint Convention on Safety of Radioactive Waste. The NNRA prescribes the following steps in order “to ensure that there are on-site and off-site emergency plans:”⁹¹³

- The licensee is obliged to “establish a public safety information forum as prescribed in order to inform the persons living in the municipal area in respect of which an emergency plan has been established...on nuclear safety and radiation safety matters.”⁹¹⁴
- The relevant holder of a nuclear authorisation is obliged to foresee whether a nuclear accident affecting the public may occur. If there is a possibility for this occurrence the NNR has to direct the holder of a nuclear authorisation⁹¹⁵ to “enter into an agreement with the relevant municipalities and provincial authorities to establish an emergency plan...”⁹¹⁶ The holder of a nuclear authorisation is obliged to cover the cost for the establishment, implementation and management of such emergency plan.⁹¹⁷ This emergency plan is subject to approval by the NNR.⁹¹⁸
- The NNR examines the emergency plan in order to ensure its effectiveness in respect of the “protection of persons should a nuclear accident occur.”⁹¹⁹
- The emergency plan which is approved by the NNR is the one required to be implemented should a nuclear accident occur.⁹²⁰

⁹¹² Section 26(4) of the NNRA.

⁹¹³ Article 25.1 of the Joint Convention.

⁹¹⁴ Section 26(4) of the NNRA.

⁹¹⁵ Section 38(1) of the NNRA.

⁹¹⁶ Section 38(1) (a) of the NNRA.

⁹¹⁷ Section 38(1) (b) of the NNRA.

⁹¹⁸ Section 38(1) (c) of the NNRA.

⁹¹⁹ Section 38(2) of the NNRA.

- The Minister ensures the effective implementation of any applicable emergency plan by making “regulations on the development surrounding any nuclear installation.”⁹²¹ These regulations are based on “recommendation of the board and in consultation with the relevant municipalities.”⁹²²
- The licensee is required to “ensure that all emergency planning and preparedness processes are exercised and tested at such intervals and at such times and to such extent as the NNR may specify.”⁹²³
- When a major nuclear accident occurs requiring a national response because it forms a disaster, the relevant Minister declares a state of disaster in order to apply the Disaster Management Act.⁹²⁴ This is important in order “to provide for-
 1. an integrated and co-ordinated disaster management policy that focuses on preventing or reducing the risk of disasters, mitigating the severity of disasters, emergency preparedness, rapid and effective response to disasters and post-disaster recovery;
 2. the establishment of national, provincial and municipal disaster management centres;
 3. disaster management volunteers; and
 4. matters incidental thereto.”⁹²⁵
- the establishment of a safety culture which is universally relevant and intended “to achieve and maintain a high level of nuclear safety worldwide through the enhancement of national measures and international co-operation including, where appropriate, safety-related technical co-operation”⁹²⁶

⁹²⁰ Section 38(3) of the NNRA.

⁹²¹ Section 38(4) of the NNRA.

⁹²² *Id.*

⁹²³ Second South African National Report on Compliance to Obligations under the Joint Convention on Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (September 2011) at 46.

⁹²⁴ Act 57 of 2002

⁹²⁵ The title of the Disaster Management Act.

⁹²⁶ Article 1.i of the Convention on Nuclear Safety. Also, article 1.i of the Joint Convention.

The NNR ensures international cooperation in case of a nuclear accident through the fulfilment of South Africa's obligations in respect of international legal instruments concerning nuclear safety and international joint emergency response plans.⁹²⁷ However, Necsa is the competent authority and the point that the licensee may notify the IAEA in line with Article 7 of the Notification Convention and Article 4 of the Nuclear Assistance Convention.

3.3.3 South Africa's Nuclear Security Regime

Laws dealing with nuclear security generally regulate aspects involving the physical protection of nuclear materials and installations as identified in the CPPNM⁹²⁸ and the ICSANT. South Africa is party to the two conventions which create legal obligations on it to take the following measures:

- (a) The adoption of measures within the domestic legislation and consistent with international law to criminalise acts defined as criminal offences including those entrenched in Article 2 of the CPPNM and Article 7 of the ICSANT.
- (b) Making the acts defined in Article 2 of the CPPNM and Article 7 of the ICSANT "punishable by appropriate penalties which take into account the grave nature of these offences."⁹²⁹
- (c) The cooperation with other states parties to the CPPNM and the ICSANT in respect of the following:
 - 1. Exchanging information e.g. about unlawful taking of nuclear material, which is subject to verification,⁹³⁰ confidentiality,⁹³¹ and should not "jeopardize the security of the State concerned or the physical protection of nuclear material."⁹³²

⁹²⁷ Section 5(e) read with section 5(f) of the NNRA.

⁹²⁸ South Africa is not a party state to the Amendment to the CPPNM of 2005.

⁹²⁹ Article 7.1.b of the ICSANT.

⁹³⁰ Article 5.b of the ICSANT.

⁹³¹ Article 6.1 of the CPPNM.

⁹³² Article 6.2 of the CPPNM.

2. The rendering of “assistance, if requested.”⁹³³
 3. The rendering of “consultation with a view to obtaining guidance on the design...”⁹³⁴
 4. The cooperation through international organisations,⁹³⁵ IAEA and the UN Secretary General.⁹³⁶
 5. The establishment of competent authorities and liaison points for communications of information.
 6. The co-ordination of “efforts through diplomatic and other agreed channels.”⁹³⁷
- (d) The adoption of “appropriate measures to ensure the protection of radioactive material, taking into account relevant recommendations and functions of the” IAEA.⁹³⁸

The NNR has certain powers regarding the physical security of nuclear premises including those arrangements which are considered “necessary for the proper protection or security of property which belongs to, or is under the control of” the NNR “or is on any premises on which activities of the” NNR “are performed.”⁹³⁹ The physical security of nuclear installations is also maintained by restrictions imposed on access of persons to them. Section 42(2) of the NNRA prohibits “unauthorised person” to “enter any premises which:

- (a) are under the control of the Regulator; and
- (b) the Regulator has identified as premises where information relating to the safety and security of or on a nuclear installation is kept.”

The NNR “has developed requirements for the assurance of nuclear security or physical protection system (PPS) at nuclear installations or associated actions in accordance” to the

⁹³³ Article 5.2.b.ii of the CPPNM.

⁹³⁴ Article 5.3 of the CPPNM.

⁹³⁵ Article 5.2.a of the CPPNM.

⁹³⁶ Article 7.4 of the ICSANT.

⁹³⁷ Article 5.2.b(i) of the CPPNM.

⁹³⁸ Article 8 of the ICSANT.

⁹³⁹ Section 42(1) of the NNRA.

NNRA, the 2008 Nuclear Energy Policy, Minimum Information Security Standards and IAEA Nuclear Security Series No.7.⁹⁴⁰

The physical protection system deploys “legislation and regulation, intelligence gathering; assessment of the threat to radioactive material and associated locations and facilities; administrative systems; various technical hardware systems; response capabilities and mitigation activities.”⁹⁴¹This is inspired by the “security culture” recommended by the IAEA Nuclear Security Series No.7 of 2008 which is updated by IAEA Nuclear Security Series No. 20 of 2013.IAEA nuclear security documents provide for a nuclear security culture and “involves individuals in a number of diverse disciplines and organizations who must work together in order to be effective.”⁹⁴² In other words, the concept of a nuclear security culture is based on the identification and effective function of all the elements involved in protecting nuclear installations and radioactive materials. These elements include the following:

- The state is responsible for the “establishment, implementation and maintenance of a nuclear security regime.”⁹⁴³ This means that the state provides for the definition of general protection objectives through laws, policy and regulations which contribute to the distribution of, responsibilities, and protection of information.⁹⁴⁴
- The identification and definition of nuclear security responsibilities which requires the designation of the competent authorities in order to deal with security policy statement and developing and improving security standards while managing structures, resources. These competent authorities are required to make regular review of their nuclear security practices and systems taking “into account lessons learned from both internal and external reviews, and changes in the threat level.”⁹⁴⁵

⁹⁴⁰ See, NNR “Nuclear security” <http://www.nnr.co.za/nuclear-security/> (27 October 2013).

⁹⁴¹ IAEA Nuclear Security Culture: Implementing Guide (2008) Nuclear Security Series No 7 at 4.

⁹⁴² *Ibid* at 6.

⁹⁴³ *Ibid*.

⁹⁴⁴ IAEA Objective and Essential Elements of a State’s Nuclear Security Regime (2013) Nuclear Security Series No 20 at 4.

⁹⁴⁵ IAEA Nuclear Security Culture: Implementing Guide (2008) at 6.

- The establishment of legislative and regulatory framework, and associated administrative measures, to govern the nuclear security regime.⁹⁴⁶
- The extension of the responsibility of the state to cover the protection of international transport of nuclear material and other radioactive material.⁹⁴⁷
- The establishment of relevant criminal procedure relating to nuclear environment in order to give definition to nuclear crimes which pose adverse impact on nuclear security, ensure the establishment of “appropriate penalties that are proportionate to the gravity of the harm that could be caused by commission of the offences or violations,” and the establishment “of the jurisdiction of the State over such offences or violations,” and “providing for the prosecution or, as appropriate, extradition of alleged offenders.”⁹⁴⁸
- The establishment of international cooperation and assistance either directly or through the IAEA or other international organisations.⁹⁴⁹
- The establishment of a system which is able to identify and assess nuclear security threats within or outside the jurisdiction of the State.⁹⁵⁰
- The establishment of plans for, preparedness system for, and a response mechanism for security events.⁹⁵¹

The NNRA establishes the NNR’s powers regarding security of property⁹⁵² and premises, and regulates the disclosure of information in a manner that does not jeopardize the security of nuclear installations and materials,⁹⁵³ and prescribes offences and penalties.⁹⁵⁴ In the same context Necsa’s security measures are designed on the basis of threat analysis in accordance with international best practice. It achieves its security objectives through the establishment of access control of employees and visitors in accordance with the section 29 of the Nuclear

⁹⁴⁶ IAEA Objective and Essential Elements of a State’s Nuclear Security Regime (2013) at 5.

⁹⁴⁷ *Ibid* at 6.

⁹⁴⁸ *Ibid*.

⁹⁴⁹ *Ibid* at 7.

⁹⁵⁰ *Ibid*.

⁹⁵¹ *Ibid* at 9.

⁹⁵² Section 42 of the NNRA.

⁹⁵³ Section 51 of the NNRA.

⁹⁵⁴ Section 52 of the NNRA.

Energy Act and the establishment of the Joint Planning Committee, the South African Police Service, State Security Agency, Necs Security, Necs Emergency Services, the Madibeng Community and the NNR in accordance the National Key Points Act.⁹⁵⁵

3.3.4 South Africa's Nuclear Liability Regime

Nuclear liability regime is intended to deal with nuclear accidents and incidents which can produce damages to human health, property, the environment, and the economy. These damages extend beyond political and geographical borders and extend the period during which claims may be brought for loss of life and personal injury.

Although South Africa is not a signatory party to any of the international instruments dealing with nuclear liability, the NNRA requires the establishment of financial security by the holder of a nuclear installation licence, "in order for the holder of a nuclear installation licence to fulfil any liability which may be incurred..."⁹⁵⁶ Following the international trend in regulating the liability for nuclear damages, the NNRA establishes the following:

3.3.4.1 Channeling Strict Liability to Operator

The liability for nuclear damage is limited to the "holder of a nuclear installation licence."⁹⁵⁷ Regardless the non-existence of "intent or negligence on the part of the holder," the holder remains the liable person "for all nuclear damage caused by or resulting from the relevant nuclear installation during the holder's period of responsibility-

- (a) by anything being present or which is done at or in the nuclear installation or by any radioactive material or material contaminated with radioactivity which has been discharged or released, in any form, from the nuclear installation; or
- (b) by any radioactive material or material contaminated with radioactivity which is subject to the nuclear installation licence, while in the possession or under the control of the holder of that licence during the conveyance thereof from the

⁹⁵⁵ 102 of 1980.

⁹⁵⁶ Section 29(2)(b) of the NNRA.

⁹⁵⁷ Section 30(1) of the NNRA.

nuclear installation, to any other place in the Republic or in the territorial waters of the Republic from or to any place in or outside the Republic.”⁹⁵⁸

3.3.4.2 Limiting the Liability in Amount

The liability for nuclear damage by any holder of a nuclear installation licence is limited, for each nuclear accident, to the amounts determined”⁹⁵⁹ by the Minister as follows:⁹⁶⁰

- The Minister determines “the level of financial security to be provided by holders of nuclear installation licences in respect of each of those categories.”⁹⁶¹ This is based on the recommendation of the board of the NNR and in consultation with the Minister of Finance and by notice in the Gazette.⁹⁶² Further the Minister determines “the manner in which that financial security is to be provided.”⁹⁶³
- The Minister may increase or decrease after consultation with the board of the NNR the level of financial security.⁹⁶⁴
- The Minister may “discharge that holder from the requirement to provide financial security” after consultation with the board of the NNR.⁹⁶⁵
- The Minister may “amend the manner in which that holder must provide financial security” after consultation with the board of the NNR.⁹⁶⁶

3.3.4.3 Limiting the Liability in Time

The liability for nuclear damage by any holder of a nuclear installation licence is subject, for each nuclear accident, to prescription of action for compensation as follows:⁹⁶⁷

⁹⁵⁸ Section 30(1) of the NNRA.

⁹⁵⁹ Section 30(2) of the NNRA.

⁹⁶⁰ Section 29(2) of the NNRA.

⁹⁶¹ Section 29(2)(a) of the NNRA.

⁹⁶² Section 29(2) of the NNRA.

⁹⁶³ Section 29(2)(b) of the NNRA.

⁹⁶⁴ Section 29(3)(a), (b) of the NNRA.

⁹⁶⁵ Section 29(3)(c) of the NNRA.

⁹⁶⁶ Section 29(3)(d) of the NNRA.

⁹⁶⁷ Section 34 of the NNRA.

- An action for compensation may be instituted for damages caused by a holder of a nuclear installation licence within “a period of 30 years from:
 - (a) The date of the occurrence which gave rise to the right to claim that compensation; or
 - (b) The date of the last event in the course of that occurrence or succession of occurrences, if a continuing occurrence or a succession of occurrences, all attributable to a particular event or the carrying out of a particular operation, gave rise to that right.”⁹⁶⁸
- The prescription period of 30 years is in line with the international instruments regulating nuclear liability. Article 8 of the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage replaces Article VI of the 1963 Vienna Convention and reads as follows:

“(a) Rights of compensation under this Convention shall be extinguished if an action is not brought within –

 - (i) with respect to loss of life and personal injury, thirty years from the date of the nuclear incident.”
- The 30 years period of prescription gives rise to a difficulty in providing financial security because international nuclear insurance pool provides insurance cover for a maximum of only 10 years.

3.3.4.4 The Establishment of Jurisdiction of Courts over Nuclear Incident

The jurisdiction of the courts over actions which caused damages to a third party has been reserved to “the courts of the Contracting Party within whose territory the nuclear incident occurred.”⁹⁶⁹ Article 12 of the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage adds a new paragraph providing that “the Contracting Party whose courts have jurisdiction shall ensure that only one of its courts shall have jurisdiction in relation to

⁹⁶⁸ Section 34(1) of the NNRA.

⁹⁶⁹ Article XI.1 of Vienna Convention on Civil Liability for Nuclear Damage.

any one nuclear incident.”⁹⁷⁰ The criteria of such selecting” are “determined by the national legislation of such Contracting Party”⁹⁷¹ in a manner intended to eliminate forum shopping which is costly for operators.⁹⁷²

South Africa is not a signatory party to any of the international instruments regulating nuclear liability and the NNRA is silent regarding jurisdiction. This means that, general rules of jurisdiction are the main available legal tools applying in South Africa. In other words, the *lex loci delicti commissi* principle becomes operative and reserves the jurisdiction for the court where the damage or the accident occurred. The courts of South Africa “have contended themselves with saying that they have jurisdiction...if delict occurred within the area over which they exercise jurisdiction...”⁹⁷³ That is to say, for jurisdictional purposes the *locus* of nuclear damages is “determined with reference to the materiality of”⁹⁷⁴ “all factors giving rise to jurisdiction under the common law,”⁹⁷⁵ taking into consideration the possibility of applying the *causae continentia* doctrine in order to “avoid a multiplicity of processes and the possibility of conflicting judgments on the same cause of action.”⁹⁷⁶

3.3.5 Sustainable Development

The principal regulatory framework dealing with sustainable development is the Constitution which sets out measures taking into account the requirement to “secure

⁹⁷⁰ Para 4 of article 12 of the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage which amends the 1963 Vienna Convention.

⁹⁷¹ OECD *Nuclear Law Bulletin: Supplement to No. 75* Vol 1 (June 2005) at 14.

⁹⁷² Handrlica J “Channelling of nuclear third party liability towards the operator jeopardised by the Brussels regulation channelling of nuclear third party liability towards the operator” (69-82) Vol 2 (2011) *CYIL* at 71.

⁹⁷³ Pistorius D *Pollak on jurisdiction* (1993) 2nd ed at 64.

⁹⁷⁴ Cilliers AC, Loots C, and Nel HC *Herbstein and Van Wisen: The Civil Practice of the High Courts and the Supreme Courts of South Africa* Vol 1 (2009) 5th ed at 76.

⁹⁷⁵ *Cordiant Trading CC v Daimler Chrysler Financial Services* [2005] ZASCA 50; [2006] 1 All SA 103 (SCA) (30 May 2005) para 11.

⁹⁷⁶ Cilliers *Herbstein and Van Wisen* (2009) at 76.

ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.”⁹⁷⁷

“Energy is essential to economic and social development and improved quality of life. Much of the world's energy, however, is currently produced and consumed in ways that could not be sustained if technology were to remain constant and if overall quantities were to increase substantially.”⁹⁷⁸

The developmental goals to be supported by developing energy enterprises should be balanced with the requirement to “halt and reverse the negative impact of human behaviour on the physical environment and promote environmentally sustainable economic development in all countries.”⁹⁷⁹ Nonetheless, sustainable development is an integral component positioned in the centre of the MDGs which are unattainable without the universal access to clean energy. That is to say the development of a nuclear power programme is required to contribute among other things to the following:

- The socio-economic development and improving the quality of life.⁹⁸⁰
- The sustainable development which “serves present and future generations.”⁹⁸¹
- The protection of the environment.
- The universal access to clean and affordable electricity.
- The maximum utilisation of available resources.
- The conservation of depleted resources e.g. fossil fuels for the present and future generations.
- The “country’s national programme of social and economic transformation, growth, development;”⁹⁸² “job creation and the further development of a skilled workforce.”⁹⁸³

⁹⁷⁷ Section 24(b)(iii) of the Constitution.

⁹⁷⁸ UN Conference on Environment & Development Rio de Janeiro, Brazil (3 to 14 June 1992) Agenda 21– Chapter 9 para 9.9.

⁹⁷⁹ Rio de Janeiro, Brazil, Chapter 21 para 21.1.

⁹⁸⁰ Section 24 of the Constitution. Also, section 2 of NEMA.

⁹⁸¹ Section 1(xxix) of the NEMA.

⁹⁸² The 2008 Nuclear energy Policy at 9.

- “The actions to develop, promote, support, enhance, sustain and monitor the nuclear energy sector in South Africa.”⁹⁸⁴
- The strategies intended to mitigate the adverse impact of GHG and global warming.⁹⁸⁵
- The justification and rationalisation of nuclear hazards.

The rationalisation of the development of nuclear power lies in the low emission of carbon dioxide.⁹⁸⁶ This has to be weighed against the “high levels of GHG emissions that are attributable to fossil fuel”⁹⁸⁷ and the exhaustive nature of all fossil fuels.⁹⁸⁸ South Africa is known for its cheap energy which is basically dependent on coal-fired power stations.⁹⁸⁹ On the one hand, cheap energy benefits the country’s “foreign exchange earnings.”⁹⁹⁰ On the other hand coal introduces harmful environmental and health effects, which are not factored into the price calculations. Taking into account the international environmental commitments the price of energy is not the only factor which enhances “South Africa’s future exports.”⁹⁹¹ This requires the Government to regulate the energy sector in order to “balance energy prices with sustainable environmental standards.”⁹⁹²

The 1998 White Paper on Energy policy requires the examination of the nuclear energy sector taking to account “the environmental and economic merits of the various alternative energy” resources.⁹⁹³ Although coal-based electricity generation remains the least cost option...” the deployment of nuclear generation capacity which has associated cost

⁹⁸³ *Ibid* at 7.

⁹⁸⁴ *Ibid* at 9.

⁹⁸⁵ *Ibid* at 7.

⁹⁸⁶ Holt M *Nuclear Energy Policy* (10 December 2009) at 9. In this context, the issues relating to nuclear waste cannot be ignored. However, the issues relating to nuclear waste management is not central in this thesis.

⁹⁸⁷ Kiratu S “South Africa’s Energy Security in the Context of Climate Change Mitigation” (1-17) Series on Trade and Energy Security, Policy Report 4, International Institute for Sustainable Development (2010) at 1.

⁹⁸⁸ Ayres R *Turning Point: An End to the Growth Paradigm* (1998) 1st ed at 163.

⁹⁸⁹ Kiratu “South Africa’s Energy Security in the Context of Climate Change Mitigation” at 4.

⁹⁹⁰ Para 3.3.2 of the 1998 White Paper.

⁹⁹¹ Para 3.3.2 of the 1998 White Paper on Energy Policy.

⁹⁹² Para 3.3.2 of the 1998 White Paper on Energy policy.

⁹⁹³ *Ibid* para 3.4.2.

implications should be “traded off against other benefits on a project-by-project basis.”⁹⁹⁴ This means that, the government is required to take into account the integration of social, economic, political, energy resources scarcity, potential nuclear hazards, nuclear waste management, access to electricity and its impact on achieving the MDGs and environmental factors in the planning, implementing and evaluating decisions relating to the development of nuclear power plants “to ensure that development serves present and future generations.”⁹⁹⁵

The NDP focuses on the required shift from exploitation of the country’s “mineral wealth with little or no regard for the environment,” to the protection of “the natural environment while allowing the country to benefit from its mineral deposits.”⁹⁹⁶ The NDP identifies the challenges posed to the environment and calls for the following:

- The protection “of the natural environment in all respects, leaving subsequent generations with at least an endowment of at least equal value.
- Enhance the resilience of people and the economy to climate change.
- Extract mineral wealth to generate the resources to raise living standards, skills and infrastructure in a sustainable manner.
- Reduce greenhouse gas emissions and improve energy efficiency.”⁹⁹⁷

3.4 CONCLUSION

The interaction between international nuclear regime and the municipal nuclear governance provides for the integration and harmonisation of a regulatory framework which ensures a successful utilisation of nuclear energy power generation. This is based on the fact that binding rules such as the non-proliferation of nuclear weapons and norms relating to safety and security of nuclear installations find their application in the municipal law. South Africa’s legal system allows international nuclear law to contribute to municipal nuclear governance

⁹⁹⁴ The 2003 Integrated Energy Plan at 26.

⁹⁹⁵ Section 1(xxix) of NEMA.

⁹⁹⁶ NDP at 47.

⁹⁹⁷ *Ibid.*

because it “treats international law as part of municipal law.”⁹⁹⁸ Of course this varies according to the nature of international law and depends on the status of international law in the national law. As explained above, the application of international law in South Africa follows many methods including the interpretive procedure implied by section 39(1) and 233 of the Constitution, and the incorporation method or the domesticating method prescribed by section 231 of the Constitution.

The Commission for Conciliation, Mediation and Arbitration (CCMA) described the governance which governs activities at Koeberg as follows:

“The Koeberg Nuclear Power Station is governed by a series of international atomic energy protocols, laws and subject to the nuclear regulations of the National Nuclear Regulator of South Africa, resulting in stringent requirements for those working in the field of nuclear radiation protection.”⁹⁹⁹

In the *Earthlife* decision the High Court (Cape of Good Hope Provincial Division) summarized the list of applicable legislations governing the construction of “model 110 MegaWatt class pebble bed modular reactor (PBMR)”¹⁰⁰⁰ by (Eskom) as follows:

“Although the decision under review was made primarily in terms of section 22(3) of ECA, there is a closely interwoven framework of related legislation impacting on the present matter: it includes the National Environmental Management Act 107 of 1998 (NEMA); the Nuclear Energy Act 46 of 1999 (the NE Act); the National Nuclear Regulator Act 47 of 1999 (the NNR Act); as well as a number of regulations, treaties and policies that fall under the jurisdiction of different government departments, all containing their own unique processes and requirements. For present purposes, however, the enquiry can be confined to ECA and its regulations.”¹⁰⁰¹

⁹⁹⁸ Dugard *International Law: A South African Perspective* at 50.

⁹⁹⁹ *NUM obo Kader v Eskom Nuclear Power Station* [2008] JOL 22572 (CCMA) at para 11.

¹⁰⁰⁰ The *Earthlife* para 1.

¹⁰⁰¹ The *Earthlife* para 3.

The CCMA takes as a starting point the complete reception of international law in South Africa's nuclear safety regime. The High Court did not investigate the provisions in e.g. the NNRA which domesticates the NPT to become applicable law. However, the High Court incorporated treaties in general in the list of legal instruments regulating nuclear development. However, it identified the Environment Conservation Act¹⁰⁰² as the sole applicable law confining the legal question within the requirement of section 22 of the Environment Conservation Act which prescribes a pre-authorisation to conduct "activities which ...may have a substantial detrimental effect on the environment" based on the environmental impact reports applied by the applicant.¹⁰⁰³

The High Court considered as environmental concerns in the *Earthlife* case "the list of worries related to nuclear energy comprises economic performance, proliferation of dangerous material, the peril of terrorism, operation safety, radioactive waste disposal, and, as a result of all these, public acceptance."¹⁰⁰⁴

Fundamentally, nuclear energy development is subject to the justification of facilities and activities in principle. The most recently proposed installation of a 9.6 GW fleet of nuclear power plants must "yield an overall benefit because it gives "rise to radiation risks"¹⁰⁰⁵ Logically, in assessing the benefits and risks of all balancing factors including safety, security, non-diversion, the security of supply, the reliability and diversity of electricity supply infrastructure, the availability of energy resources, the affordability of access to electricity, and the adverse impact of electricity supply infrastructure on the environment must be considered.

The electricity supply infrastructure is the determining factor in creating a balance between the developmental requirements of access to electricity and the need to protect the environment. In other words, the selection process of the components of electricity supply infrastructure must strike the balance in the energy mix chosen for a particular country.

¹⁰⁰² 73 of 1989.

¹⁰⁰³ The *Earthlife* para 4 and 5.

¹⁰⁰⁴ Toth FL and Rogner H "Oil and nuclear power: Past, present, and future" (1-25) Vol 28 (2006) *Energy Economics* at 2.

¹⁰⁰⁵ IAEA Fundamental Safety Principles (2006) IAEA Safety Standards Series No. SF-1 at 10.

CHAPTER IV

SOUTH AFRICA'S NUCLEAR ENERGY DEVELOPMENT IN THE CONTEXT OF ENERGY MIX

4.1 INTRODUCTION

Energy is a fundamental factor in turning the wheel of a prosperous global economy and sustainable development.¹⁰⁰⁶ The development aspects related to agriculture, industrial productivity, health care, education, etc. require a proper infrastructure of energy supply.¹⁰⁰⁷ Effective access to clean, efficient, affordable and reliable energy services is a vital factor in the maintenance of the current living standards of mankind.¹⁰⁰⁸ For example, the American energy model, which is a derivative of “ever more ingenious provision and application of various sources and forms of energy,” is responsible for “the strength of industry, the speed of transportation, the myriad comforts and conveniences of home and workplace, and the security of the nation.”¹⁰⁰⁹

The MDGs also places energy as the key factor in influencing principles of sustainable development.¹⁰¹⁰ UNSG Ban Ki-moon projects energy in the heart of the efforts towards poverty eradication and climate change mitigation.¹⁰¹¹ He prioritises two areas in achieving

¹⁰⁰⁶ Energy for a Sustainable Future: The Secretary-General's Advisory Group on Energy and Climate Change (AGECC) Summary Report and Recommendations (28 April 2010) New York at 7. Hereafter referred to as the AGECC.

¹⁰⁰⁷ See the forward of Mohamed ElBaradei in “Nuclear power and sustainable development” (April 2006) IAEA.

¹⁰⁰⁸ Kaltschmitt M, Streicher W, and Wiese A *Renewable Energy: Technology, Economics And Environment* (2010) at 1.

¹⁰⁰⁹ The National Academies *What You Need to Know About Energy* (2008) National Academy of Sciences at 2.

¹⁰¹⁰ See, the UN Millennium Declaration, General Assembly resolution 55/2 adopted on 18 September 2000.

¹⁰¹¹ See, the AGECC. Also see, Kandeh K. Yumkella, the Director-General of the UN Industrial Development Organization (UNIDO), encourages the AGECC to concentrate on the universal access to modern energy services and the improved energy efficiency.

“internationally-agreed climate goals” namely, improving energy access and strengthening energy efficiency.¹⁰¹²

Ban Ki-moon states that “expanding access to affordable, clean energy is critical for realising the MDGs and enabling sustainable development across much of the globe.”¹⁰¹³ The main focus is on electricity which is central in achieving the MDGs through its contribution to the following objects:

- Eradication of extreme poverty and hunger, by enabling refrigeration, cooking, irrigation and job opportunities.
- Realisation of universal education, by facilitating study after dark, attracting teachers to rural areas, facilitating the use of updated media and promoting children’s school attendance.
- Promotion of gender equality and women empowerment by increasing access to education, facilitating the traditional women’s tasks and the reduction of indoor pollution.
- Reduction of child mortality by improving services and hospitals, reduction of indoor pollution, allowing for more time for parents to spend with their children, and allowing for improved water supply.
- Betterment of maternal health by improving services and hospitals, enabling refrigeration for the purposes of storing “tests, medication and vaccines,” and “enabling the use of electronic equipment for pre-and post-natal care and monitoring;”¹⁰¹⁴
- “Combat of HIV/AIDS, malaria and other diseases” by facilitating medical facilities, enabling refrigeration for the purposes of vaccinations and medications;
- Environmental sustainability by enhancing energy mix approach as well as the reduction of deforestation and soil erosion.¹⁰¹⁵

¹⁰¹² The UNSG’s opinion is based upon the findings of the AGECC, established 2009 and chaired by Kandeh Yumkella.

¹⁰¹³ See, the UNSG’s opinion.

¹⁰¹⁴ Malzbender “Domestic electricity provision in the democratic South Africa” at 13.

¹⁰¹⁵ McDonald D *Electric Capitalism: Recolonising Africa on the Power Grid* (2009) at xvii.

- “Reduction of fire incidents, particularly in low-income urban areas, from the use of paraffin and candles,” and the “reduction of local and indoor air pollution from firewood use.”¹⁰¹⁶

South Africa’s statutory norms regulating energy and electricity do not deviate from the findings of the AGECC. They also aim at universal access to electricity¹⁰¹⁷ and intend to facilitate the achievement of the efficient, effective, sustainable and orderly development and operation of the electricity supply infrastructure in South Africa.¹⁰¹⁸

The energy policy of South Africa can be summarised by its objectives and priorities. The 1998 White Paper on Energy policy presents five basic objectives namely: “improving access to energy services, improving energy governance, stimulating economic development, and managing energy related environmental impacts.”¹⁰¹⁹ The priorities focus on a plan for energy security serving the main stakeholders including households, industry, commerce, mining, transport, and agriculture.¹⁰²⁰

However, South Africa’s energy supply infrastructure needs more attention in order to achieve the objectives set out in the policy. South Africa recently experienced “unprecedented levels of load shedding nationally.”¹⁰²¹ The country’s electricity consumption has increased significantly due to economic growth and the electrification programme. Consequently, “the electricity reserve margin has shrunk to about 8%, compared with the international standard of at least 15%.”¹⁰²² The electricity reserve margin is represented by the generation capacity which should be “available at any time to meet the level of electricity demanded at that time” in order to assure the stability “of the national electricity supply system.”¹⁰²³ The decrease in the reserve margin capacity affects

¹⁰¹⁶ Malzbender “Domestic electricity provision in the democratic South Africa” at 13.

¹⁰¹⁷ Section 2(d) Electricity Regulation Act.

¹⁰¹⁸ Section 2(a) Electricity Regulation Act.

¹⁰¹⁹ The 1998 White Paper on Energy policy at 6.

¹⁰²⁰ *Ibid* at 10- 11.

¹⁰²¹ DME, National Response to South Africa’s Electricity Shortage at 1.

¹⁰²² Calldo F “Eskom’s power crisis: Reasons, impact & possible solutions” (15 February 2008) *Report, Solidarity* at 10.

¹⁰²³ “Interventions to address electricity shortages” at 2.

the reliability of electricity supply and fundamentally contributes to the necessity of load shedding as a last resort measure to protect the electricity grid from breaking down entirely. It is predicted that the risk of the load shedding will continue to remain high especially during shut downs for major maintenance or incidents, such as equipment failure, “generator output reductions (load losses) as a result of coal quality,” or “problems with coal supply.”¹⁰²⁴

South Africa’s immediate electricity constraint was estimated around 3 GW of capacity which was required “to be released to provide the necessary ‘breathing space’.”¹⁰²⁵ South Africa was thus found to need to plan for a serious “power generation capacity expansion programme”¹⁰²⁶ in order to meet the continuous rise in electricity demand, taking into consideration that reinforcing the electricity supply infrastructure would have to reconcile the country’s environmental obligations and the availability of energy resources.

South Africa’s energy supply infrastructure is fundamentally made up of coal-fired power plants.¹⁰²⁷ It is projected that the country will continue relying “on coal for at least the next two decades.”¹⁰²⁸ Two major additional coal-fired power stations “Kusile and Medupi” are under construction.¹⁰²⁹ This is criticised for instance by Greenpeace considering that South Africa is “currently the world's 12th largest emitter,” because connecting the two additional

¹⁰²⁴ *Ibid* at 4.

¹⁰²⁵ *Ibid* at 6.

¹⁰²⁶ *Ibid* at 7.

¹⁰²⁷ In 2009 South Africa produced 247 Million Tonnes Coal Equivalent (Mtce) and 67 Million (Mtce) were exported. This means that 180 (Mtce) were used locally and 70% of which used by Eskom. See, Eberhard A “The Future of South African coal: market, investment, and policy challenges” (Working Paper #100 January 2011) *Freeman Spogli Institute for International Studies* at 4.

¹⁰²⁸ The 2003 Integrated Energy Plan at 4.

¹⁰²⁹ Refer to the President of the Republic of South Africa Mr. Zuma in his Annual State Address 2012, where he requested South African to save power until the two power stations come on board. See, allAfrica “South Africa: Greenpeace Statement on the State of the Nation Address” (10 February 2012) [HTTP://ALLAFRICA.COM/STORIES/201202101098.HTML](http://ALLAFRICA.COM/STORIES/201202101098.HTML) (Accessed 17 February 2012).

power stations to the grid will increase South Africa's emissions footprint by 10%.¹⁰³⁰ This will impose "negative effects on South Africans' health, livelihood and future."¹⁰³¹

South Africa's energy policy does not ignore the environmental concerns and has proposed to "balance the use of natural energy resources with environmental considerations."¹⁰³² The 1998 White Paper on Energy Policy considered that "the energy sector has larger environmental impacts than most economic sectors, with associated greenhouse gas emissions feared to be a major contributor to global warming."¹⁰³³ Meanwhile, the Policy has contextualised nuclear capacity as an option in the future which depends upon "environmental and economic merits of the various alternative energy sources."¹⁰³⁴ Nuclear energy is considered as one of the most reliable, cleanest and safest options for South Africa in order to guarantee energy security and to mitigate climate changes.¹⁰³⁵ South Africa has therefore planned to install 9.6 GW of new nuclear capacity by 2030 and the DoE planed "to roll out the procurement process" in 2012 for a Generation III reactor.¹⁰³⁶

South Africa's decision in favour of expanding its nuclear capacity is presumed to meet the requirements of the policy pertaining to diversification of the available energy resources in order to ensure energy security supply, support economic growth, and contribute to environmental management.¹⁰³⁷ This means that the nuclear energy option will have to compete in long-term policies pertaining to energy resources constraints in a carbon constrained economy in order to propose a high margin in the whole scenario of energy mix data.¹⁰³⁸ The IRP adopts the RBS which proposes "a nuclear fleet of 9,6 GW; 6,3 GW of coal;

¹⁰³⁰ See, the President of the Republic of South Africa Mr Zuma in his Annual State Address of 2012.

¹⁰³¹ *Ibid.*

¹⁰³² The 1998 White Paper on Energy policy at 3.

¹⁰³³ *Ibid.*

¹⁰³⁴ *Ibid* at 12.

¹⁰³⁵ Department of Energy *Strategic Plan 2011/12 – 2015/16* at 5.

¹⁰³⁶ Maclachlan A "South Africa targets launching Gen III reactor tender in 2012" Vol 52 no, 38 22 (September 2011) www.platts.com. See, also <http://www.necsa.co.za/Article/6cb631b9-7f97-4d04-97ab-7ecd14398e/6/South-africa-targets-launching-gen-iii-reactor-tender-in---september-.aspx> (accessed 17 February 2012).

¹⁰³⁷ See, the preamble of the National Energy Act.

¹⁰³⁸ IRP at 9.

11,4 GW of renewables; and 11,0 GW of other generation sources”¹⁰³⁹ in a manner intended to balance the government objectives including:

- “a) Reducing carbon emissions;
- b) New technology uncertainties such as costs, operability, lead time to build etc;
- c) Water usage;
- d) Localisation and job creation;
- e) Southern African regional development and integration; and
- f) Security of supply.”¹⁰⁴⁰

This chapter analyses the actual role of nuclear energy in the context of the energy landscape. The chapter attempts to show that access to affordable electricity is a governmental obligation which requires administrative planning. Access to affordable electricity has been litigated in South African courts with reference to legal regimes including international and constitutional law, human rights and statutory norms. Access to affordable electricity is an evolving principle which is interlinked with the rights to adequate housing, living standards and human rights generally. Entirely consistent with this interpretation and in terms of section 6(1) of the National Energy Act, the government is required to “develop and, on an annual basis, review and publish the Integrated Energy Plan in the *Gazette*.”¹⁰⁴¹ The IRP intends to achieve among other things the “universal accessibility and free basic electricity.”¹⁰⁴² This requires the “optimal use of indigenous and regional energy resources”¹⁰⁴³ after defining the “viable energy supply options,”¹⁰⁴⁴ which takes into account “environmental, health, safety and socio-economic impacts;¹⁰⁴⁵ and developmental requirements of the Southern African region.”¹⁰⁴⁶

¹⁰³⁹ IRP at 9.

¹⁰⁴⁰ *Ibid.*

¹⁰⁴¹ Section 6(1) of the National Energy Act.

¹⁰⁴² Section 6(2)(d) of the National Energy Act.

¹⁰⁴³ Section 6(4)(b) of the National Energy Act.

¹⁰⁴⁴ Section 6(4)(e) of the National Energy Act.

¹⁰⁴⁵ Section 6(4)(f) of the National Energy Act.

¹⁰⁴⁶ Section 6(6)(b) of the National Energy Act.

The findings of this chapter are predicated by the IRP which proposes a 9.6 GW increase in nuclear energy capacity to be implemented by 2030. The nuclear energy supply option is intended to:

- Contribute to the universal accessibility and free basic electricity for South Africans.
- Suppress adverse environmental factors.
- Use indigenous and regional resources optimally.
- Promote socio-economic provisions.
- Enhance regional development.

This chapter explores energy components and their impact on human life in general and South Africans in particular. Legal frameworks governing both the positive and negative impacts of energy on the quality of the life inevitably must strike a balance between the requirements for the development of the energy supply infrastructure and the environmental problems stemming from such developments.

This chapter attempts to establish that nuclear energy option for South Africa does not contradict and may enhance the constitutional principles pertaining to sustainable development and socio-economic provisions. Moreover, the legal checks and balances pertaining to electricity supply infrastructure may compel the government to prefer a certain energy component over another.

4.2 ENERGY

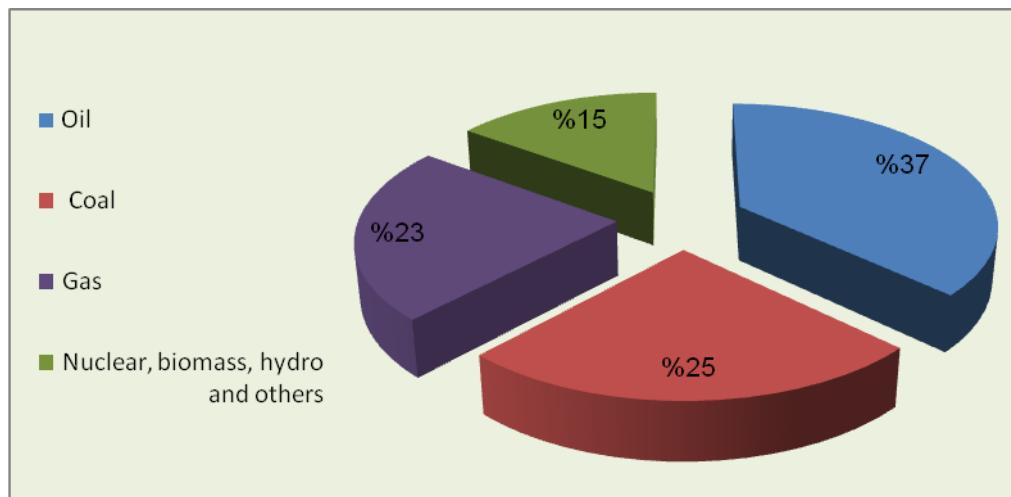
Traditionally, electricity tends to be produced and distributed by state monopolies which focused on the security and generalisation of supply to respond to the demands of the modern economic sectors, such as industry, transport, and urban infrastructure.¹⁰⁴⁷ Modern economies are energy driven, necessitating institutional, regulatory, and technological reforms. Privatisation of electricity generation became a new trend since the 1970ies, fostering the role of the markets in developing industries. Leading companies worldwide¹⁰⁴⁸

¹⁰⁴⁷ Tully S “The Contribution of Human Rights to Universal Energy Access” (518-548) Vol 4, issue 3 (Spring 2006) *Northwestern Journal of International Human Rights* at 518.

¹⁰⁴⁸ Such as Ansaldo, Westinghouse, Areva, Franco Tosi Meccanica, etc.

have embarked on developing methods of electricity generation, which can be categorised according to the source of energy encompassing burning fossil fuels, renewables, and exploding fissionable materials.

Figure IV- 1 Global energy supply infrastructure 2008¹⁰⁴⁹



The global energy trends have shown that fossil fuels have fundamentally contributed to energy supply and they will continue to be the major supplier until 2040.¹⁰⁵⁰ Figure 4.1 illustrates that, the Global energy supply infrastructure of 2008 was as follows:

- 37% of energy supply came from oil,
- 25% from coal,
- 23% from gas, and
- Nuclear, biomass, hydro, and others contributed the remaining 15%.

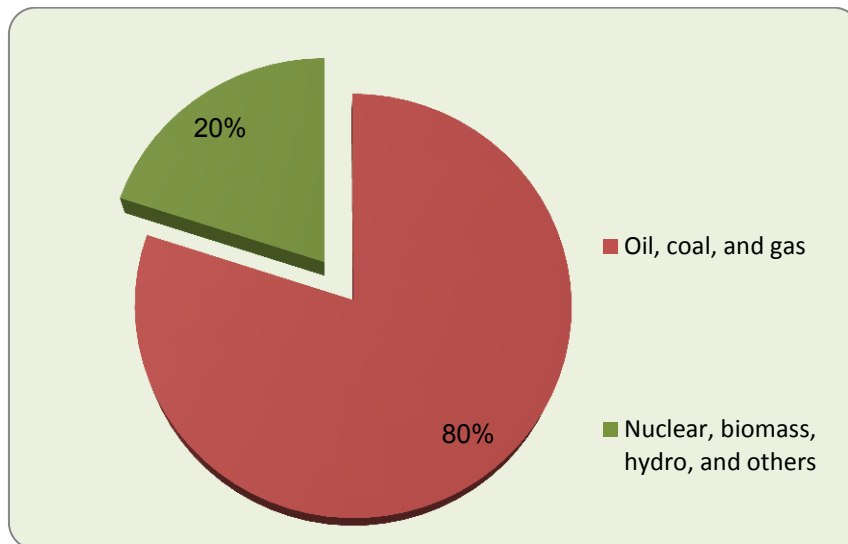
Despite the introduction of nuclear energy and renewable energy to modern energy systems, the global energy consumption in 2008 showed that coal, oil, and natural gas

¹⁰⁴⁹ Figure 4.1; Global energy supply infrastructure 2008. See, World Energy Crises <http://planetforlife.com/> (accessed 7 November 2012). Referring to 2008 statistics is intended to show energy trends.

¹⁰⁵⁰ Exxonmobil *The Outlook for Energy: A View to 2040* at 3.

contributed 85% of the world's energy, where nuclear, biomass, hydro and other renewables supplied only 15%.¹⁰⁵¹

Figure VI- 2 Global energy supply in 2040¹⁰⁵²



By 2035 the global energy demand will increase by 53%.¹⁰⁵³ Nonetheless, the change in the global energy supply infrastructure in 2040 will be insignificant in terms of the introduction of nuclear energy. Figure 4.2 reflects the energy outlook of 2012 which estimates that fossil fuels “continue to be the most widely used fuels, and have the scale needed to meet global demand, making up about 80 percent of total energy consumption in 2040.”¹⁰⁵⁴

Figure 4.3¹⁰⁵⁵ below shows that, the world electricity generation was 6 115 terawatt hours (TWh)¹⁰⁵⁶ in 1973 and it increased to 21 431 TWh in 2010. In 1973 coal contributed 38.30%,

¹⁰⁵¹ See, “World energy crises” <http://planetforlife.com/> (accessed 7 November 2012).

¹⁰⁵² The world's energy supply in 2040. See, *The Outlook for Energy: A View to 2040* (2012). https://www.exxonmobil.com/Corporate/files/news_pub_eo.pdf (accessed 7 November 2012).

¹⁰⁵³ Bloomberg News “Led by Demand in China, energy use is projected to rise 53% by 2035” Published on 19 September 2011 http://www.nytimes.com/2011/09/20/business/energy-environment/energy-demand-is-expected-to-rise-53-by-2035.html?_r=1 (accessed 20 February 2012).

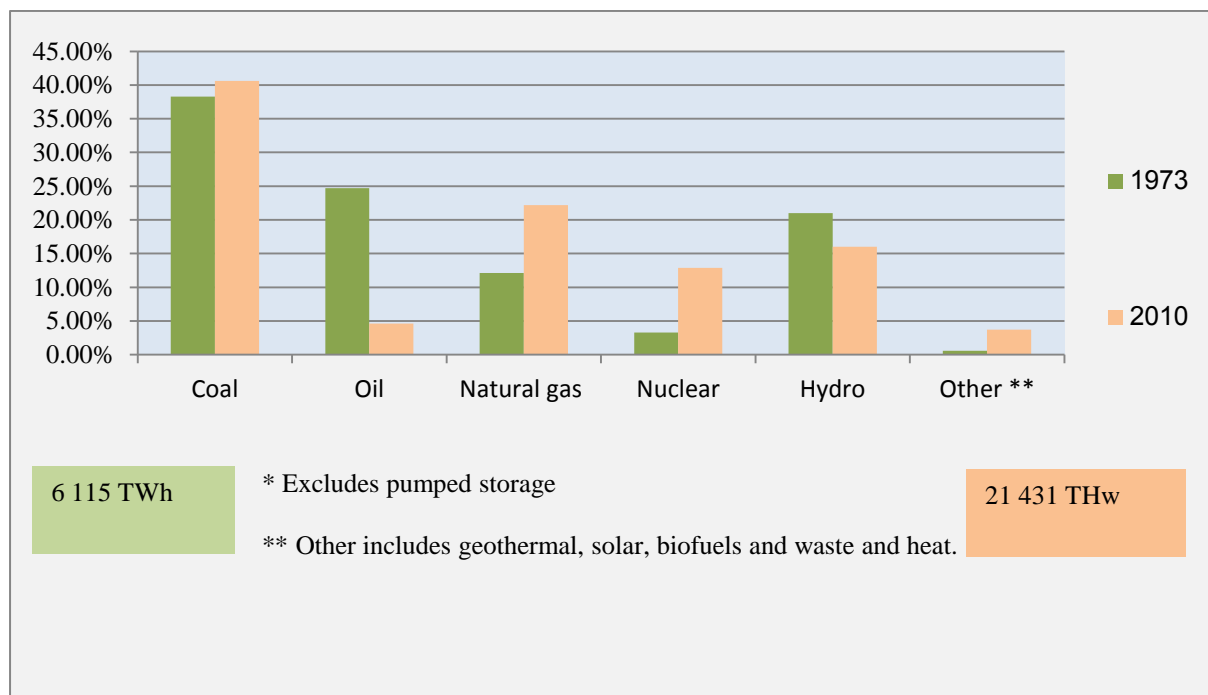
¹⁰⁵⁴ Exxonmobil *The Outlook for Energy: A View to 2040* (2013) at 3.

¹⁰⁵⁵ IEA *Key World Energy Statistics* (2012) at 24 <http://www.iea.org/publications/freepublications/publication/kwes.pdf> (Accessed 7 November 2012).

¹⁰⁵⁶ Hereafter referred to as TWh.

oil 24.7%, gas 12.1, nuclear 3.3%, hydro 21%, and other 0.6%. In 2010 the contribution of coal, gas, nuclear, and other grew successively to 40.6%, 22.2%, 12.9% and 3.7, where in 2010 the contribution of oil and hydro decreased down to 5% and 3.10% respectively. Figure 4.3 shows that the contribution of nuclear energy has increased from 3.3% in 1973 to 12.9% in 2010. Figure 4.3 shows that the development in nuclear energy field is small and forms only 12.9% of the world’s electricity supply which is concentrated in the developed world. The large percentage of coal continues to pose environmental adverse impacts by exacerbating concerns relating to GHGs emissions, climate change and the depletion of the ozone layer.

Figure VI-3: 1973 and 2010 Global fuel shares of electricity generation*¹⁰⁵⁷



Generally, the electricity generation system requires three categories of power plants namely, base-load power plants, mid-merit power plants, and peak power plants:

- Base-load power plants are intended to meet the continuous and predictable demand throughout the year. Therefore the plant should be “robust, durable,

¹⁰⁵⁷ 1973 and 2010 Global fuel shares of electricity generation. See, IEA Agency Key World Energy Statistics (2012) at 24 <http://www.iea.org/publications/freepublications/publication/kwes.pdf> (accessed 7 November 2012).

efficient, fairly cheap, and “capable of operating for a very large fraction of the year for three or four decades.”¹⁰⁵⁸ Practice has shown that such load can only be met by “modern nuclear or fossil fuelled stations.”¹⁰⁵⁹ In South Africa base-load power plants are mainly coal-fired power plants, besides the two reactors at Koeberg and one other oil-fired power plant that has been converted to a gas-fired power plant.

- Mid-merit power stations are required to meet predictable variations in the demand “during the day or the week-between night and day, and between weekends and each day.”¹⁰⁶⁰ Old base-load power plants can be re-commissioned to meet such demand.
- Peak-load power plants are intended to meet surge demand which occurs e.g. “when, in millions of households, electric kettle is switched on at the end of popular television programme.”¹⁰⁶¹ Such demand requires power plants that are able to produce full power promptly. These power plants are ideally gas turbine generators and hydro-electric power plants including pump storage.

Although coal-fired power plants pose serious adverse impacts to the environment, the electricity generation system cannot do without them. The deployment of coal-fired power plants increased in 2010 and will increase further by 2035. However, there is a global responsibility to transform national energy systems in order to maintain sustainable development because the current global electricity infrastructure has a major negative impact on the environment. Profiling the current global electricity infrastructure indicates a unique opportunity to reorganise the electricity supply infrastructure. This can be done by restructuring the electricity infrastructure for each country worldwide according to their income category which can be categorised in three groups of countries:

- Low-income countries which need to build extra energy supply infrastructure in order to serve the several billions of people who don’t have access to energy.¹⁰⁶²

¹⁰⁵⁸ Brookes *The Economics of Nuclear Energy* (1984) at 1-2.

¹⁰⁵⁹ *Ibid.*

¹⁰⁶⁰ *Ibid* at 2.

¹⁰⁶¹ *Ibid.*

¹⁰⁶² The Agecc at 8.

- Middle-income countries which need to deal with energy system development by deploying energy efficiency techniques in order to attain low-GHG emissions technologies.¹⁰⁶³
- High-income countries, whose energy supply infrastructure from the 1960s-1970s is reaching the end of its economic life, have the opportunity to set up new energy efficiency targets and to invest in “lower-carbon generation capacity.”¹⁰⁶⁴

The above categorisation can inform South Africa’s energy policy expansion. South Africa needs to build extra energy supply infrastructure in order to continue its electrification programme and economic growth similar to low-income countries. Moreover, South Africa has the opportunity to deploy low-GHGs emissions technologies, minimise carbon generation capacity, and set up efficiency targets similar to middle-income and high-income countries.

South Africa’s energy frameworks have been influenced by post-apartheid-resaped normative rules which provide for energy policy and energy governance. The South African energy policy must consider many factors including socio-economic, environment, international relations, post-oil-crises energy policies, regional energy policies, global financial market, energy prices volatility, and international political uncertainties. These are compelling factors in shaping South Africa’s energy policy which is predicated by achieving energy security¹⁰⁶⁵ in order provide electricity for all.

The Reconstruction and Development Programme (RDP)¹⁰⁶⁶ which is “an integrated, coherent socio-economic policy framework” intended to mobilise the people and the resources of the country “toward the final eradication of apartheid and the building of a democratic, non-racial and non-sexist future”¹⁰⁶⁷ stipulates among other things access electricity for all. Paragraph 2.7.7 of the RDP reads as follows:

¹⁰⁶³ The Agecc at 8.

¹⁰⁶⁴ *Ibid.*

¹⁰⁶⁵ The 1998 White Paper on Energy policy at 8.

¹⁰⁶⁶ The Reconstruction and Development Programme: A Policy Framework (1994). Hereafter referred to as the RDP.

¹⁰⁶⁷ Para 1.1.1 of the RDP.

“An accelerated and sustainable electrification programme must provide access to electricity for an additional 2.5 million households by the year 2000, thereby increasing the level of access to electricity to about 72 per cent of all households (double the present number). Both grid and non-grid power sources (such as solar cells and generators) must be employed. All schools and clinics must be electrified as soon as possible. Communities must be involved in the planning and execution of this programme. Micro, small and medium-sized enterprises must be given support and shown preference in the tendering process.”

The post-apartheid energy policy is contextualised within the reconstruction project intended for the welfare of the society purporting five objectives including “increasing access to affordable energy services,” the maintenance of “security of energy supply through diversity,” “improving energy governance,” “stimulating economic development,” and “managing energy-related environmental and health impacts.”¹⁰⁶⁸

South Africa’s energy governance has developed a vision for the reconfiguration of access to affordable energy services within the context of realising international human rights, achieving the MDGs, socio-economic rights, sustainable development, and protecting the environment. This vision can be summarised by the requirements of giving access to affordable electricity as a basic human right, whilst protecting the environment, and achieving the development of the electricity supply infrastructure within the notion of sustainable development.

The South African government has set out electrification targets as an attempt to address the inherited energy imbalances and seeking to supply affordable electricity to all households.¹⁰⁶⁹ Electricity provision has been unequally supplied to South African people rendering many sectors of the society historically disadvantaged. The 1994 South African election marked a new dawn of electrification policy purporting the sentiment of transformation and rectifying the injustices. In 1994, 30% of all South Africans had access to

¹⁰⁶⁸ The 1998 White Paper on Energy policy at 8.

¹⁰⁶⁹ DME, General Notice 1693 of 2003, Electricity Basic Services Support Tariff (Free Basic Electricity) Policy for the Republic of South Africa 1 April 2003 Government Gazette Vol. 457 Pretoria 4 July 2003 No. 25088.

electricity. That now stands at 70%, with an addition of 149 901” connections in 2010.¹⁰⁷⁰ South Africa’s achievement in electrification is remarkable hence “88% urban and 55% rural populations gained access to electricity services” by 2009.¹⁰⁷¹

The concept of electrification has taken a large space in official policy documents such as the 1998 White Paper on Energy Policy, Integrated National Electrification Programme (INEP),¹⁰⁷² Free Basic Electricity¹⁰⁷³ and Free Basic Alternative Energy.¹⁰⁷⁴ Eskom has been implementing electrification policies and has electrified households as follows: 152 125 in 2007, 168 538 in 2008, 112 965 in 2009, 149 901 in 2010, and 149 914 in 2011.¹⁰⁷⁵ Electrification in South Africa has been institutionalised by the INEP “under the auspices of the” then DME and “intended to address the backlogs in the household electrification in South Africa.”¹⁰⁷⁶ The INEP is proposed as a mechanism responsible for “rolling-out electrification connections” in order to achieve 100% electrification.¹⁰⁷⁷ On 7 March 2011 the current DoE briefed the Parliamentarian Committee “on the progress of the” INEP “whose new drive was to increase access to electricity from 81% to 92% by 2014.”¹⁰⁷⁸ It is

¹⁰⁷⁰ Eskom Integrated Report 2010) at 23.

¹⁰⁷¹ Niez A *Comparative study on rural electrification policies in emerging economies* (2010) at 81.

¹⁰⁷² This includes policy guidelines relating to the Electrification of unproclaimed areas, Schools and Clinics, of Farm Dweller Houses, and Suite of Supply for the Integrated National Electrification Programme. Here after referred to as the INEP. See, DoE Acts and legislations http://www.energy.gov.za/files/policies/p_electricity.html (accessed 16 June 2013).

¹⁰⁷³ Free Basic Electricity. Notice 1693 of 2003. No. 25088 Government Gazette (4 July 2003).

¹⁰⁷⁴ Free Basic Alternative Energy. Notice 391 of 2007. No. 29760 Government Gazette (2 April 2007).

¹⁰⁷⁵ Eskom Holdings Limited Integrated Report of 2011 at 14.

¹⁰⁷⁶ See (ii) he Electricity Basic Services Support Tariff (Free Basic Electricity) Policy for the Republic of South Africa

¹⁰⁷⁷ Section 4(1)(vii) of the Electricity Basic Services Support Tariff (Free Basic Electricity) Policy for the Republic of South Africa (4 July 2003) No. 25088 Government Gazette

¹⁰⁷⁸ See, Integrated National Electrification Programme: briefing by Department of Energy on 7 March 2011. <http://www.pmg.org.za/report/20110308-department-energy-intergrated-national-electrification-programme> (accessed 16 June 2013).

clear that the INEP pursues and gives effect to the institution of universal access to electricity.¹⁰⁷⁹

The policy of electrification is synonymous to the principle of access to affordable electricity which is argued as a constitutional right linking access to electricity with the right to adequate housing. The findings in *Joseph and Others v City of Johannesburg and Others*¹⁰⁸⁰ case imply that the constitutional right to housing and amenities such as water, health care, and clean air extend to include electricity.¹⁰⁸¹ In *Lindiwe Mazibuko and others v City of Johannesburg*¹⁰⁸² the Constitutional Court required the City of Johannesburg to “...continually reconsidering its policy and investigating ways to ensure that the poorest inhabitants of the City gained access not only to water, but also to other services, such as electricity, sanitation and refuse removal,”¹⁰⁸³ Yacoob J utilised the findings of *Mkontwana v Nelson Mandela Metropolitan Municipality and Another, Bissett and Others v Buffalo City Municipality and Others, Transfer Rights Action Campaign and Others v MEC, Local Government and Housing, Gauteng, and Others (KwaZulu-Natal Law Society and Msunduzi Municipality and Amici Curiae)* to arrive at the conclusion that supplying electricity by municipalities to their residents is part of their public duty, because electricity in the wording of Skweyiya J “is one of the most common and important basic municipal services and has become virtually indispensable...”¹⁰⁸⁴

¹⁰⁷⁹ The term “universal access” was mentioned during the briefing on the INEP in a document of 3 pages. See, *Ibid.* “INEP: briefing...”

¹⁰⁸⁰ (CCT 43/09) [2009] ZACC 30; 2010 (3) BCLR 212 (CC); 2010 (4) SA 55 (CC) (9 October 2009) at para 32. Hereafter referred to as the *Joseph*.

¹⁰⁸¹ *Joseph and Others v City of Johannesburg and Others* at para 32.

¹⁰⁸² (CCT 39/09) [2009] ZACC 28; 2010 (3) BCLR 239 (CC); 2010 (4) SA 1 (CC) (8 October 2009). Hereafter referred to as the *Mazibuko*.

¹⁰⁸³ The *Mazibuko* at para 94.

¹⁰⁸⁴ The *Joseph* at para 34.

4.2.1 South Africa's Energy Supply Infrastructure

On the one hand, “energy is the life-blood of development”¹⁰⁸⁵ which is a constitutional requirement undertaken by the national, provincial, and local governments. These executive authorities are required to be “development-oriented” in realising the “democratic values and principles enshrined in the Constitution.”¹⁰⁸⁶ On the other hand, energy is the main polluter which has adverse impact on the environment which is constitutionally protected by the national, provincial, and local governments.

South Africa's new dispensation has determined the architecture of norms governing energy supply. “With the end of apartheid South Africa experienced fundamental shifts resulting in significant changes in the energy policy context.”¹⁰⁸⁷ Energy supply has been re-contextualised by the post-apartheid governance process which is marked by the re-examination, reforming and redrafting of “nearly every aspect of social and economic policy in South Africa.”¹⁰⁸⁸ The country is required to develop adequate energy supply infrastructure meeting the demand and to “manage energy-related environmental impacts.”¹⁰⁸⁹ The development of energy norms in South Africa maintains the values of the Bill of Rights propagating egalitarian¹⁰⁹⁰ principles towards electricity and respect to environment.

The national, provincial, and municipal authorities have been given the mandate to promote socio-economic development while sustaining a safe and healthy environment.¹⁰⁹¹

¹⁰⁸⁵ See, the forward of P M Maduna; the then Deputy Minister of DME in the 1998 White Paper on Energy policy at 4.

¹⁰⁸⁶ Section 195(1)(c) of the Constitution.

¹⁰⁸⁷ The 1998 White Paper on Energy policy at 5.

¹⁰⁸⁸ *Ibid* at 6.

¹⁰⁸⁹ Winkler H *Energy policies for sustainable development in South Africa's residential and electricity sectors: Implications for mitigating climate change* (June 2006) Thesis presented for the Degree of Doctor of Philosophy in the Energy Research Centre, University Of Cape Town at 1.

¹⁰⁹⁰ See 6(2)(e) of the National Energy Act which requires the Integrated Energy Plan to maintain “social equity” in dealing with issues relating to energy.

¹⁰⁹¹ See, sections 146, 152, 153 of the Constitution.

Therefore, promoting universal access to affordable and reliable electricity¹⁰⁹² requires the development of adequate electricity supply infrastructure and the maintenance of the terms which refer to a safe and healthy environment within the energy projects.¹⁰⁹³

The guidelines in developing electricity supply infrastructure are defined by the balance between demand¹⁰⁹⁴ and supply utilising indigenous and regional resources¹⁰⁹⁵ within the sustainable development fundamentals.¹⁰⁹⁶ That is to say, future development plans which are intended to “achieve the efficient, effective, sustainable and orderly development and operation of electricity supply infrastructure in South Africa,”¹⁰⁹⁷ are required to take into consideration many defining factors which involve in energy planning. These factors are listed in section 6 of the National Energy Act as follows:

“(2) The Integrated Energy Plan must deal with issues relating to the supply, transformation, transport, storage of and demand for energy in a way that accounts for—

- (a) security of supply;
- (b) economically available energy resources;
- (c) affordability;
- (d) universal accessibility and free basic electricity;
- (e) social equity;
- (f) employment;
- (g) the environment;
- (h) international commitments;
- (i) consumer protection; and
- (j) contribution of energy supply to socio-economic development.

¹⁰⁹² Section 6(4)(e) of the National Energy Act.

¹⁰⁹³ Section 6(2)(b) of the National Energy Act.

¹⁰⁹⁴ Section 6(4)(c) of the National Energy Act.

¹⁰⁹⁵ Section 6(4)(b) of the National Energy Act.

¹⁰⁹⁶ Section 6(4)(c) of the National Energy Act.

¹⁰⁹⁷ Section 2(a) of the Electricity Regulation Act.

(3) The Integrated Energy Plan must—

- (a) security of supply; take account of plans relating to transport, electricity, petroleum, water, trade, macro-economy energy infrastructure development, housing, air quality management, greenhouse gas mitigation within the energy sector and integrated development plans of local and provincial authorities;
- (b) inform and be informed by plans from all supply, production and demand sectors whose plans impact on or are impacted by the Integrated Energy Plan; and
- (c) be based on the results of the energy analysis envisaged in sections 3(4)(a) and 3(5).

(4) The development of the Integrated Energy Plan must take into account—

- (a) sustainable development;
- (b) optimal use of indigenous and regional energy resources;
- (c) balance between supply and demand;
- (d) economic viability;
- (e) environmental, health, safety and socio-economic impacts; and
- (f) developmental requirements of the Southern African region.

(5) The Integrated Energy Plan must have a planning horizon of no less than 20 years.

(6) The Integrated Energy Plan must—

- (a) serve as a guide for energy infrastructure investments;
- (b) take into account all viable energy supply options; and
- (c) guide the selection of the appropriate technology to meet energy demand.

(7) Before finalising the Integrated Energy Plan, the Minister must—

- (a) invite public comments; and

(b) duly consider such comments.”¹⁰⁹⁸

The factors listed in section 6 of the National Energy Act influence the structure of electricity supply infrastructure. Consequently, the legal construct that governs the electricity supply infrastructure has developed principles which control energy supply options. These principles focus on the proper selection of the appropriate technologies and available energy resources in order to realise the universal goal of access to electricity, diversify energy resources, achieve affordability requirements, honour environmental commitments, and to be in line with sustainable development guidelines. These principles function as a dynamic balance informing the selection process required to allocate energy components such as fossil, renewables, and nuclear energy.

4.2.1.1 Fossil Fuel Energy

Fossil fuels have been known since the discovery of fire, which marked the first step of mankind “on the ladder of civilization.”¹⁰⁹⁹ Fire can be defined as to include all the rapid oxidation of a material in the exothermic chemical reaction of burning, which discharges heat, light, etc.¹¹⁰⁰ Scientifically, fire is a chemical reaction expressed as follows: $C + O_2 \rightarrow CO_2$.¹¹⁰¹ That is to say, burning the carbon, which is the organic matter in the fossil fuels, is the process of combining carbon and oxygen.

The combustion process of fossil fuels converting the energy stored in the organic matter to heat energy can be thermo-mechanically deployed to produce electricity. Thermal-power plants produce electricity. They consist of three major components: a boiler, a turbine, and a generator. These are supported by auxiliary devices such as feed water pumps, condenser, transformer, etc.

¹⁰⁹⁸ Section 6(2)(a) of the National Energy Act.

¹⁰⁹⁹ Rickover H "Energy resources and our future" (2 December 2006) *Energy Bulletin*. <http://www.energybulletin.net/node/23151> (accessed 21 July 2012).

¹¹⁰⁰ Quintiere J *Principles of Fire Behaviour* (1998) at 2.

¹¹⁰¹ Carbon dioxide. Hereafter referred to as CO₂.

The combustion process in the furnace of a power station falls within the laws of conservation of energy, which do not allow the creation or destruction of energy, but allow it to be transformed from one state to another.¹¹⁰² That is to say, according to the laws of thermodynamics¹¹⁰³ a power plant which operates on fossil fuels including coal, oil, gas, etc, converts the heat resulting from burning them into a motion required to spin the turbine which is coupled with rotating armature in the generator.¹¹⁰⁴ Generally, a coal-fired power plant and an oil-fired power plant are similar to nuclear power plants as they are steam driven and base-load power plants.¹¹⁰⁵ The only difference is that the latter gains heat from exploding fissionable materials which requires a reactor while the formers gain heat from burning coal or oil or gas which require furnaces.

4.2.1.1.1 Coal

Coal is a fossil fuel and fundamentally composed from carbon, hydrogen and oxygen.¹¹⁰⁶ The energy which has been stored during the coalification¹¹⁰⁷ of the organic matter has become vital in industrial activities such as electricity generation, steel, and cement production, etc.¹¹⁰⁸ Converting coal into electricity in coal-fired power stations is a process of generating thermo energy and transforming it into mechanical energy at the steam turbine. The process starts by preparing the coal through crushing and feeding it into the pulverisers,¹¹⁰⁹ where the coal is ground and mixed with combustion air and blown into the boiler furnace.¹¹¹⁰ The boiler has miles of tubes filled with high quality water. Once inside the

¹¹⁰² Nunoo K *The trinity of lights* (2007) at 62.

¹¹⁰³ King J *World Transformation: A Guide to Personal Growth and Consciousness* (2007) at 133.

¹¹⁰⁴ Crowell B *Conservation Laws* (2003) at 136-141.

¹¹⁰⁵ "Base-load plant refers to energy plant or power stations that are able to produce energy at a constant, or near constant, rate, i.e. power stations with high capacity factors." See, IRP at 5.

¹¹⁰⁶ See, World Coal Association <http://www.worldcoal.org/coal/> (accessed 21 March 2012).

¹¹⁰⁷ See, *ibid* "What is coal" <http://www.worldcoal.org/coal/what-is-coal/> (accessed 21 March 2012).

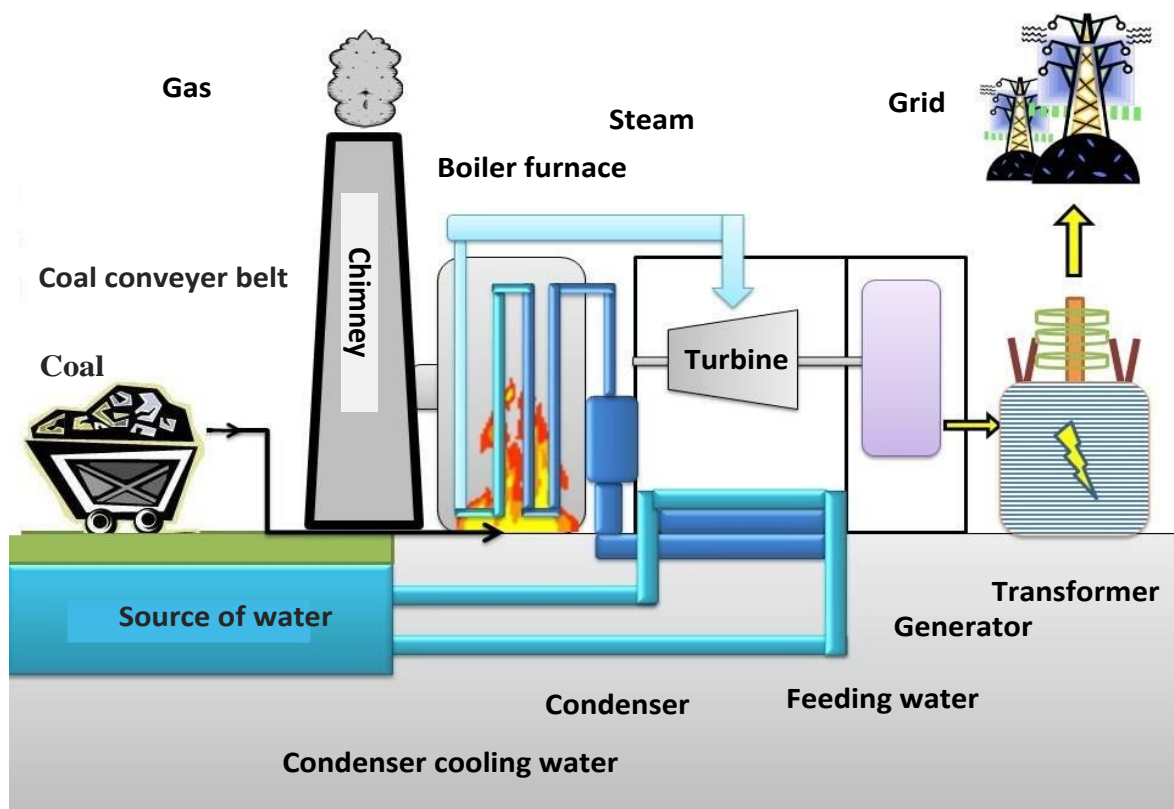
¹¹⁰⁸ <http://www.worldcoal.org/coal/uses-of-coal/> (accessed 21 March 2012).

¹¹⁰⁹ A power plant which is equipped with pulverisers burns the coal more efficiently than those using cyclone burners, which burn larger pieces of coal. South Africa fundamentally deploys pulverized coal-fired boilers. See, IRP at 23.

¹¹¹⁰ Westwick D *Power Plants and Power Systems Control* (2007) 1st ed at 177- 179.

boiler the pulverised coal powder ignites releasing heat energy which converts the water running into the down-comers tubes to steam.¹¹¹¹ The temperature of the steam reaches 1000° Fahrenheit (537° Celsius) and passes through the super heaters gaining the quality and pressure required to spin the steam turbine which is connected to the shaft of the electric generator.¹¹¹²

Figure VI- 4: Coal-fired power station¹¹¹³



As figure 4.4 shows the components of a coal-fired power station include a furnace, boiler, chimney, turbine, generator, transformer, feed water pumps, and condenser. A coal-fired power plant operates by burning coal, changing water to steam, and emitting gases. These three agents of operation have adverse impact on the environment.

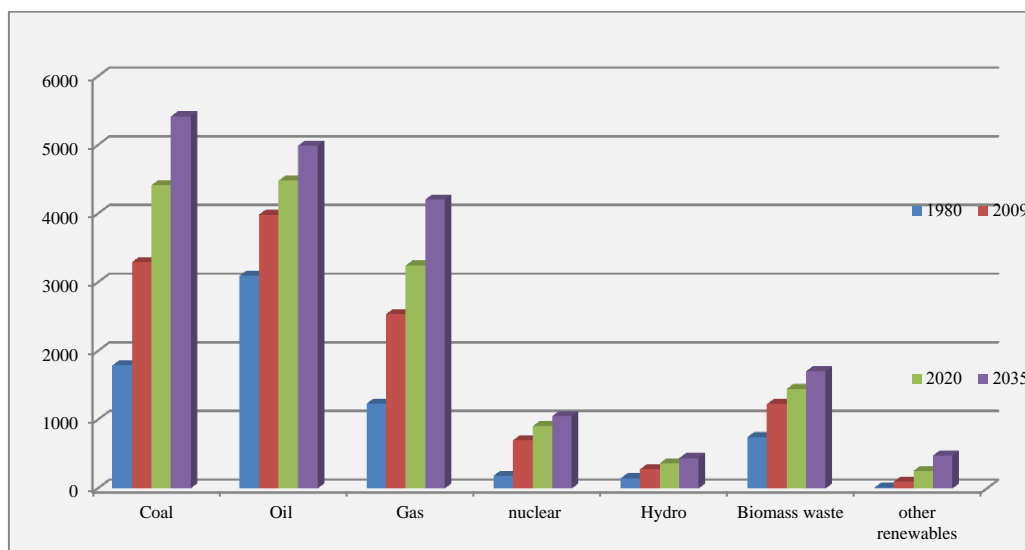
¹¹¹¹ Oka Y and Embi M “Coal-fired plant history for Malaysian projects” (197-2003) In Cen K, Chi Y, and Wang F *Challenges of Power Engineering and Environment: proceedings of the International Conference on Power Engineering* volume 1 (2007) at 197-199.

¹¹¹² Breeze P *Power Generation Technologies* (2005) at 21.

¹¹¹³ Qasaymeh KAI “Coal-fired power station.”

However, coal has maintained its role as the main source for energy generation until the discovery of oil and gas. Figure 4.5 shows that, in 2006 coal accounted for 25% of the total world energy demand¹¹¹⁴ and it seems “that coal use will increase under any foreseeable scenario because it is cheap and abundant.”¹¹¹⁵ According to figure 4.5, the world energy demand of coal according to the Current Policies Scenario¹¹¹⁶ was 1792(Mteo)¹¹¹⁷ in 1980 and will rise up to 5419(Mteo) in 2035.¹¹¹⁸

Figure VI- 5: World energy demand by fuel according to Current Policies Scenario (Mtoe)¹¹¹⁹



¹¹¹⁴ IEA *Key World Energy Statistics* (2006).

¹¹¹⁵ *MIT Study on the Future of Coal: Options for a Carbon-Constrained World* (2007) MIT Study on the Future of Coal: Options for a Carbon-Constrained World (2007) Massachusetts Institute of Technology at ix.

¹¹¹⁶ The World energy outlook of 2011 estimates the projections of energy demand and supply according to three scenarios namely New Policies Scenario, Current Policies Scenario, Scenario 450. According to the Current Policies Scenario the world primary demand is likely to increase up to 40% between 2009 and 2035, where “the coal demand grows the most in absolute terms and overtakes oil to capture the largest single share of the energy mix before 2035.” According to the New Policies Scenario the coal and oil demand declines leaving the growth of the natural gas, nuclear power and renewables demand for the 450 Scenario. *World Energy Outlook* (2011) at 68- 74.

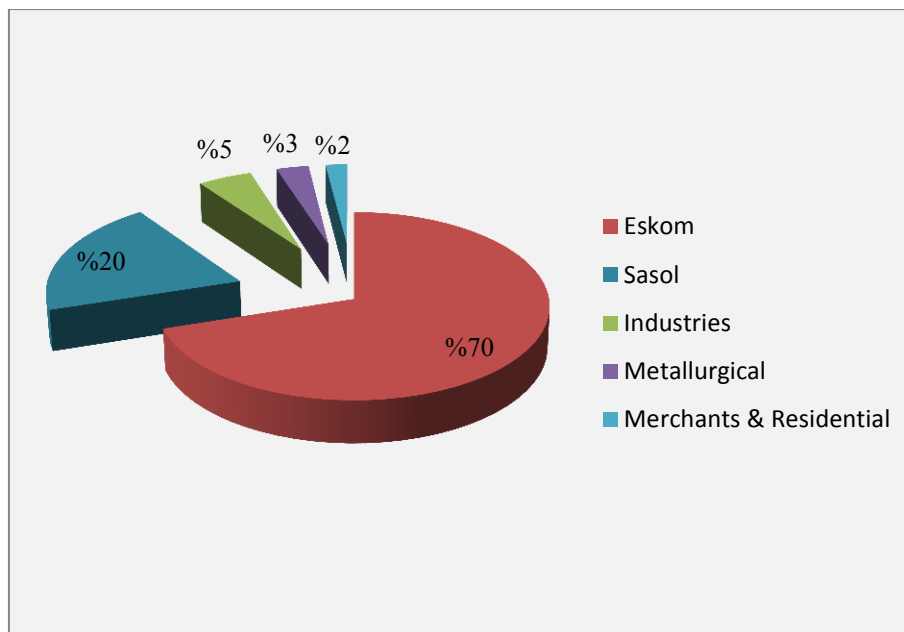
¹¹¹⁷ (Mtoe) million tons of oil equivalent.

¹¹¹⁸ *World Energy Outlook* (2011) at 71.

¹¹¹⁹ World energy demand by fuel according to Current Policies Scenario (Mtoe). See, *World Energy Outlook* (2011) at 71.

South Africa’s coal production amounts to “224 million tons of marketable coal annually,”¹¹²⁰ 25% of which is exported internationally and 75% “feeds various local industries, with 53% used for electricity generation.”¹¹²¹ Figure 4.6 shows that Eskom, which is the main local client, consumes 70% of domestic coal for electricity generation.¹¹²² Sasol converts 20% of coal into liquid fuel. Industries use 5%. 3% is used for metallurgical purposes, and 2% is used by merchants and for residential.¹¹²³

Figure VI- 6: Coal use in South Africa¹¹²⁴



Burning coal in order to generate electricity is inevitable in South Africa because it is the most abundant, readily available and cheapest.¹¹²⁵ Figure 4.7 shows that, in 2006 the total

¹¹²⁰ Coal power <http://www.eskom.co.za/c/article/200/coal-power/> (Accessed 20 March 2011).

¹¹²¹ *Ibid.*

¹¹²² Eberhard “The future of South African coal: market, investment, and policy challenges” (2011) at 8.

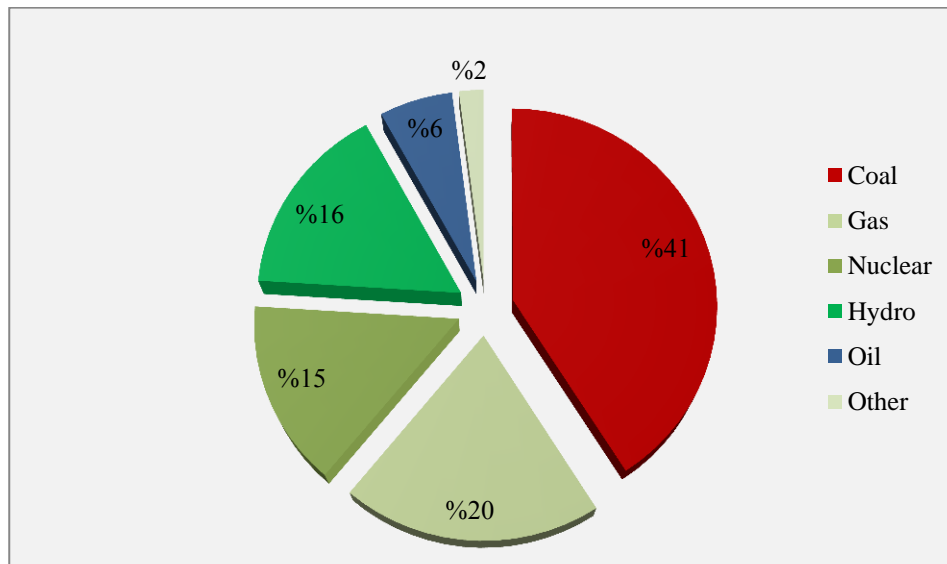
¹¹²³ *Ibid.*

¹¹²⁴ Coal use in South Africa. See, Coal power <http://www.eskom.co.za/c/article/200/coal-power/> (accessed 20 March 2011).

¹¹²⁵ The price of million British Thermal Units (Btu) of coal is \$1–2 while it is \$ 6–12 per million Btu for natural gas and oil. See, *MIT Study on the Future of Coal: Options for a Carbon-Constrained World* (2007) at 1.

world electricity generation from coal-fired capacity was 41%.¹¹²⁶ Currently, coal accounts for approximately 36% and will likely remain “at this rate until 2020.”¹¹²⁷

Figure VI- 7: 2006 world electricity generation by source¹¹²⁸



The future reliance on coal is likely to increase after Fukushima.¹¹²⁹ Moreover, cleaner coal technologies may maintain the future viability of coal in a carbon-constrained world. For example, carbon capture and sequestration, the optimisation of existing power plants, burning biomass as a fuel, and gasification technologies that turn coal into a gas and remove impurities from the coal-gas before it is combusted, may offer partial solutions for both emissions stressed environments and resource scarcity.¹¹³⁰ However, the exhaustible

¹¹²⁶ *International Energy Outlook 2010* U.S. Energy Information Administration (EIA) at 79.

¹¹²⁷ Eskom “Coal power” <http://www.eskom.co.za/c/article/200/coal-power/> (accessed 20 March 2011).

¹¹²⁸ 2006 world electricity generation by source. See, <http://www.eskom.co.za/c/article/200/coal-power/> (accessed 20 March 2011).

¹¹²⁹ See for example, Sonal Patel “Germany’s Reliance on Coal Grows” (1 October 2012) <http://www.powermag.com/coal/4986.html> (accessed 7 November 2012).

¹¹³⁰ See, Robert S Giglio “Power engineer-focus on coal: new technologies reduce environmental impacts of coal-fired plants” http://www.engineerlive.com/Power-Engineer/Focus_on_Coal/New_technologies_reduce_environmental_impacts_of_coal-fired_plants/22603/ (accessed 28 March 2012).

nature¹¹³¹ of coal, its ever increasing price, and its contribution to GHGs¹¹³² have introduced the vision of “substantially decarbonised economies”¹¹³³ intended to manage the variables of a carbon-constrained world.

Taking into consideration that South Africa’s electricity generation fundamentally relies on coal combustion, which is “the main contributor to carbon dioxide emissions,”¹¹³⁴ and that “South Africa has one of the highest levels of carbon dioxide emissions per capita in the World,”¹¹³⁵ the country must urgently promote other forms of energy. In the least, South Africa should consider global energy trends to define its own targets. Figure 4.8 compares the world’s energy infrastructure, France’s energy infrastructure, and the USA energy infrastructure. For the purpose of comparison figure 4.8 is read with figure 4.7. Figure 4.7 shows that the world electricity generation from coal accounted up to 40% in 2006, while figure 4.8 shows that South Africa’s electricity generation from coal accounts up to 85% in 2011.¹¹³⁶ In 2006 the French energy system, which is almost liberated from reliance on

¹¹³¹ “South Africa’s coal reserves are estimated at 53 billion tonnes, and with our present production rate there should be almost 200 years of coal supply left.” See, Eskom “Fact sheet: coal in South Africa” http://recruitment.eskom.co.za/content/CO_0007CoalSARev9.pdf (accessed 20 March 2011).

¹¹³² The 2003 White Paper on Renewable Energy defines GHGs as follows: “Gases primarily carbon dioxide, methane, and nitrous oxide in the earth’s lower atmosphere that trap heat, thus causing an increase in the earth’s temperature and leading towards the phenomenon of global warming.” The 2003 White Paper on Renewable Energy at 6.

¹¹³³ Zillman D, Redgwell C, Omorogbe Y, and Barrera-Hernández L *Beyond the Carbon Economy: Energy Law in Transition* (2008) at 516.

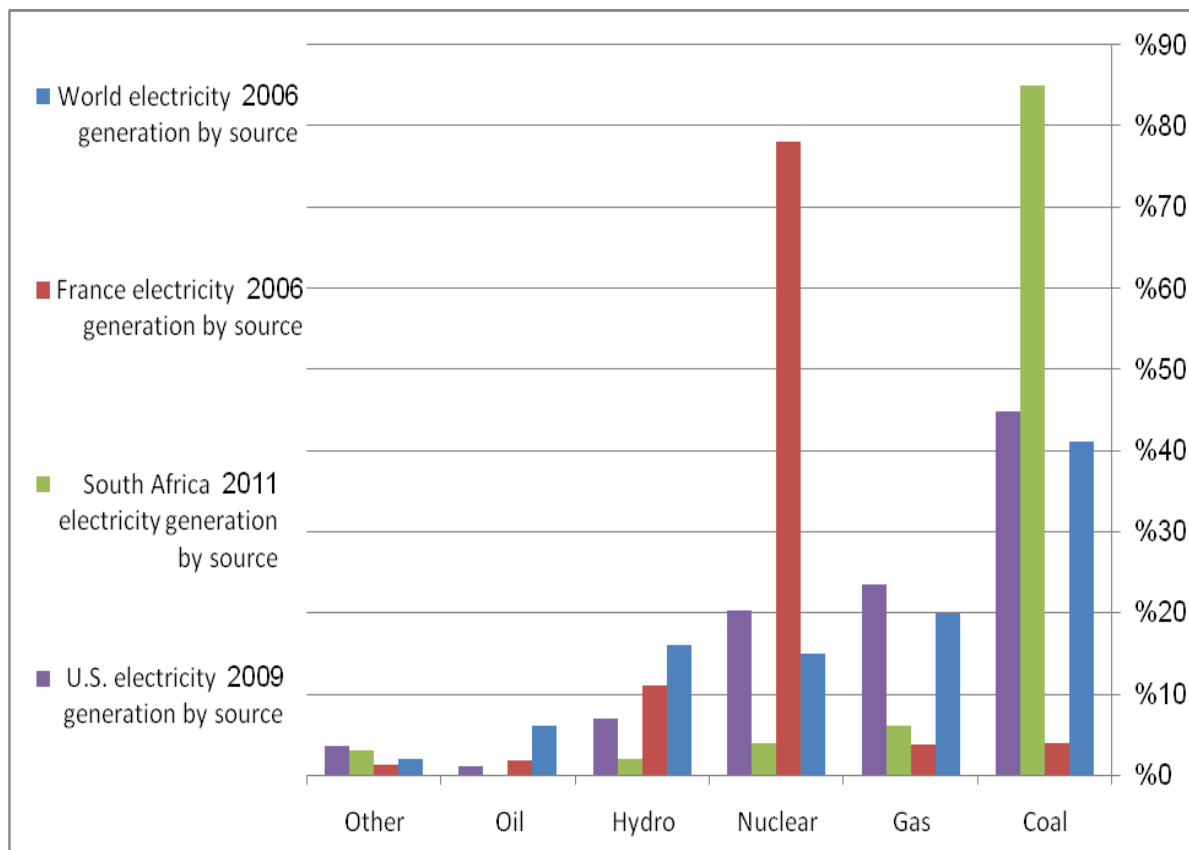
¹¹³⁴ The 2003 White Paper on Renewable Energy at 3.

¹¹³⁵ *Ibid.*

¹¹³⁶ See, Sources of electricity in the USA in 2009 http://www.eia.doe.gov/cneaf/electricity/epm/table1_1.html (accessed 20 March 2011). Data related to the USA electricity generation in 2009 see, USA Energy Department Information Administration: Electric Power Monthly <http://www.eia.gov/electricity/monthly> (accessed 20 March 2011). See also, EIA Country Analysis Brief: France <http://www.eia.gov/countries/country-data.cfm?fips=FR> (accessed 20 March 2011). South Africa’s estimations related to electricity generation by source are inconsistent. On the one hand, the Energy Department’s website publishes that “Almost 90 percent of South Africa’s electricity is generated in coal-fired power stations. Koeberg, a large nuclear station near Cape Town, provides about 5 percent of capacity. A further 5 percent is provided by hydroelectric and pumped storage schemes. See, Energy Department: Basic electricity http://www.energy.gov.za/files/electricity_frame.html (accessed 20 March 2011). On the other hand the

coal, used only 3.90% in order to generate electricity,¹¹³⁷ while, the USA electricity generation from coal-fired capacity in 2009 was 44.90%.¹¹³⁸

Figure VI- 8: Electricity by source: comparison perspective¹¹³⁹



Integrated Energy Plan for the Republic of South Africa published by DME on 19 March 2003 states that 89% is generated from coal, 5% from nuclear, 4% from pumped storage, 2% from hydro and less than 1% from gas turbine and Bagasse. Eskom states that “presently, about 77% of our country’s primary energy needs are provided by coal...which is unlikely to change significantly in the next decade, due to the relative lack of suitable alternatives to coal as an energy source.” See, “Coal power” <http://www.eskom.co.za/c/article/200/coal-power/> (accessed 20 March 2011). See also, Davidson O and Winkler HE “South Africa’s energy future: Visions, driving factors and sustainable development indicators” Report for Phase I of the Sustainable Development and Climate Change project (August 2003) Energy & Development Research Centre University of Cape Town at 4.

¹¹³⁷ Ministère de l'Ecologie, du Développement Durable, et de l'Energie <http://www.developpement-durable.gouv.fr/spip.php?page=404> (accessed 20 March 2011).

¹¹³⁸ USA EIA “Electricity” <http://www.eia.gov/electricity/monthly/> (accessed 20 March 2011).

¹¹³⁹ http://www.eia.doe.gov/cneaf/electricity/epm/table1_1.html, <http://www.eia.gov/electricity/monthly>, and <http://www.eia.gov/countries/country-data.cfm?fips=FR> (accessed 20 March 2011).

The French nuclear-based energy option has been rationalised by economic and environmental factors. For example, a nuclear Kilowatt hour (KWh)¹¹⁴⁰ costs 0.170 franc, while a coal-fired KWh costs 0.270 franc.¹¹⁴¹ However, the application of nuclear energy in France is not required to be identically applied in South Africa. This is attributed to the price of coal-fired electricity generation which is cheap for the following reasons:

- South Africa has abundant coal reserves.
- Coal-fired power stations are reliable.
- The South Africa's infrastructure to generate electricity from coal is well established.
- Burning coal is the most cost-effective and energy efficient way of generating electricity.¹¹⁴²
- Minimal cost of transportation because many of Eskom's coal power stations are built next to coal mines.¹¹⁴³

The economy of South Africa is energy driven and characterised as a “high energy intensity economy” because it basically relies “on coal for production of electricity and liquid fuels.”¹¹⁴⁴ South Africa has 24 coal-fired powers stations including Kusile Power Station in Mpumalanga which will be completed in 2014 and Medupi Power Station in Limpopo which is under construction since 2007.¹¹⁴⁵ However, 5 coal-fired power stations have been

¹¹⁴⁰ Hereafter referred to as KWh.

¹¹⁴¹ Niall L “Nuclear energy” (5-44) in Farah M translator *Energy: Its Sources and Issues* (1981) Madbuli at 43.

¹¹⁴² Eskom “Coal power” <http://www.eskom.co.za/c/article/200/coal-power/> (accessed 7 November 2012).

¹¹⁴³ *Ibid.*

¹¹⁴⁴ The 1998 White Paper on Energy policy at 14.

¹¹⁴⁵ The two power stations will generate 9600 MW. See, Eskom “Kusile Power Station” <http://www.eskom.co.za/c/article/58/kusile-power-station/> (accessed 28 March 2012); Eskom “Medupi Power Station” <http://www.eskom.co.za/c/article/57/medupi-power-station/> (accessed 28 March 2012).

decommissioned¹¹⁴⁶ and one of them was converted to a gas-power station and re-commissioned in 2007.¹¹⁴⁷

The rising electricity demand and economic growth in South Africa require Eskom to “provide additional large-scale base-load power stations” which can only be either nuclear power stations or coal-fired power stations.¹¹⁴⁸ At the same time, South Africa's indigenous energy resource base continues to be dominated by coal¹¹⁴⁹ rendering other energy sources marginal until 2035. This is reflected in the IRP which shows that the country's new build options assume the development of 750 Megawatt (MW)¹¹⁵⁰ in 2027, 2000 MW in 2028, 750 MW in 2029, and 1500 in 2030 MW from coal.¹¹⁵¹

The disadvantages of the deployment of coal in generating electricity involve:

- The waste problems which include “sulphur and nitrogen oxides, organic compounds, heavy metals, radioactive elements, GHGs, and a lot of ash.”¹¹⁵²
- GHGs emissions e.g. a 500 megawatt of coal-fired power station produces approximately 3 million tons/year of CO₂.¹¹⁵³ This means that Kusile will generate an estimated 37 million tonnes of CO₂ equivalent emissions annually, increasing the country's total contribution to climate change by an immense 10%.¹¹⁵⁴ Added to that

¹¹⁴⁶ Ingagane Power Station in KwaZulu-Natal which was in operation since 1963 generating 500 MW and was decommissioned in 1990.

¹¹⁴⁷ Athlone Power Station in Western Cape which was in operation since 1961 generating 180 MW and was decommissioned in 2003. Colenso Power Station KwaZulu-Natal which was in operation since 1926 160 and was decommissioned in 1984, Driehoek Power Station Gauteng in 1898 until 1911, and Orlando Power Station Gauteng 1942 300 Decommissioned 1998.

¹¹⁴⁸ Final scoping report for the proposed Eskom nuclear power station and associated infrastructure (July 2008) at ix.

¹¹⁴⁹ DoE “Coal resources” http://www.energy.gov.za/files/coal_frame.html (accessed 11 November 2012).

¹¹⁵⁰ Hereafter referred to as MW.

¹¹⁵¹ IRP at ix.

¹¹⁵² Eskom “Coal power” <http://www.eskom.co.za/c/article/200/coal-power/> (accessed 12 March 2012).

¹¹⁵³ *MIT study on the future of Coal: Options for A Carbon-Constrained World* (2007) at ix.

¹¹⁵⁴ “The True Cost of Coal in South Africa - Paying the price of coal addiction” <http://www.greenpeace.org/africa/Global/africa/publications/coal/TrueCostOfCoal.pdf> (accessed 12 March 2012).

are the emission of nitrogen oxides and sulphur oxides which cause acid rain when they react with the atmosphere.

- Other negative interferences including the distraction of animal habitats, vegetation, “polluted acidic runoff from the mine sites,”¹¹⁵⁵ and the inefficient coal transformation.”¹¹⁵⁶
- “Building a coal-fired power station is a long and expensive process.”¹¹⁵⁷
- Challenges presented by the nature of coal including increases in its price, its reserve exhaustion and its contribution to global warming.¹¹⁵⁸
- “Conventional coal fired plants are a major consumer of water during their requisite cooling processes.”¹¹⁵⁹

Although coal-fired power plants pose serious challenges to sustainable development, Eskom generated 220 219 Gigawatt hours (GWh) from coal-fired capacity in 2011, which required burning 124.7 million tonnes (Mt) of coal.¹¹⁶⁰

The expansion of coal-fired power stations creates the typical test of the tension between the right to ecologically sustainable development and a policy development pertaining to the promotion of “efficient, economic and effective use of resources...”¹¹⁶¹ That is to say, that the evaluation of coal-fired power plants as economic assets and services, required for development, must include environmental factors including clean air, clean water, and protection of ecosystem.

¹¹⁵⁵ Schröder WU “Energy Realpolitik: Towards a Sustainable Energy Strategy” (August 2007) the University of Rochester, Nuclear Science Research Group at 6. http://www-ucjf.troja.mff.cuni.cz/cfs/download/Rochester_PositionPaper.pdf (accessed 12 March 2012).

¹¹⁵⁶ The 1998 White Paper on Energy policy at 25.

¹¹⁵⁷ Eskom “Coal power” <http://www.eskom.co.za/c/article/200/coal-power/>(accessed 12 March 2012).

¹¹⁵⁸ The 2008 Nuclear Energy Policy.

¹¹⁵⁹ Notice 382 OF 2009 (Government Gazette 32122) National Energy Regulator of South Africa: South Africa Renewable Energy Feed-in Tariff (REFIT) Regulatory Guidelines 26 March 2009 at 13. See, “Greenpeace warns that new coal-fired power stations and coal mines will lead to a water crisis in South Africa.” <http://washafrika.wordpress.com/2012/07/12/south-africa-new-coal-fired-power-stations-will-cause-water-crisis-warns-greenpeace/> (accessed 12 March 2012).

¹¹⁶⁰ Eskom 2011 Integrated Report at 13.

¹¹⁶¹ Section 195(1)(b).

The deployment of coal-fired power stations required to meet the ever rising electricity demand is part of the regional planning and urban and rural “social and economic development”¹¹⁶² which is required by the regional, national, provincial and local spheres of government. Another legations-ideation is that the installation of coal-fired power stations by enterprises benefits from the protection afforded under section 22 of the Constitution (guaranteeing freedom of trade). In this context, however, section 24 of the Constitution functions as a limitation clause which may be invoked in proportional, reasonable, necessary fashion.¹¹⁶³ That is to say, the right to establish and operate coal-fired power plants has to be reconciled with the right to an ecologically sustainable development which is also constitutionally and even universally relevant. Moreover, South Africa is obliged to be a responsible global neighbour by honouring its environmental commitments including the imposition of additional constraints on CO2 emissions.¹¹⁶⁴ In short the current 85% of electricity generated by coal-fired power plants is detrimental and frustrating the balance required by sustainable development.

4.2.1.1.2 Oil

The MPRDA¹¹⁶⁵ defines oil as follows:

“...any liquid, solid hydrocarbon or combustible gas existing in a natural condition in the earth’s crust and includes any such liquid or solid hydrocarbon or combustible gas, which gas has in any manner been returned to such natural condition, but does not include coal, bituminous shale or other stratified deposits from which oil can be obtained by destructive distillation or gas arising from a marsh or other surface deposits.”¹¹⁶⁶

¹¹⁶² Section 152(1)(c) and 153(a) of the Constitution.

¹¹⁶³ For further reading on the constitutional test relating to limitation clause see, Currie I and De Waal J *The Bill of Rights Handbook* (2005) 28.

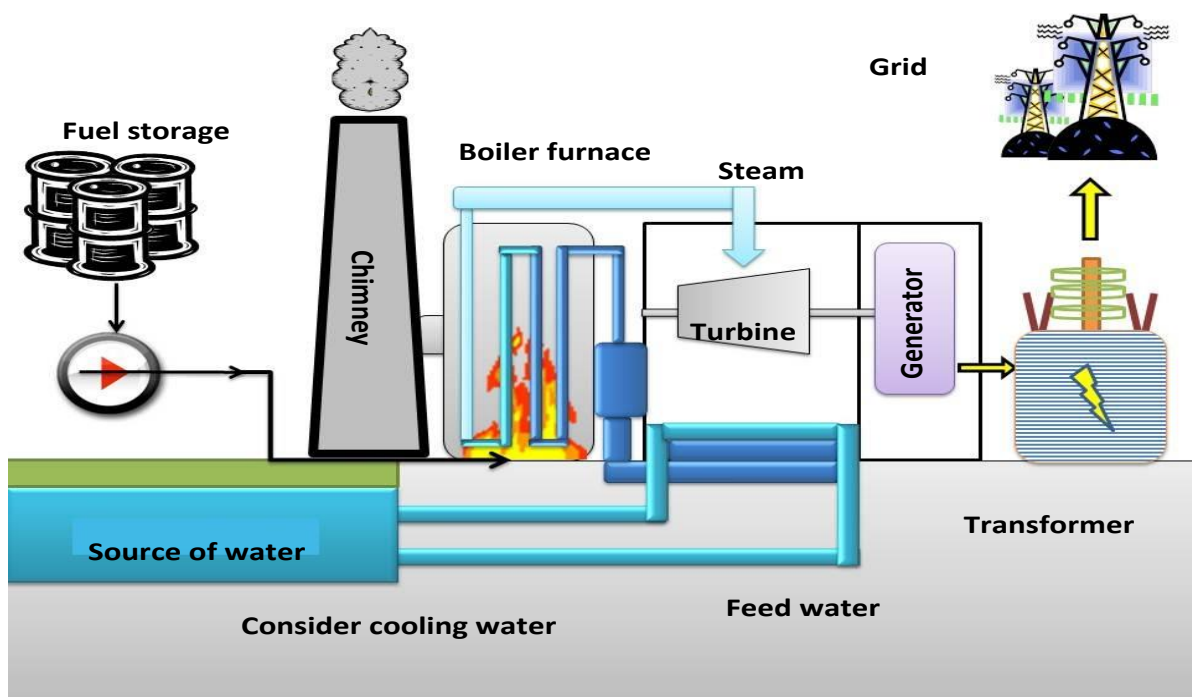
¹¹⁶⁴ DOE/EIA *Annual Energy Outlook 2011 with Projections to 2035* (April 2011) at 2.

¹¹⁶⁵ The MPRDA.

¹¹⁶⁶ See, section 1 of the MPRDA.

Oil is fossil fuel which is a flammable liquid and fundamentally composed from a complex mixture of hydrocarbons, hydrogen and oxygen.¹¹⁶⁷ The formation of oil is a natural process involves the transformation of the accumulation of remains of microscopic plants, animals, plankton, and algae into hydrocarbons liquid over millions of years, and under the pressure of earth crust as deep as between 7000 – 18000 feet.¹¹⁶⁸ Converting oil into electricity is a process of generating thermo energy and transforming it into mechanical energy at the steam turbine similar to the methods utilised in converting coal into electricity.¹¹⁶⁹

Figure VI- 9: Oil-fired power plant¹¹⁷⁰



Oil has played an important role in the reconstruction of post-WWII OECD countries. It sustained economic growth in promoting “automotive transport, petrochemical industry,

¹¹⁶⁷ See, World Coal Association <http://www.worldcoal.org/coal/> (accessed 12 March 2012).

¹¹⁶⁸ Inkpen A and Moffett M *The Global Oil and Gas Industry: Management, Strategy, and Finance* (2011) at 84.

¹¹⁶⁹ See, the simulation of a 320 MW oil-fired power station which is similar to a coal-fired power station except the furnace which ignites fuel. See, Flynn D *Thermal power plant simulation and control* (2003) Institution of Electrical Engineers at 189- 190.

¹¹⁷⁰ Qasaymeh KAI “Oil-fired power station.”

space heating in the residential and commercial sectors, and power generation.”¹¹⁷¹ Oil is fundamental in electricity generation because it can be deployed in both thermal power stations and also in combustion engines generating electricity. An oil thermal power station is a base-load station which is intended to operate throughout the year for three or four decades.¹¹⁷² Combustion engines generating electricity commonly referred to as “generators”, on the other hand, operate on fuel and can be deployed in mid-merit plants in order “to meet predictable variations during the day and the week-day and night, and between weekdays and weekends.”¹¹⁷³

The relationship between oil and nuclear energy in the context of electricity generation has developed over the past sixty years from competition into complementary relationship. One can identify three trends in the relationship between oil and nuclear energy:

- The first relates to the increase in the price of oil in the 1970s-1980s which pushed up the demand for nuclear energy.
- The second relates to the incidents at Three Mile Island and Chernobyl, which turned the industry towards oil and coal and renewables.
- The third relates to the Fukushima incident in 2011 which has shaken the confidence in nuclear energy to the extent that important industrial countries e.g. Germany, decided to abandon nuclear energy altogether.

Other factors have also impacted on the relationship between oil and nuclear energy globally including:

- Oil supply security as a result of oil price volatility, which was assumed to average around “\$100 per barrel in 2008, rising to \$150 in 2026.”¹¹⁷⁴
- Geo-political sensitivity which has increased due to instability in North Africa and the Middle East.

¹¹⁷¹ Toth F and Rogner H “Oil and nuclear power: Past, present, and future” (1-25) Vol 28 (2006) *Energy Economics* at 2.

¹¹⁷² Brookes *The Economics of Nuclear Energy* (1984) at 1-2.

¹¹⁷³ *Ibid* at 2.

¹¹⁷⁴ Marquard A, Merven B, and Tyler E *Costing A 2020 Target of 15% Renewable Electricity for South Africa* (October 2008) at 10.

- Environmental concerns involving “water pollution from off-shore installations and tanker accidents, soil contamination in processing plants, emissions of substances contributing to acid deposition (SO_x and NO_x) and to global climate change (CO₂), and the spectre of resource depletion.”¹¹⁷⁵

According to Current Policies Scenario the world oil demand was 3079 (Mtoe) in 1980, and it increases to 4992 (Mtoe) by 2035.¹¹⁷⁶ In 2006, the world electricity generation from oil amounted to 6%,¹¹⁷⁷ with French electricity generation from oil amounting to only 1.6%, and USA electricity generation from oil amounted to 1% in 2009. The South African electricity supply infrastructure shows that South Africa did not at all rely on oil to generate electricity in 2011.¹¹⁷⁸

The IRP does not propose any oil-fired power plants development. Instead, the DoE is committed to a new “3nuclear fleet” of 9600 MW.¹¹⁷⁹ This is clearly influenced by the consideration that South Africa does not produce oil and relies on imported fuel from many countries including Saudi Arabia, Iran, Kuwait, and Iraq.¹¹⁸⁰ Strategically, South Africa does not plan to include oil-fired power plants in the electricity supply infrastructure and prefers to rely on its intended nuclear expansion to “provide acceptable assurance of security of supply in the event of a peak oil-type increase in fuel prices...”¹¹⁸¹

4.2.1.1.3 Gas

The Gas Act¹¹⁸² defines gas as follows:

¹¹⁷⁵ Toth F and Rogner H “Oil and nuclear power: Past, present, and future” at 2.

¹¹⁷⁶ See, *World Energy Outlook* (2011) at 71.

¹¹⁷⁷ See figure 4.7.

¹¹⁷⁸ See figure 4.5.

¹¹⁷⁹ IRP at 11

¹¹⁸⁰ Davidson and Winkler “South Africa’s energy future: Visions, driving factors and sustainable development indicators” at 4. Most of South Africa’s crude oil is sourced from the Middle-East, where imports from Saudi Arabia and Iran in 2003 accounted for 81%. See, IRP at 11.

¹¹⁸¹ IRP at 11.

¹¹⁸² 48 of 2001.

“Gas means all hydrocarbon gases transported by pipeline, including natural gas, artificial gas, hydrogen rich gas, methane rich gas, synthetic gas, coal bed methane gas, liquefied natural gas, compressed natural gas, re-gasified liquefied natural gas, liquefied petroleum gas or any combination thereof.”¹¹⁸³

The formation of gas is similar to the natural process which forms oil. That is to say natural gas is a result of exposing the organic matter to heat and pressure.¹¹⁸⁴ “Gas...is a by-product in the oil refining process and is readily available in the global market.”¹¹⁸⁵ Gas is a fossil fuel which is flammable composed fundamentally from methane (CH₄) which is a simpler chain carbon which forms the main composition of the natural gas.¹¹⁸⁶

According to the Current Policies Scenario, the world energy demands of gas was 1234 (Mteo) in 1980 and grew up to 2539 (Mteo) in 2009. Projections predict that the world energy demand for gas will rise as far as to 3247 (Mteo) in 2020 and it will further grow to 4206 (Mteo) by 2035.¹¹⁸⁷ In 2006 gas accounted for 20% of the world electricity generation,¹¹⁸⁸ but only for 3.80% of electricity generation in France.¹¹⁸⁹ In 2009 gas accounted for 23.4% of the USA electricity generation.¹¹⁹⁰ The same ratio for South Africa in 2011 was 6%.¹¹⁹¹

¹¹⁸³ Section 1 of the Gas Act.

¹¹⁸⁴ See, Gas formation <http://www.natgas.info/html/gasformation.html> (accessed 12 March 2012).

¹¹⁸⁵ DME, National Response to South Africa’s Electricity Shortage.

¹¹⁸⁶ Worthington R “Cheap at half cost: coal and electricity in South Africa” (19-148) in McDonald *Electric Capitalism* at 112.

¹¹⁸⁷ See above, figure 4.5.

¹¹⁸⁸ See above, figure 4.7.

¹¹⁸⁹ See above, figure 4.8.

¹¹⁹⁰ See above, figure 4.8.

¹¹⁹¹ See above, figure 4.8.

The process of generating electricity from gas follows the laws of thermodynamics. The natural gas or liquefied gas “passes through the turbine that spins the electric generator.”¹¹⁹² Industrial gas-fired power plants operating in South Africa are of two types:

- **Open cycle (single cycle) gas turbine** (OCGT) consists of a simple gas turbine which rotates as a result of burning gas exchanging heat with the turbine. The shaft is connected to an electric generator. The gas-powered plant is supported with auxiliary systems such as the fuel supply system, lube cooling system, fire protection system and the control system. South African municipalities operate 331 MWe and Eskom operates 331 MWe of OGCTs. The 662MWe of gas turbine capacity are currently used for emergency power or for peaking power.¹¹⁹³
- **Gas-fired combined-cycle gas-turbine** (CCGT)¹¹⁹⁴ uses “both combustion and steam turbine technologies.”¹¹⁹⁵ The exhausted heat released from the combustion turbine goes to the CCGT unit in order to create steam to spin the steam turbine.¹¹⁹⁶ South Africa intends on installing¹¹⁹⁷ “a minimum 711 MW from” gas-driven CCGT power plants.¹¹⁹⁸ This requires the creation of a gas supply infrastructure which was supposed to bring about the first CCGT by 2010.¹¹⁹⁹

¹¹⁹² Brennan T, Palmer K, and Martinez S *Alternating Currents: Electricity Markets and Public Policy* (2002) at 15.

¹¹⁹³ *Energy for Sustainable Development: South African Profile* (April 2004) Energy Research, Centre University of Cape Town Phase 1 final report at 47.

¹¹⁹⁴ The first CCGT in South Africa is under construction in New Castle, KwaZulu-Natal and will produce 15MW electricity and 120 000t/h of industrial steam.

¹¹⁹⁵ Brennan T, Palmer K, and Martinez S *Alternating Currents: Electricity and Public Policy* (2002) at.15.

¹¹⁹⁶ *Ibid.*

¹¹⁹⁷ Hughes A, Haw M, Winkler H, Marquard A, and Merven M *Energy Emissions: A Modelling Input into the Long Term Mitigation Scenarios Process* (October 2007) LTMS Input Report 1, prepared for the Department of Environment Affairs and Tourism, South Africa (Energy Research Centre, University of Cape Town at 12.

¹¹⁹⁸ This is based upon the policy-adjusted IRP which is attributed to the modelling changes that resulted from public participation. See, IRP at 12

¹¹⁹⁹ IRP at 16.

Recently, the world has witnessed “a major shift towards natural gas for electricity generation.”¹²⁰⁰ The use of natural gas in electricity generation may relax environmental and energy security tensions for the following reasons:

- Gas-fired power plants can achieve 60% efficiency in particular the gas-fired combined-cycle gas-turbine (CCGT).¹²⁰¹
- Gas turbines require a short construction time compared to base-load power plants, in some instances as little as a few weeks to a few months.
- The construction and the operation cost of gas power plants are significantly lower than coal-fired power plants.¹²⁰²
- Flexibility in terms of turn on and off procedures to meet the peak demand.
- Natural gas is about 60% cleaner than coal in terms of carbon dioxide emissions,¹²⁰³
- Natural gas does not release any SO₂ and emissions of NO_x are significantly reduced.¹²⁰⁴

Although the relative importance of gas is increasing so as to “contribute around 25% to electricity generation from 2030 onwards,”¹²⁰⁵ “it plays a small role in South Africa’s energy economy, accounting for less than 1% of ...total primary energy supply...”¹²⁰⁶ This is due to the country’s “small reserves of natural gas and coalbed methane.”¹²⁰⁷ Nonetheless, the

¹²⁰⁰ Dell R and Rand D *Clean Energy* (2004) at 62-63.

¹²⁰¹ Hughes *Energy Emissions: A Modelling Input into the Long Term Mitigation Scenarios Process* at 12.

¹²⁰² “New CCGT plants can be constructed at a cost of \$450 per kilowatt, less than half the cost of coal fired steam plant.” See, Brennan et al *Alternating Currents: Electricity and Public Policy* (2002) at 15.

¹²⁰³ Energy Research Centre University of Cape Town *Energy for Sustainable Development: South African Profile* (April 2004) Phase 1 final report at 13.

¹²⁰⁴ Dell and Rand *Clean Energy* (2004) at 62-63.

¹²⁰⁵ Kearney M “Modelling the impact of CO₂ taxes in combination with the Long Term Mitigation Scenarios on emissions in South Africa using a dynamic computable general equilibrium model 78-98 in Winkler et H eds *Putting A Price on Carbon: Economic Instruments to Mitigate Climate Change in South Africa and other Developing Countries* (23-24 March 2010) Proceedings of the conference held at the University of Cape Town at 83.

¹²⁰⁶ Energy Research Centre University of Cape Town *Energy for Sustainable Development: South African Profile* (April 2004) Phase 1 final report at 10.

¹²⁰⁷ *Ibid* at 41.

government underpins gas in various economic activities. In her forward for Strategic Plan 2011/12 – 2015/16, the Minister of Energy Dipuo Peters, MP emphasised the “efficient supply and availability of gas resources.”¹²⁰⁸

South Africa’s statutory norms governing the operation of gas are intended to promote efficiency, effectiveness, and sustainability of “gas transmission, storage, distribution, liquefaction and regasification facilities and the provision of efficient, effective and sustainable gas transmission, storage, distribution, liquefaction, re-gasification and trading services.”¹²⁰⁹ Moreover, these norms “ensure the safe, efficient economic and environmentally responsible transmission, distribution, storage, liquefaction and re-gasification of gas,”¹²¹⁰ while they promote among other things “access to gas in an affordable and safe manner.”

In 2011 South Africa’s electricity generation from gas amounted to 6%. In 2030 the Policy-Adjusted IRP proposes a significant increase to 2.6 GW from Gas-CCGT and 3.9 GW from Peak OCGT.¹²¹¹

The reliance of the future development of the electricity supply infrastructure on gas-based power plants is considered viable because natural gas is an abundant regional resource which can be imported from Mozambique. Nevertheless, the projections for 2030 contemplated in the IRP indicate that natural gas is not intended to replace coal and nuclear powered base-load power plants.

4.2.1.2 Renewable Energy

The term renewable energy refers to all sources of energy that can be renewed or extended.¹²¹² It also indicates resources which are inexhaustible or replaceable by new growth which relate to energy. These resources “are replenishable within a human lifetime

¹²⁰⁸ Strategic Plan 2011/12 – 2015/16 at 4.

¹²⁰⁹ Section 2(a) of the Gas Act.

¹²¹⁰ Section 2(b) of the Gas Act.

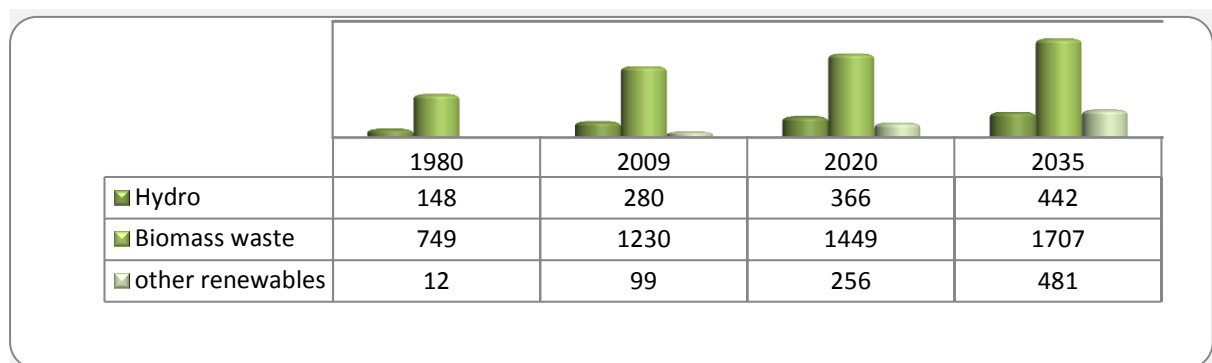
¹²¹¹ See, the Adjusted-Policy IRP as contemplated in the 2011 IRP at 6.

¹²¹² Oxford Dictionaries <http://english.oxforddictionaries.com/definition/renewable> (accessed 12 November 2012).

by natural processes and they are wind, wave, solar, biomass (wood fuel, agricultural residues, animal wastes, biofuel and other bioenergy), hydropower and geothermal energy.”¹²¹³ Renewable energy also refers to sustainable energy and links sustainable development with environmental management.

Section 1 of the National Energy Act defines renewable energy so as to include “energy generated from natural non-depleting resources including solar energy, wind energy, biomass energy, biological waste energy, hydro energy, geothermal energy and ocean and tidal energy...”¹²¹⁴ The 1998 White Paper on Renewable Energy enumerates renewable energy sources including “sun, wind, biomass, water (hydro), waves, tides, ocean current, geothermal, and any other natural phenomena which are cyclical and non-depletable.”¹²¹⁵

Figure VI- 10: World energy demand for renewables: Current Policies Scenario (Mteo)¹²¹⁶



Renewable energy has developed to form a fundamental component of the global energy economy.¹²¹⁷ Renewables contribute to the diversification and security of energy supply,

¹²¹³ *Sustainable energy: A Framework for New and Renewable Energy in Southern Africa* (March 2006) Economic Commission for Africa (ECA) Southern Africa Office (SRO-SA) at 17.

¹²¹⁴ Section 1 of the National Energy Act.

¹²¹⁵ The 2003 White Paper on Renewable Energy.

¹²¹⁶ World energy outlook 2011 OECD/ IEA (2011) at 71.

¹²¹⁷ Renewable energy is “vigorously promoted by the green community” as a solution for climate change and global warming. See Gleason Renewable “Energy a dim prospect” (2 November 2012) <http://www.bdlive.co.za/opinion/columnists/2012/11/02/renewable-energy-a-dim-prospect> (accessed 12 November 2012).

economic development, and mitigate environmental concerns. In 2006 renewable energy technologies used to “supply 13.3% of the world’s primary energy supply.”¹²¹⁸

Figure 4.10 shows that the world energy demand for renewables was 909 and 1609 Mteo in 1980 and 2009 successively. In 2020 the demand increases to reach 2071 Mteo and in 2035 the demand is projected to reach 2630.¹²¹⁹ In South Africa the Policy-Adjusted IRP projects under new build options project a very optimistic 17.8 GW including 8400 MW of wind energy by 2027, 8400 MW of Photo Voltaic (PV) by 2030, and 1000 MW of Concentrating Solar Power (CSP) by 2025.¹²²⁰

South African renewable energy contributed 6% to electricity generation in 2004 and declined to 5% in 2011. The Policy-Adjusted IRP shows that South Africa imported 2.1 GW of hydraulically generated power in 2011, mainly from the Cahora Bassa Hydropower scheme in Northern Mozambique. Nevertheless, as a result of the second round of public participation conducted in November/December 2010,¹²²¹ the Policy-Adjusted IRP came to propose 17.8 GW of renewable energy by 2030. The public participation “led to several changes to the IRP model assumptions. The main changes were the disaggregation of renewable energy technologies to explicitly display PV, CSP and wind options...”¹²²²

The legal normative rules governing renewable energy are unconsolidated and can be traced in several unrelated statutory instruments including those which deal with energy and those which deal with environmental issues in the context of environmental impact assessments. The South African policy pertaining to energy is committed to increasing substantially “the generation and consumption of renewable energies” in order to diversify energy resources, “taking into account environmental management requirements and interactions amongst economic sectors...”¹²²³ Renewable energy is intended to address many challenges and to create many opportunities including the enhancement of the

¹²¹⁸ *Renewable energy: RD&D priorities*, Insights from IEA Technology Programmes (2006) OECD/ IEA at 15.

¹²¹⁹ See, *World energy outlook of 2011* at 71.

¹²²⁰ See, IRP at 14.

¹²²¹ IRP at 6

¹²²² IRP at 6

¹²²³ See, the preamble of the National Energy Act.

utilisation of resources effectively and efficiently,¹²²⁴ mitigate GHGs effects, empowering the population in remote rural areas, and liberalising the energy sector including the transformation of the electricity distribution sector into a decentralised grid of regional electricity distributors.

Currently, four policy documents have introduced renewable energy targets, including the 1998 White Paper on Energy Policy, the 2003 White Paper on Renewable Energy, the IRP, and the NDP. The 1998 White Paper on Energy Policy's take on renewable energy is based on the integrated resource planning principle of "ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options."¹²²⁵ The 2003 White Paper on Renewable Energy requires the government to envisage the role of renewable energy in a holistic energy economy as follows:

"An energy economy in which modern renewable energy increases its share of energy consumed and provides affordable access to energy throughout South Africa, thus contributing to sustainable development and environmental conservation."¹²²⁶

The IRP underlines renewables and the additional cost-optimal scenarios and proposes among other things to bring forward "the installation of renewables (solar PV, CSP and wind)...in order to accelerate a local industry."¹²²⁷

4.2.1.2.1 *Solar Energy*

Solar energy is the process of generating electricity from the sunlight, which does not deplete any of the earth's natural resources. Solar energy is the earth's primary source of renewable energy, which generates electricity from the sun by either PV or solar-thermal technologies:

¹²²⁴ Shabangu Deputy Minister of the then DME "Forward" in the 2003 White Paper on Renewable Energy at i.

¹²²⁵ The 1998 Energy White Paper at XX.

¹²²⁶ The 2003 White Paper on Renewable Energy at 1.

¹²²⁷ IRP at 6

- PV technologies were initially developed for the space program at the end of the 1950s. The PV panel is typically composed of thin film layers made from silicon and other conductive materials that produce chemical reactions triggered by the sunlight. These chemical reactions release electrons which are responsible for generating an electric current. The PV cells generate electricity from the sun directly and can be used in power supplies for “domestic use, game farms, household and community water pumping schemes.”¹²²⁸ The PV systems are deployed broadly in South Africa in power supplies for conventional and cellular telecommunications networks.
- Solar-thermal technologies rely on various means to concentrate sunlight in order to produce heat necessary for the creation of steam or air movement, which can turn turbines generating electricity.¹²²⁹ Solar-thermal technologies functions like traditional thermal electricity generating technologies.¹²³⁰ That is to say, the sun’s heat is used to create steam or air movements, which in turn will spin a turbine generating electric current.¹²³¹

Solar energy has not yet been legislated in South Africa. Borrowing from the California jurisdiction, Section 801.5(a) of the California Civil Code¹²³² defines a solar energy system as to mean either of the following:

“1. Any solar collector or other solar energy device whose primary purpose is to provide for the collection, storage, and distribution of solar energy for space heating, space cooling, electric generation, or water heating.

¹²²⁸ The 2003 White Paper on Renewable Energy at 21.

¹²²⁹ The Economist “The other kind of solar power” (Q2 2009) Technology Quarterly <http://economist.com/node/13725855> (accessed 12 March 2012).

¹²³⁰ Power Scorecard “Electricity from: Solar Energy” http://www.powerscorecard.org/tech_detail.cfm?resource_id=9 (accessed 12 March 2012).

¹²³¹ Parabolic dish systems and central receiver systems technologies are under investigation to weigh their commercial merits.

¹²³² The definition of solar energy is borrowed from the California Civil Code because it is unavailable in the South African law.

2. Any structural design feature of a building, whose primary purpose is to provide for the collection, storage, and distribution of solar energy for electricity generation, space heating or cooling, or for water heating.”

4.2.1.2.2 *Wind Energy*

Wind energy relies on the conversion of kinetic energy accompanying air in motion into e.g. electricity by using wind turbines and mechanical power typically in a windmill. Generating electricity from wind turbines is a mechanical process which is subject to the conservation laws which allow the conversion of the power stored in the wind through a rotating shaft to electricity. The 2003 White Paper on Renewable Energy defines wind energy as follows:

“Wind energy uses the naturally occurring energy of the wind either directly as in windmills or to generate electricity, and can be used, for example, to charge batteries or pump water. Large modern wind turbines operate together in ‘wind farms’ to produce electricity for utilities. Small turbines are used to meet localised energy needs.”¹²³³

The 2003 White Paper on Renewable Energy differentiates between two categories relating to generating electricity, namely, the large turbines intended for production of electricity for utilities which can be connected to the national grid and small turbines intended for rural areas which can be connected to sub-grid. The Policy-Adjusted IRP proposes 8.4 GW wind energy without specifying the quantity generated neither from wind farms nor the small turbines. But most of the studies suggest that the eastern coast of South Africa which is more viable for wind farms would be supplying the national grid.

4.2.1.2.3 *Hydropower*

Hydropower is the process of directing the “movement of water under gravitational force to drive turbines to generate electricity.”¹²³⁴ Hydropower falls within renewable energy because it is considered as a process of using the Earth's water cycle in order to generate

¹²³³ The 2003 White Paper on Renewable Energy at 1-2.

¹²³⁴ The 1998 White Paper on Energy policy at 2.

electricity.¹²³⁵ Normally, a dam will hold the water flowing downstream allowing it to building up kinetic energy. The water is forced through a hydraulic turbine that is connected to an electric generator.

South Africa has development potential for hydropower nationally and regionally. National small hydropower plants have development potential which may promote the life of people around the basins. For example, “the Eastern Cape and KwaZulu-Natal provinces are endowed with the best potential for the development of small, i.e. less than 10MW, hydropower plants.”¹²³⁶ “The Southern African Power Pool (SAPP) allows the free trading of electricity between SADC member countries, providing South Africa with access to the vast hydropower potential in the countries to the north, notably the significant potential in the Congo River (Inga Falls).”¹²³⁷

The term renewable energy focussed on sustainability which is intended to fulfil the dream of environmentalists and developers alike. On the one hand, environmentalists’ concerns emanating from the stalks of fossil-fired power plants are ostensibly addressed by using renewables. Although renewables pose certain adverse environmental impacts, nonetheless, they generally, do not contribute to GHGs and they do not produce significant waste products such as ash or nuclear waste (depleted uranium). On the other hand, one must consider electricity service providers’ concerns about adequate energy supply security. Nonetheless, the requirement of a greater diversification of the electricity supply infrastructure calls for the utilisation of a wide range of renewable resources. This is in line with legal normative rules governing the energy and electricity supply infrastructure which are based on enhancing affordable electricity supply and sustainable development.

Renewable energy poses a serious challenge to South Africa because the technology available is neither cheap nor capable of substituting base-load power plants. For example -

¹²³⁵ Clean energy “Hydroelectricity”<http://www.epa.gov/cleanenergy/energy-and-you/affect/hydro.html> (accessed 12 March 2012).

¹²³⁶ The 2003 White Paper on Renewable Energy at 17-18.

¹²³⁷ *Ibid* at 20.

“wind and solar have capacity factors as low as 20% or less. In other words, these contraptions can be relied on to produce only 20% of their installed capacity. With their unreliable and unpredictable power output, the renewable energy programme doesn’t stop Eskom from building new coal-fired or nuclear power stations.

Even worse, it doesn’t help Eskom burn less coal. Because these energy sources are unpredictable (the wind stops blowing, or it clouds over) and because coal-fired stations can’t be turned on and off on demand but need to run on constant conditions, Eskom has to keep the spinning reserve going even when renewables are delivering power, in case they suddenly stop.”¹²³⁸

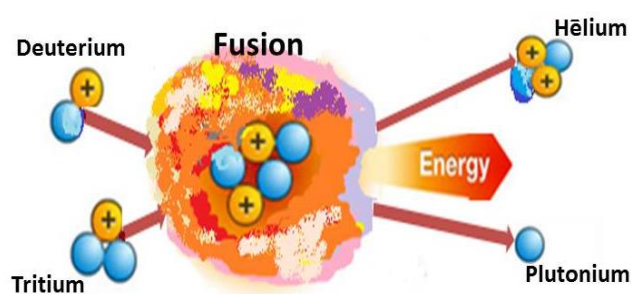
Moreover, renewable energy poses many adverse environmental impacts including the disturbance of the air course and noise created by giant wind turbines, severely affecting animals and birds and rendering spaces around them uninhabitable for humans. Giant wind turbines also interfere with landscapes, disturbing the scenery, and can cause severe hazards when they become defective or disintegrate structurally under certain wind conditions. The PV solutions, on the other hand, require very large surface areas of an average 200 hectares for generating a mere 10mw of power, as well as constant maintenance (cleaning) with detergents that are harmful to plant life. Hydropower is also not without adverse environmental impacts as large dams will influence local and regional climates, pose earthquake risks, and interfere with the normal water course and fish and plant life in rivers, sometimes accumulating and encouraging dangerous weed growth that contributes to GHGs. Large dams are also costly to build and expensive to insure as they carry a risk of massive destructions and loss of life in some cases many millions in numbers, in the event of dam failure and downstream flooding catastrophe.

¹²³⁸ See, Gleason D “Renewable energy a dim prospect” (2 November 2012) Business Day Live <http://www.bdlive.co.za/opinion/columnists/2012/11/02/renewable-energy-a-dim-prospect> (accessed 12 November 2012).

4.2.1.3 Nuclear energy

Nuclear energy includes “all the energy released by a nuclear fission or nuclear fusion process.”¹²³⁹ Nuclear fusion is an opposite reaction of fission process because it is based on fusing two nuclei of light elements together under favourable conditions to form a heavier element releasing formidable energy.¹²⁴⁰ As figure 4.11 illustrates, the repellant forces that arise between the positively charged protons in two atoms of hydrogen such as tritium and deuterium have to be overcome, and temperatures of over 100 million degrees centigrade are normally required to form an atom of helium.¹²⁴¹ Although, the reaction which involves nuclear fusion releases more energy than that resulting from nuclear fission,¹²⁴² nuclear fusion is irrelevant for the purpose of this present thesis because it releases a great deal of energy which is uncontrollable and cannot be deployed for the peaceful purposes at the current stages of scientific research

Figure VI- 11: Fusion reaction¹²⁴³



Nuclear fission normally occurs during the process which involves bombarding a heavy nuclear material, such as uranium and plutonium by neutrons under favourable conditions, consequently splitting the atom of a given element and releasing formidable energy.¹²⁴⁴

¹²³⁹ Section 1(xvi) of the Nuclear Energy Act.

¹²⁴⁰ *Fundamentals handbook: nuclear physics and reactor theory* at 54.

¹²⁴¹ Simpson *et al* *NPT Briefing Book: 2012 Edition* at Part I - 1.

¹²⁴² “Fusion-Is it just a dream?” Interview with IAEA Fusion Physicist Ralf Kaiser (Published: 12 October 2012) <http://www.iaea.org/> (accessed 7 November 2012).

¹²⁴³ Qasaymeh KAI “Fusion reaction.”

¹²⁴⁴ Simpson *et al* *NPT Briefing Book: 2012 Edition* at Part I - 1. Also, *Fundamentals Handbook: Nuclear Physics and Reactor Theory* at 46.

Nuclear materials used in nuclear reactors are fundamentally uranium-235 (^{235}U) and plutonium-239 (^{239}Pu). ^{235}U is an isotope which contains in its nucleus 92 protons and 143 neutrons. ^{239}Pu is also an isotope which contains in its nucleus 92 protons and 146 neutrons. The sum of protons and neutrons, which is 235 in the nucleus of ^{235}U and 239 in the nucleus of ^{239}Pu , identifies the atoms of the isotopes.

Figure VI- 12: Nuclear fission¹²⁴⁵

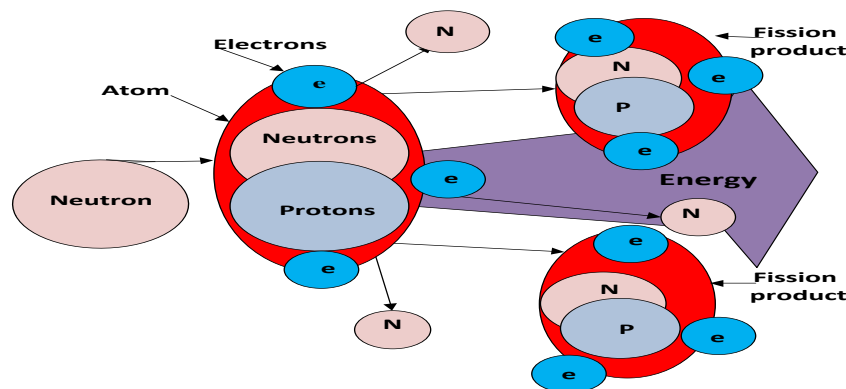


Figure 4.12 illustrates the fission process. A neutron has to be accelerated to reach a critical speed and launched at nuclei of ^{235}U . As a result of this bombardment, the ^{235}U splits into smaller parts releasing energy and frees neutrons and protons. The free neutrons may be captured by uranium-238 which is placed in the reactor core, forming ^{239}Pu . ^{235}U makes up for only 0.7% of natural uranium ore, which is fundamentally composed of uranium-238. ^{239}Pu does not exist naturally at all, but it is manufactured by placing uranium-238 inside a nuclear reactor, where some its nuclei capture slow moving neutrons, thus forming fissile ^{239}Pu .

The process of generating electricity from nuclear capacity requires a nuclear reactor and nuclear fuel:

- In terms of the Nuclear Energy Act, “nuclear fuel means any material capable of undergoing a nuclear fission or nuclear fusion process on its own or in combination with some other material and which is produced in a nuclear fuel assembly or other

¹²⁴⁵ Qasaymeh KAI “Nuclear fission.”

configuration.”¹²⁴⁶ The definition of nuclear fuel incorporates all fissile materials which can be deployed in electricity generation. Technically, generating electricity from nuclear capacity means the completion of the nuclear fuel cycle which involves various activities which begins by “mining of uranium and ends with the disposal of nuclear waste.”¹²⁴⁷

The nuclear fuel cycle commences by mining the triuranium octoxide (U_3O_8) and converting it to Uranium hexafluoride (UF_6 which contains 0.7% U_{235} . This mixture needs to be enriched up to 3-5%. The enriched uranium is fabricated and becomes fuel rods. The fuel rods are inserted into the reactor core where the enriched uranium is used. The spent fuel goes to storage where it can be reprocessed, vitrified or otherwise disposed.¹²⁴⁸

- A nuclear reactor is a machine designed to initiate and control a sustained nuclear chain reaction which converts nuclear energy to heat energy intended to be used for useful purposes.¹²⁴⁹

Reactors can be used to produce “neutrons, fission products, and heat.”¹²⁵⁰ Neutrons can be employed in the reactor in order to create new fissionable material, such as plutonium, by “a process of transmutation of elements.”¹²⁵¹ The heat can be deployed to generate steam required to spin a turbine in order to generate electricity.

A nuclear reactor substitutes the furnace and the boiler in a conventional coal power plant. The heat generated from sustained and non-explosive nuclear chain reactions

¹²⁴⁶ Section 1(xvii) of the Nuclear Energy Act.

¹²⁴⁷ World Nuclear Association “The Nuclear Fuel Cycle” <http://www.world-nuclear.org/info/inf03.html> (Updated June 2011) (Accessed 24 October 2011).

¹²⁴⁸ *Ibid.*

¹²⁴⁹ Hafstad L “Nuclear reactor developments” in Stason E *Lectures on atomic energy industrial and legal problems* at 3.

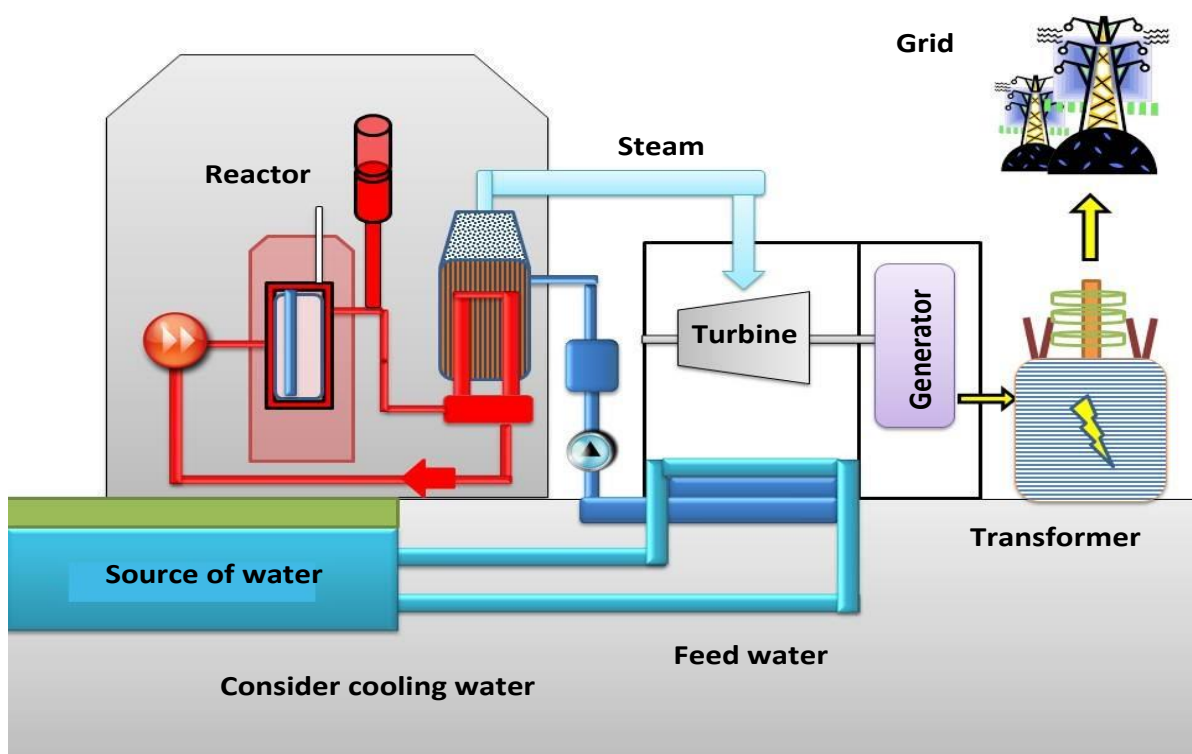
¹²⁵⁰ *Ibid.*

¹²⁵¹ *Ibid.*

is submitted to the laws of thermodynamics. The only difference lies in the process of conversion of water to useful steam in the reactor by means of fissile fuel.

The nuclear industry has manufactured nuclear power reactors for multiple purposes including generating electricity for civil uses and naval vessels, research, and large nuclear reactors used by nuclear-weapon states to produce plutonium for military explosive purposes.¹²⁵² Nuclear technology has introduced five different nuclear reactors including the light water reactors (LWRS), heavy water reactors (HWRS), gas cooled reactors (GCRS OR MAGNOX), high temperature gas cooled reactors (HTGRS), and liquid metal fast breeder reactors (LMFBRS).¹²⁵³

Figure VI- 13: Nuclear power plant¹²⁵⁴



As figure 4.13 illustrates, the process of generating electricity from nuclear capacity is similar to thermal power plants e.g. coal-fired power plants. The large amount of heat

¹²⁵² *NPT Briefing Book* (2008) the Mountbatten Centre for International Studies University of Southampton at 9.

¹²⁵³ *Ibid.*

¹²⁵⁴ Qasaymeh KAI "Nuclear power plant."

released from combusting uranium is transferred to the water which is pressurised through the steam generator. As a result, the water in the steam generator is converted to steam and pressurised through a steam turbine which converts the heat contained in the steam into mechanical energy. The turbine shaft is joined to an electric generator which converts the turbine mechanical energy to electricity.

The development of nuclear energy shows that the world nuclear energy consumption in 2005 was 2659 billion kWh and it will grow up to 4916 billion kWh in 2035.¹²⁵⁵ Despite the Fukushima accident, the IAEA continues to emphasise nuclear energy in global electricity production. The number of nuclear power reactors in operation worldwide is 441 generating 375268 MWe, 5 nuclear reactors generating 2972 MWe are in long-term shutdown, and 67 nuclear reactors generating 64064 MWe are under construction.¹²⁵⁶

The Fukushima accident has impacted on nuclear expansion programmes worldwide. The projections of the world nuclear capacity declined by 7-8% after the accident.¹²⁵⁷ Germany phased out eight power reactors and decided to “discontinue the use of nuclear power.”¹²⁵⁸ Belgium, Italy and Switzerland have submitted their nuclear programmes for re-evaluation.

¹²⁵⁵ EIA “Independent statistics and analysis U.S. Energy Administration and Information” http://www.eia.gov/oiaf/aeo/tablebrowser/#release=IEO2011&subject=0-IEO2011&table=8-IEO2011®ion=0-0&cases=Reference-0504a_1630 (accessed 7 November 2012).

¹²⁵⁶ IAEA Nuclear Power Reactors in the world Reference Data Series No. 2 (2011 Edition) at 11. It seems that there is slight difference between International Atomic Energy Agency and the European Nuclear Society in relation to the statistics pertaining to nuclear capacity and nuclear power plants worldwide. According to the European Nuclear Society “as of February 2, 2012 in 31 countries 435 nuclear power plant units with an installed electric net capacity of about 368 GW are in operation and 63 plants with an installed capacity of 61 GW are in 15 countries under construction. See “European Nuclear Society” <http://www.euronuclear.org/info/encyclopedia/n/nuclear-power-plant-world-wide.htm> (7 November 2012). According to IAEA the world operates 437 nuclear power reactors with total net capacity produce 371 762 MWe. 3 nuclear power reactors are in long-term shut down and 64 nuclear power reactors are under construction. See, IAEA “Power reactor information system” <http://www.iaea.org/pris/> (7 November 2012).

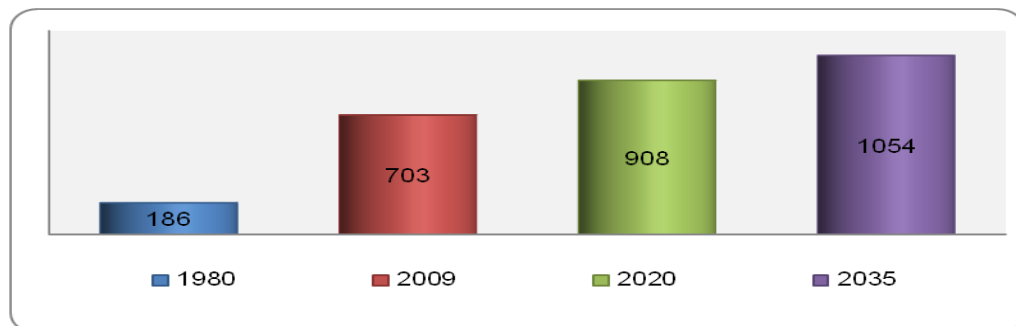
¹²⁵⁷ IAEA Annual Report 2011, submitted by the Board of Governors which is required to do so in terms of Article VI.J of the Agency’s Statute. This report covers the period (1 January to 31 December 2011) GC (56) at 1.

¹²⁵⁸ *Ibid.*

“Austria, Denmark, Greece and New Zealand, continued to exclude the nuclear power option.”¹²⁵⁹

Nevertheless, nuclear power generation is expected to grow globally.¹²⁶⁰ As figure 4.14 illustrates, nuclear energy will grow from 703 Mteo in 2009 to 1054 Mteo in 2035.¹²⁶¹ The growth and the expansion in nuclear energy will be stimulated by the need to reduce GHGs and by the new technologies that improve safety and deal with nuclear waste.

Figure VI- 14: World nuclear energy demand according to Current Policies Scenario (Mteo)¹²⁶²



4.3 CONCLUSION

The world continues to search for the best methods by which the earth’s resources can be exploited effectively and efficiently. Energy always poses a challenge because of the scarcity of energy components. New challenges emerged when the world realised that the environment has been degraded drastically. The world has realised that climate patterns are changing and the ozone layer has been compromised. Consequently, development which is based on the continuous burning of fossil fuels has become unjustifiable.

Fossil fuels are the main emitters of GHGs and in the mean time they are rapidly depleting. In simple words, the world has to find other sources of energy because fossil fuels pollute the environment immensely and they will soon perish. This is unsustainable and contradicts

¹²⁵⁹ *ibid.*

¹²⁶⁰ McDonald A “Nuclear power global status: a look at nuclear power generation around the world...”

¹²⁶¹ The global energy demand will be about 30% higher in 2040 compared to 2010.

¹²⁶² *World energy outlook 2011* OECD/ IEA (2011) at 71.

the requirements defining sustainable development which prescribes “...the integration of social, economic, and environmental factors into planning, implementation and decision making so as to ensure ...” that “development serves present and future generations.”¹²⁶³

The world’s attempts to deal with the issues emerging from burning fossil fuels are challenged by political, economic, and technological problems. These challenges can be categorised in two categories namely, environmental challenges and developmental challenges. The key principle regulating the environment requires “the right to development” to “be fulfilled so as to equitably meet developmental and environmental needs of present and future generations.”¹²⁶⁴ This creates a dynamic balance which may be applied to energy enterprises. The balance in energy development is centered on the need to reduce GHG emissions. The first compelling conclusion suggests that the deployment of renewable energy alone cannot curb emissions resulting from burning fossil fuels. The South African RBS projects an 11.4 GW of renewables for the period 2010-230. The projection was adjusted from a cost-optimised scenario developed under a carbon emission constraint of 275 million tons per year from 2025, incorporating localisation objectives and bringing forward the renewable roll-out.”¹²⁶⁵ Nevertheless, “renewable energy has played a small role due to its limited access.”¹²⁶⁶ In most instances currently, renewable energy is kept off the national grid, being connected primarily to limited subnational grids.

The status of nuclear energy in South Africa has been compared with America and France. As figure 4.15 illustrates, South Africa operates the only two reactors in Africa, at Koeberg, generating 12923.65 GWh in 2011,¹²⁶⁷ while America operates 104 nuclear power stations and France operates 58 nuclear power stations. France generates 77.71% of its electricity

¹²⁶³ Section 1 of the MPRDA.

¹²⁶⁴ Principle 3 of the Rio Declaration. The UN Conference on Environment and Development held at Rio de Janeiro in 1992. <http://www.unep.org/Documents.Multilingual/Default.asp?documentid=78&articleid=1163> (12 June 2013).

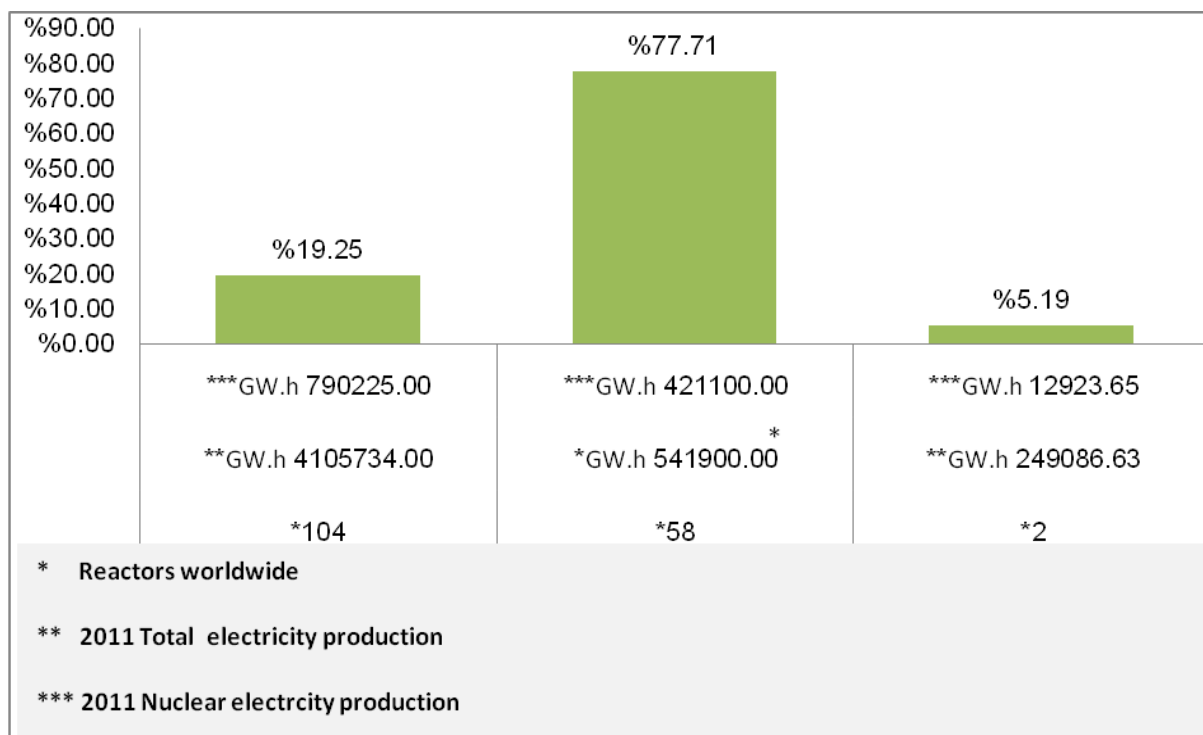
¹²⁶⁵ Para 2.2 of the IRP.

¹²⁶⁶ Musango “South African Energy Model: A System Dynamics Approach” at 8.

¹²⁶⁷ IAEA, Power Reactor Information System (PRIS), South Africa <http://www.iaea.org/PRIS/CountryStatistics/CountryDetails.aspx?current=ZA> (accessed 8 November 2012).

from nuclear energy while America generates 19.25%.¹²⁶⁸ South Africa's IRP projects a significant increase in nuclear energy capacity, as base-load power plants capable of substituting its aging coal-fired power plants, by a measure of 22% by 2030. This projection will minimise South Africa's reliance on coal which will decrease to 65% and allow for important increases in renewable energy.

Figure VI- 15: 2011 Nuclear power statuses in France, USA and South Africa¹²⁶⁹



The three components of electricity infrastructure including fossil fuels, nuclear energy, and renewables have to be balanced in order to fulfil developmental goals. In this context, it is fundamental to take into account that energy supply infrastructure cannot be adequately structured without base-load power stations which can only be either nuclear or fossil-fired

¹²⁶⁸ IAEA, PRIS, France <http://www.iaea.org/PRIS/CountryStatistics/CountryDetails.aspx?current=FR>, and IAEA, PRIS, America <http://www.iaea.org/PRIS/CountryStatistics/CountryDetails.aspx?current=US> (accessed 8 November 2012).

¹²⁶⁹ <http://www.iaea.org/PRIS/CountryStatistics/CountryDetails.aspx?current=ZA>, <http://www.iaea.org/PRIS/CountryStatistics/CountryDetails.aspx?current=FR>, and <http://www.iaea.org/PRIS/CountryStatistics/CountryDetails.aspx?current=US> (accessed 8 November 2012).

power stations. That is to say, the model for energy supply infrastructure is based on indigenous resources has to take into account the crucial position of base-load power stations in South Africa. The fundamental role of base-load power stations validates the French model which sources 79% of its energy from nuclear capacity as opposed to the current South African system which sources 85% of its energy from coal-fired power capacity.

The French model is driven by the scarcity of fossil fuels resources in France and the technological advancement of the French nuclear energy sector. The South African model is influenced by the country's generous endowment with coal which renders generating electricity from coal resources cheap. However, it is questionable as to whether coal is sustainable due to its increasing production costs and the large quantities of GHGs emissions produced by any coal based energy generation.

Both the French and the South African models pose serious problems for environmentalists. A strong anti-nuclear movement emerged in France during the 1970s which protested against the nuclear option. Many of these protests culminated in violence such as the massive demonstration organised in 1977 at the Superphénix breeder reactor in Creys-Malvillein.¹²⁷⁰ In South Africa, environmentalists are attacking Eskom's planning insistently. For example, on 24 October 2012 Eco-Activists Group "climbed the building's roof structure to unfurl a banner across the front entrance reading: 'Eskom is under new management'."¹²⁷¹ South Africa's electricity infrastructure is dependent on the national public electricity utility Eskom, which generates 95% of the country's electricity.¹²⁷² 5% is generated by municipal generators, auto generators, or industries which generate electricity for their own use.¹²⁷³ In 2011 Eskom's power stations achieved a net maximum capacity of 41194 MW, of which coal-fired stations accounted for 34952 MW, 600 MW hydro-electric, 1400 MW pumped storage, 2409 MW gas turbine, 1830 MW nuclear, 3 MW wind

¹²⁷⁰ Nelkin D and Pollak M *The Atom Besieged: Antinuclear Movements In France and Germany* (1982) at 3.

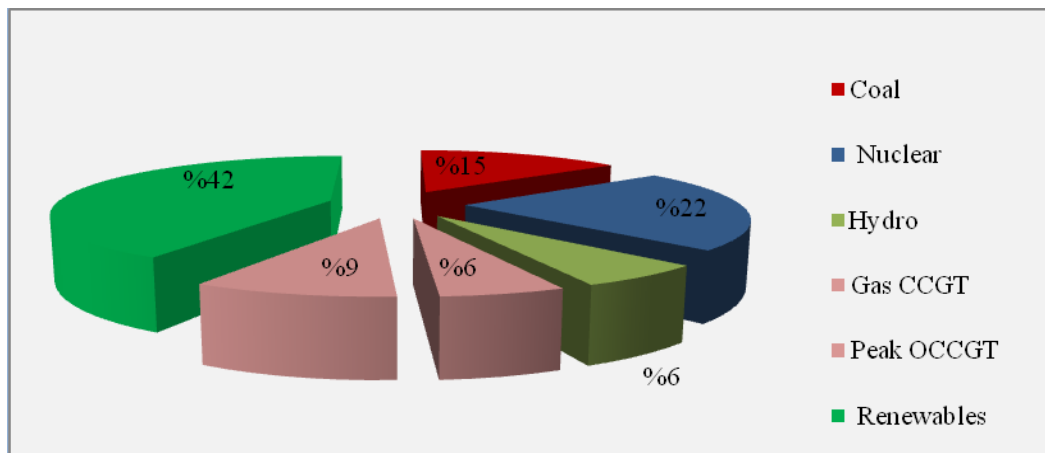
¹²⁷¹ See, Times Live "Eco activists fined for trespassing at Eskom offices" (24 October 2012) <http://www.timeslive.co.za/scitech/2012/10/24/eco-activists-fined-for-trespassing-at-eskom-offices> (accessed 5 November 2012).

¹²⁷² Musango "South African Energy Model: A System Dynamics Approach" at 5.

¹²⁷³ *Ibid.*

energy.¹²⁷⁴ South Africa's long term power generation capacity expansion programme proposes the increase of its generating capacity in 2030 by more than double the current levels, up to 85,241 GW.¹²⁷⁵

Figure VI- 16: South Africa's additional capacity until 2030 in GW¹²⁷⁶



The IRP has undergone many revisions in the process of introducing the RBS and the Policy-Adjusted IRP. “The RBS included provision for a nuclear fleet of 9,6 GW; 6,3 GW of coal; 11,4 GW of renewables; and 11,0 GW of other generation.” The RBS proposes less reliance on coal-fired electricity generation which it dropped from 85% in 2011 to 65.5% in 2030. Nuclear energy increases from 5% to 20%. Nevertheless, a second round of public participation was conducted in November/December 2010, and led to further modifications “to the IRP model assumptions,”¹²⁷⁷ proposing the Policy-Adjusted IRP which includes 9,6 GW of nuclear; 6,3 GW of coal; 17,8 GW of renewables; and 8,9 GW of other electricity generation resources.

The National Energy Act requires the Minister to “develop and, on an annual basis, review and publish the Integrated Energy Plan in the Gazette.”¹²⁷⁸ The IRP is intended to deal with issues relating to the supply, transformation, transport, storage of and demand for

¹²⁷⁴ See, *Eskom Holdings Limited Integrated Report* (2011) at 12

¹²⁷⁵ IRP at 9.

¹²⁷⁶ *Eskom Holdings Limited Integrated Report* (2011) at 39. See, also IRP at 7.

¹²⁷⁷ IRP at 6.

¹²⁷⁸ Section 6(1) of the National Energy Act.

energy...”¹²⁷⁹ The NDP which was published under the auspices of the presidency urges South Africa to “invest in and help exploit the wide range of opportunities for low-carbon energy from hydroelectric and other clean energy sources.”¹²⁸⁰ It further, considers as enabling milestone that the production of sufficient energy required to supporting “industry at competitive prices, ensuring access for poor households, while reducing carbon emissions per unit of power by about one-third”¹²⁸¹ Nevertheless, energy development by its nature poses a threat to the environment. Therefore “a low-carbon future is the only realistic option, as the world needs to cut emissions per unit of output by a factor of about eight in the next 40 years.”¹²⁸²

The electricity infrastructure components of South Africa expose the country’s ecology to many threats. For example, the water system in South Africa is under strain. With the increase of the population of South Africa and the scarcity of water and energy resources, the national goal is to “diversify South Africa's energy mix to include more renewable energy sources, which tend to be variable in terms of production, should be balanced against the need to provide a reliable, more affordable electricity supply.”¹²⁸³ In simpler words, it is fashionable to be passionate about clean energy but the harsh reality is that reliability and affordability of the electricity supply lie in the base-load power plants, which can be only fossil fuels and nuclear power based plants.

The key constraints and risks in the context of carbon emissions reduction, are: “new technology uncertainties such as costs, operability, lead time to build etc,” “water usage, localisation and job creation;” Southern African regional development¹²⁸⁴ and integration; security of supply,¹²⁸⁵ diversification of energy resources, the availability of indigenous regional resources, economic viability. The due consideration of these risks for planning a

¹²⁷⁹ Section 6(2) of the National Energy Act.

¹²⁸⁰ NDP at 32.

¹²⁸¹ NDP at 33.

¹²⁸² NDP at 91.

¹²⁸³ NDP at 159.

¹²⁸⁴ “The largest infrastructure gaps are in energy, with citizens in 30 of the 47 countries in sub-Saharan Africa facing regular power shortages and power interruptions. Power outages are responsible for a loss of between 1% and 6% of potential GDP every year.” See, NDP at 87.

¹²⁸⁵ Integrated Resource Plan for Electricity 2010-2030 Revision 2 Final Report (25 March 2011) at 6.

mid and long-term electricity supply infrastructure will redirect the focus on the viability of the nuclear energy option as the only available answer to the demand for the progressive realisation of both South Africa's socio-economic rights¹²⁸⁶ and the protection of the environment.

¹²⁸⁶ Article 14.2.h of the CEDAW.

CHAPTER V

THE ESTABLISHMENT OF THE RIGHT TO ACCESS TO ELECTRICITY

5.1 INTRODUCTION

The development of electricity supply infrastructures is not merely a technical or economic issue, but is instead determined by fundamental normative values and constitutional objectives. “It is universally accepted that energy, and access to it, is essential for human development.”¹²⁸⁷ As much as nuclear energy development is subject to international nuclear law, access to electricity is subject to the international human rights regime. The common denominator between the two normative regimes is that nuclear energy offers reliable, clean, and modern electricity supply which contributes to the progressive realisation of the universal access to electricity. The MDGs illustrate the role of electricity in the eradication of extreme poverty and hunger,¹²⁸⁸ achieving universal primary education,¹²⁸⁹ promoting gender equality and empower women,¹²⁹⁰ reducing child mortality,¹²⁹¹ and improving maternal health.¹²⁹² “The conclusion that access to energy is integral to overcoming poverty is nowadays accepted by every member of the international community.”¹²⁹³

¹²⁸⁷ Para 3 of the 2008 Nuclear Energy Policy.

¹²⁸⁸ See, the first goal of the MDGs.

¹²⁸⁹ See, the second goal of the MDGs.

¹²⁹⁰ See, the third goal of the MDGs. “Increasing access to modern energy brings major benefits for women and girls – in health, education and productive activities.” See, Barnard M *Nuclear Energy in Africa: A Legal Framework for Sustainable Energy Access* (October 2013) Unpublished LLD Thesis, North-West University at 30.

¹²⁹¹ See, the fourth goal of the MDGs.

¹²⁹² See, the fifth goal of the MDGs.

¹²⁹³ Bradbrook A, Gardam J, and Cormier M “Human Dimension to the Energy Debate: Access to Modern Energy Services” (526-553) Vol 26, no 4 (2008) *Journal of Energy & Natural Resources Law* at 528. Also Michelle Barnard regards access to modern energy is indispensable to the promotion of sustainable development, the achievement of the MDGs and socio-economic rights. See, Barnard *Nuclear Energy in Africa* at 90.

Access to reliable and affordable, modern electricity is a foundation of sustainable development which is not achievable “without sustainable energy.”¹²⁹⁴ “Furthermore, adequate, affordable and reliable energy services are necessary to guarantee sustainable economic and human development.”¹²⁹⁵ The role of “access to modern affordable energy services” in achieving the development goals which are pronounced in the UN Millennium Declaration is fundamental.¹²⁹⁶

The year 2012 has been identified by the UN as the International Year of Sustainable Energy for All. The UNGA passed Resolution 65/15 on 16 February 2011 which

“encourages all Member States, the United Nations system and all other actors to take advantage of the Year to increase awareness of the importance of addressing energy issues, including modern energy services for all, access to affordable energy, energy efficiency and the sustainability of energy sources and use, for the achievement of the internationally agreed development goals, including the Millennium Development Goals, sustainable development and the protection of the global climate, and to promote action at the local, national, regional and international levels.”¹²⁹⁷

Nevertheless, this does not provide for an express human right to access to affordable electricity under public international law. Public international is, however, not static and allows for *de lege ferenda* propositions emanating, in this instance, from the requirement to “promote social progress and better standards of life.”¹²⁹⁸ The international efforts to conceptualise these requirements function as a propelling dynamic which revamp traditional human rights as well as environmental legal instruments.

¹²⁹⁴ See, UN, Sustainable Energy for All, “Universal access” <http://www.sustainableenergyforall.org/objectives/universal-access> (accessed 12 November 2012).

¹²⁹⁵ IAEA *Energy Indicators for Sustainable Development: Guidelines and Methodologies* (2005) at 30.

¹²⁹⁶ See, the preamble of the UNGA resolution 65/15 on 16 February 2011.

¹²⁹⁷ Article 4 of the UNGA resolution 65/15.

¹²⁹⁸ The preamble of the UN Charter.

The international legal framework governing access to electricity recognises the right to access to electricity. Article 14 of the CEDAW reads as follows:

“2. States Parties shall take all appropriate measures to eliminate discrimination against women in rural areas in order to ensure, on a basis of equality of men and women, that they participate in and benefit from rural development and, in particular, shall ensure to such women the right:

...

(h). To enjoy adequate living conditions, particularly in relation to housing, sanitation, electricity and water supply, transport and communications.”

The re-contextualisation of Article 14.2.h of the CEDAW within the context of the International human rights instruments; particularly the Covenant on Civil and Political Rights (ICCPR)¹²⁹⁹ and the International Covenant on Economic, Social and Cultural Rights (ICESCR)¹³⁰⁰ poses the question as to whether the right to access to affordable, reliable and clean electricity as an implied international human right obliges governments to undertake “to take the necessary steps, in accordance with its constitutional processes,”¹³⁰¹ “individually and through international assistance and co-operation, especially economic and technical, to the maximum of its available resources, with a view to achieving progressively the full realization” of that right.¹³⁰²

¹²⁹⁹ The International Covenant on Civil and Political Rights It was adopted and opened for signature, ratification and accession by UNGA resolution 2200A (XXI) of 16 December 1966 and entered into force 3 January 1976, in accordance with article 27. South Africa signed the Convention in 1994 and ratified it on 10 Dec 1998. Hereafter referred to as the ICCPR).

¹³⁰⁰ International Covenant on Economic, Social and Cultural Rights (ICESCR). It was adopted and opened for signature, ratification and accession by UNGA resolution 2200A (XXI) on 16 December 1966. It was entered into force on 3 January 1976, in accordance with article 27. South Africa signed the Convention on 3 October 1994 and only ratified it in 2012. Hereafter referred to as the ICESCR.

¹³⁰¹ Article 2(2) of ICCPR.

¹³⁰² Article 2 of the ICESCR.

The requirement of legal recognition of the universal access to reliable and affordable modern electricity falls within the socio-economic rights cluster.¹³⁰³ It creates an obligation on the state to take the appropriate measures so as to progressively achieve the full realisation of such a right, to the maximum of the available resources of the country. Consequently, the proposed right to universal access to reliable and affordable modern electricity may not be fully justiciable. The right operates so as to oblige the state to take reasonable legislative and other measures within its available resources to progressively achieve access to electricity by all, as a foundation of its objectives to eradicate poverty and achieve sustainable development.¹³⁰⁴

This chapter is concerned with the right to access to affordable and reliable electricity in order to establish the responsibility of governments to develop an adequate electricity supply infrastructure, in order to make electricity available to all its citizens. Access to affordable and reliable electricity is a requirement for the fulfilment of several constitutional rights in South Africa, including the right to access to adequate housing,¹³⁰⁵ the right to health care, food, and water,¹³⁰⁶ the child's rights,¹³⁰⁷ and the right to education.¹³⁰⁸

5.2 THE ROLE OF ELECTRICITY IN PROMOTING ADEQUATE STANDARDS OF LIVING AND ACHIEVING SOCIO-ECONOMIC RIGHTS

The role of electricity provision in improving the quality of life of people throughout the world is fundamental. International human rights regimes recognise access to electricity as a condition for the fulfilment of many fundamental rights. The role of electricity in creating

¹³⁰³ In *Ex Parte Chairperson of the Constitutional Assembly: In Re Certification of the Constitution of the Republic of South Africa* 1996 (4) SA 744; 1996 (10) BCLR 1253 (CC) at para 78., the Constitutional Court held that "the fact that socio-economic rights will almost inevitably give rise to such implications does not seem to us to be a bar to their justiciability. At the very minimum, socio-economic rights can be negatively protected from improper invasion." See also, Currie I and De Waal J *The Bill of Rights: Handbook* (2008) 5th ed at 522-523.

¹³⁰⁴ See, the *Grootboom* para 21. See also, De Schutter O *International Human Rights Law: Cases, Materials, Commentary* (2010) at 725.

¹³⁰⁵ Section 26 of the Constitution.

¹³⁰⁶ Section 27 of the Constitution.

¹³⁰⁷ Section 28 of the Constitution.

¹³⁰⁸ Section 29 of the Constitution.

adequate standards of living and generally in achieving socio-economic rights underpins the proposition of access to electricity as an international human right. The ICESCR provides for progressive realisation of the contemplated rights which impose “immediate obligations, stating that the steps taken to realise rights must be deliberate, concrete and targeted.”¹³⁰⁹

5.2.1 The Role of Electricity in Achieving Adequate Standards of Living Principle

The fundamental international instruments promoting the achieving of adequate standards of living principle include:

- The African Charter on Human and Peoples' Rights (ACHPR).¹³¹⁰
- The CEDAW.
- The Convention on the Rights of the Child (UNCRC).¹³¹¹
- The ICESCR.
- The UN Charter.
- The Universal Declaration on Human Rights (UNDHR).¹³¹²

The UN Charter requires the international community to undertake the responsibility “to promote social progress and better standards of life.”¹³¹³ The UN Charter does not refer to electricity expressly, but the role of electricity in development and the standards of life is central in achieving the Charter's goals. Article 55 of the Charter promotes:

- a. Higher standards of living, full employment, and conditions of economic and social progress and development;
- b. Solutions of international economic, social, health, and related problems; and international cultural and educational cooperation; and

¹³⁰⁹ Barnard *Nuclear Energy in Africa* at 52.

¹³¹⁰ The African (Banjul) Charter on Human and Peoples' Rights was adopted 27 June, 1981 and entered into force 21 October 1986. Hereafter referred to as the ACHPR.

¹³¹¹ Convention on the Rights of the Child, Adopted and opened for signature, ratification and accession by UNGA resolution 44/25 of 20 November 1989 and entered into force 2 September 1990. Hereafter referred to as the UNCRC.

¹³¹² The Universal Declaration on Human Rights which was adopted by the UNGA in 1948. Hereafter referred to as the UNDHR.

¹³¹³ The preamble of the UN Charter.

- c. Universal respect for and observance of, human rights and fundamental freedoms for all without distinction as to race, sex, language or religion.”

Access to reliable and affordable modern electricity has been “taken for granted in developed countries,” which “perhaps explains the tardiness of the world community in recognising” access to affordable electricity as human right expressly.¹³¹⁴

The UN Charter requires states to create “conditions of stability and well-being which are ... based on respect for the principle of equal rights and self-determination of peoples and promote ...higher standards of living...”¹³¹⁵ The UNDHR confers for everyone the right “...to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services...”¹³¹⁶ Article 27(1) of the UNCRC prescribes “...the right of the child to a standard of living adequate for the child’s physical, mental, spiritual, moral and social development.” The ACHPR does not refer directly to the principle of the right to adequate standards of living. Nevertheless, achieving “a better life for the peoples of Africa and to promote international cooperation having due regard to the Charter of the United Nations and the Universal Declaration of Human Rights” are reaffirmed in the preamble.¹³¹⁷

The notion of adequate standard of living is considered as an integral part of human rights. Article 11 of the ICESCR requires:

"The States Parties to the present Covenant recognize the right of everyone to an adequate standard of living for himself and his family, including adequate food, clothing and housing, and to the continuous improvement of living conditions. The States Parties will take appropriate steps to ensure the realization of this right, recognizing to this effect the essential importance of international co-operation based on free consent."

¹³¹⁴ Bradbrook “Human dimension to the energy debate: Access to modern energy services” at 526.

¹³¹⁵ See, Article 55 of the UN Charter.

¹³¹⁶ Article 25 of the UDHR.

¹³¹⁷ The preamble of the ACHPR.

Electricity provision impacts directly on the realisation of the objectives of most human right rights instruments relating to adequate living standards. The scope of application of Article 27 UNCRC incorporates the content of both Article 25 of the UDHR and Article 11 of the ICESCR,¹³¹⁸ and Article 14.2.h of the CEDAW. These instruments have established the components of adequate living standards e.g. the right to housing and other socio-economic rights. In this context, in General Comment 4 on the right to adequate housing (1991), the ICESCR refers to energy which is required for cooking, heating and lighting.¹³¹⁹ This includes access to electricity¹³²⁰ because the lack of access to modern electricity services inhibits the advancement of the available economic opportunities which are a condition for elevating living standards.¹³²¹

5.2.2 The Role of Electricity in Achieving Socio-Economic Rights

The fundamental international instruments promoting the achieving of socio-economic rights include:

- The ACHPR.
- The ICESCR.
- CEDAW.
- The Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women.¹³²²
- The UNCRC.
- The Treaty of Southern African Development Community (SADC).¹³²³
- The UNDHR.

¹³¹⁸ Eide A A *Commentary on the United Nations Convention on the Rights of the Child: Article 27, the Right to an Adequate Standard of Living* (2006) at 15.

¹³¹⁹ Tully "The Contribution of Human Rights to Universal Energy Access" at 519-521.

¹³²⁰ Dugard J and Mohlakoana N "More work for women: a rights-based analysis of women's access to basic services in South Africa" 156 in Goldblatt B and McLean K eds *Women's Social and Economic Rights: Developments in South Africa* (2011) at 164.

¹³²¹ Bradbrook "Human dimension to the energy debate: Access to modern energy services" at 528.

¹³²² Adopted in Maputo, Mozambique on 11 July 2003 and entered into force on 25 November 2005.

¹³²³ Adopted in Windhoek, Namibia, on 17 August 1992 and entered into force on 14 August 2001. Hereafter referred to as The SADC.

- The UN Charter.

The maintenance of socio-economic rights is universally, regionally, and nationally relevant. International normative rules propagate the achievement of “economic and social advancement of all peoples.”¹³²⁴ The UN has geared its organs including the UNGA¹³²⁵ and the Economic and Social Council¹³²⁶ to promote “economic and social progress and development”¹³²⁷ and offer “solutions of international economic, social, health, and related problems; and international cultural and educational co-operation...”¹³²⁸ In other words, the peoples of the UN resolved to employ the “international machinery”¹³²⁹ at their disposal to achieve economic, social and cultural rights including the right to education, the right to housing, the right to an adequate standard of living, and the right to health. The UN normative rules have functioned as compelling factors in the progressive development of norms protecting socio-economic rights such as the CEDAW, International Convention on the Elimination of All Forms of Racial Discrimination,¹³³⁰ UNCRC, ICESCR, ICCPR, the Convention Relating to the Status of Refugees,¹³³¹ and UDHR.

The enforcement of these conventions and covenants is generally requires each state party to take the necessary measures to ensure the realisation of the rights contemplated. For example, Article 2, paragraph 1 of the ICESCR reads as follows:

“Each State Party to the present Covenant undertakes to take steps, individually and through international assistance and co-operation, especially economic and technical, to the maximum of its available resources, with a view to achieving progressively the

¹³²⁴ See the preamble of the UN Charter.

¹³²⁵ Article (13)(2)(b) of the UN Charter.

¹³²⁶ Article (62)(1) of the UN Charter.

¹³²⁷ Article (55)(a) of the UN Charter.

¹³²⁸ Article (55)(b) of the UN Charter.

¹³²⁹ The preamble of the UN Charter.

¹³³⁰ The convention was adopted and opened for signature by the United Nations General Assembly on 21 December 1965 and entered into force on 4 January 1969.

¹³³¹ The Convention was approved at a special UN conference on 28 July 1951 and entered into force on 22 April 1954.

full realization of the rights recognized in the present Covenant by all appropriate means, including particularly the adoption of legislative measures.”

International frameworks governing socio-economic rights reflect universal and relevant standard which have been recognised, emphasised, recalled, and reaffirmed over and over.¹³³² The universality of socio-economic rights as contemplated in the UN Charter and the other international human rights instruments have also inspired regional instruments. For example, the Protocol to the African Charter on Human and Peoples’ Rights on the Rights of Women in Africa states in its preamble the following:

“Recalling that women's rights have been recognised and guaranteed in all international human rights instruments, notably the Universal Declaration of Human Rights, the International Covenant on Civil and Political Rights, the International Covenant on Economic, Social and Cultural Rights, the Convention on the Elimination of All Forms of Discrimination Against Women and its Optional Protocol, the African Charter on the Rights and Welfare of the Child, and all other international and regional conventions and covenants relating to the rights of women as being inalienable, interdependent and indivisible human rights.”

The Charter of the OAU affirms “the adherence to principles of the United Nations and the Universal Declaration of Human Rights”¹³³³ The Constitutive Act of the African Union calls

¹³³² For example, the preamble of the Vienna Declaration and Programme of Action (the Vienna Declaration and Programme of Action (VDPA) on 12 July 1993 is a human rights declaration. It was adopted by consensus at the World Conference on Human Rights on 25 June 1993 in Vienna, Austria. The UN High Commissioner for Human Rights was created by this Declaration endorsed by UNGA resolution 48/121 on 20 December 1993. states that:

"Emphasizing that the Universal Declaration of Human Rights, which constitutes a common standard of achievement for all peoples and all nations, is the source of inspiration and has been the basis for the United Nations in making advances in standard setting as contained in the existing international human rights instruments, in particular the International Covenant on Civil and Political Rights and the International Covenant on Economic, Social and Cultural Rights."

¹³³³ The Charter of the Organization of African Unity was “adopted in Addis Ababa, Ethiopia, on 25 May 1963 and entered into force on 13 September 1963. Replaced in 2001 by the Constitutive Act of the African Union

for “implementing the Treaty establishing the African Economic Community in order to promote the socioeconomic development of Africa...”¹³³⁴ The ACHPR reaffirms the

“adherence to the principles of human and peoples' rights and freedoms contained in the declarations, conventions and other instruments adopted by the Organization of African Unity, the Movement of Non-Aligned Countries and the United Nations.” The ACHPR assures the right to development and interplays civil and political rights with socio-economic rights.¹³³⁵

Article 20 of the ACHPR states that “all peoples...shall freely determine their political status and shall pursue their economic and social development according to the policy they have freely chosen.” Added to that many other African regional instruments such as the African Youth Charter and the African Charter on the Rights and Welfare of the Child.

The norms pertaining to socio-economic rights can also be traced sub-regionally. For example, the Southern African Development Community (SADC) Declaration on Poverty Eradication and Sustainable Development¹³³⁶ evokes the objectives of SADC which intend to “promote sustainable development and equitable economic growth and socio-economic development...” and to “enhance the standard and quality of life of the people of SADC...”¹³³⁷ Article 5.1.a of the Treaty of SADC states that the objectives of SADC amongst of other things shall be to

“promote sustainable and equitable economic growth and socio-economic development that will ensure poverty alleviation with the ultimate objective of its eradication, enhance the standard and quality of life of the people of Southern Africa and support the socially disadvantaged through regional integration.”

(see below), when the OAU was succeeded by the AU.” See, Heyns C and Killander M *Compendium of Key Human Rights Documents of the African Union* (2010) at 2.

¹³³⁴ See the preamble of the Constitutive Act of the African Union which was “adopted in Lomé, Togo, on 11 July 2000 and entered into force on 26 May 2001.

¹³³⁵ See the preamble of the ACHPR.

¹³³⁶ The SADC Declaration on Poverty Eradication and Sustainable Development was signed at Pailles in the Republic of Mauritius on 20 April 2008.

¹³³⁷ See, the preamble of the Declaration.

The protection of socio-economic rights within the SADC is international in character. Generally, SADC states member have ratified most international human rights instruments.¹³³⁸

The municipal protection of socio-economic rights must be approached as a national or constitutional commitment¹³³⁹ originated in the universality and fundamentality of human rights. The South African Constitutional framework governing socio-economic rights is influenced by the ICESCR.¹³⁴⁰ The South Africa's socio-economic rights were numerated in *Minister of Health and Others v Treatment Action Campaign and Others*¹³⁴¹ as including "access to education, land, housing, health care, food, water and social security."¹³⁴² These rights are "entrenched in the Constitution, and the state is obliged to take reasonable legislative and other measures within its available resources to achieve the progressive realisation of each of them."¹³⁴³

The inclusion of the right of access to electricity within the socio-economic rights cluster is nevertheless a complex proposition. The Constitutional Court acknowledges that "the Constitution explicitly recognises social and economic rights with regard to housing, as well as healthcare, food, water and social security."¹³⁴⁴ However, "the adjudication of issues in connection with access to the provision of electricity" requires the interpretation of other legal avenues. Skweyiya J compared electricity to water which is a constitutional right. Then he moved on and interplayed the constitutional "obligations on local government to provide basic municipal services, which include electricity."¹³⁴⁵ Nevertheless, Judge Schwartzman at the Witwatersrand Division of the Transvaal High Court in *Strydom v Minister of Correctional*

¹³³⁸ Pieters D *European Social Security and Global Politics* (2003) at 120-121.

¹³³⁹ *Ibid.*

¹³⁴⁰ Great Britain: Parliament: Joint Committee on Human Right, *The International Covenant on Economic, Social and Cultural Rights: Twenty First Report of Session 2003-04* (2004) at 16.

¹³⁴¹ 2002 (5) SA 717 (SACC).

¹³⁴² *Id* at para 94

¹³⁴³ *Id.*

¹³⁴⁴ *Nokotyana and Others v Ekurhuleni Metropolitan Municipality and Others* (CCT 31/09) [2009] ZACC 33; 2010 (4) BCLR 312 (CC) (19 November 2009) at 1. Hereafter referred to (the *Nokotyana*).

¹³⁴⁵ The *Joseph* at para 40.

*Services and Others*¹³⁴⁶ found that prisoners in the Maximum Security Section of the Johannesburg prison have the right to electricity in their cells.¹³⁴⁷

The critical issue lies in understanding and setting standards of living and adequate housing which may require electricity. The Constitutional Court adjudicated socio-economic rights and the state's obligations to provide them according to the individual "circumstance" of each case.¹³⁴⁸ Yacoob J considered in *Grootboom* that "the state's obligation to provide access to adequate housing depends on context, and may differ from province to province, from city to city, from rural to urban areas and from person to person."¹³⁴⁹ In the *Mazibuko* judgment, O'Regan J remarked:

"Just as *Grootboom* illustrated that what would be required of the state to achieve the right of access to adequate housing varies depending on context, this case illustrates that the obligation in relation to the right of access to sufficient water will vary depending upon circumstance."¹³⁵⁰

The Court uses similar deductions as are found in respect of international fundamental or human rights instruments. For example, O'Regan J referred to section 27(2) of the Constitution which requires that "the state must take reasonable legislative and other measures, within its available resources, to achieve the progressive realisation of each of these rights."¹³⁵¹ Yacoob J identified three key elements which define the extent of the state's obligation to provide access to socio-economic including:

- 1) The obligation to "take reasonable legislative and other measures";
- 2) "To achieve the progressive realisation" of the right; and

¹³⁴⁶ 1999 3 BCLR 342 (W).

¹³⁴⁷ For further reading and comments relating to *Strydom v Minister of Correctional Services* refer to De Vos P "Prisoner's rights litigation in South Africa since 1994: a critical evaluation" No. 3 CSPRI Research Paper Cape Town 2003 at 17. See also, Dejo O *An Integrative Rights-Based Approach to Human Development in Africa* (2009) at 207.

¹³⁴⁸ The *Mazibuko* at para 62.

¹³⁴⁹ The *Grootboom* at para 37.

¹³⁵⁰ The *Mazibuko* para at 62.

¹³⁵¹ The *Mazibuko* at para19.

3) “Within available resources.”¹³⁵²

Yacoob J remarked that “socio-economic rights are expressly included in the Bill of Rights; they cannot be said to exist on paper only.”¹³⁵³ He articulated the ICESCR, and the general comments issued by the “United Nations Committee on Social and Economic Rights which requires state party to progressively realise...the rights provided for in the Covenant and in the context of the full use of the maximum available resources,”¹³⁵⁴ taking into consideration “the improvement of all aspects of environmental and industrial hygiene”¹³⁵⁵

5.3 SOUTH AFRICA’S CONSTITUTIONAL EXAMINATION OF THE RIGHT TO ACCESS TO ELECTRICITY

The examination of access to electricity provision as part and parcel of those rights protected by international instruments requires its application in the state party to these instruments. The question arises as to whether the direct application of these international instruments is allowed.

Although, section 39 of the Constitution “obliges the court to consider international law as a tool to interpretation of the Bill of Rights,”¹³⁵⁶ the interpretation of the Constitution of South Africa cannot be always guided by the international instrument. In the *Grootboom*, Yacoob J did not accept that Article 11.1 of the ICESCR to guide the interpretation of section 26 of the Constitution because they are not identical.¹³⁵⁷ Therefore, the examination of access to electricity provision from the point of view of the Constitutional Court is relevant.

¹³⁵² The *Grootboom* at para. 38. See also, *Minister of Health and Others v Treatment Action Campaign and Others* at para 94.

¹³⁵³ The *Grootboom* at para 20.

¹³⁵⁴ The *Grootboom* at para 45.

¹³⁵⁵ Article 12(2)(b) of the ICESCR.

¹³⁵⁶ The *Grootboom* at para 26.

¹³⁵⁷ The *Grootboom* at para 28.

Access to the provision of electricity has been argued before the Constitutional Court “on several occasions.”¹³⁵⁸ In the *Joseph* case the applicants sought the “reconnection of the electricity supply to Ennerdale Mansions” where they lived.¹³⁵⁹ They argued that their rights including the “right of access to adequate housing under section 26 of the Constitution” and the “right to human dignity under section 10 of the Constitution” ...“were materially and adversely affected by the termination of electricity supply.”¹³⁶⁰ The Court measured the access to electricity against the right to access to water. Skweyiya J found that “in contrast to water, there is no specific provision in respect of electricity in the Constitution.”¹³⁶¹ However, Skweyiya J remarked that electricity remains “an important basic municipal service which local government is ordinarily obliged to provide.”¹³⁶² Skweyiya J focused his investigation on the right of the applicants “to receive electricity as a basic municipal service.” He sketched the linkage of the obligation of the local government to provide municipal services which is originated in section 152 of the Constitution and found its application in the Municipal Systems Act¹³⁶³ and the Housing Act.¹³⁶⁴ The Housing Act recognises section 26 of the Constitution which confers the right to everyone “to access to adequate housing, and the state must take reasonable legislative and other measures, within its available resources, to achieve the progressive realisation of this right.”¹³⁶⁵ This raises two fundamental issues:

- As to whether the criteria of adequate housing include access to electricity.
- As to whether the unequal set up case-to-case approach to the right to adequate housing the *Grootboom* decision from province to province, from city to city, from

¹³⁵⁸ The *Nokotyana* at para 1. For example, *Nokotyana and Others v Ekurhuleni Metropolitan Municipality and Others*, *Jaftha v Schoeman and Others*, *Van Rooyen v Stoltz and Others*, *Joseph and Others v City of Johannesburg and Others*, and *Lindiwe Mazibuko and others v City of Johannesburg*.

¹³⁵⁹ The *Joseph* at para 10.

¹³⁶⁰ The *Joseph* at para 12.

¹³⁶¹ The *Joseph* at para 40.

¹³⁶² The *Joseph* at para 40.

¹³⁶³ 32 of 2000.

¹³⁶⁴ 107 of 1997.

¹³⁶⁵ The preamble of the Housing Act.

rural to urban areas and from person to person, is to be followed in respect of access to electricity.

5.3.1 The Right to Adequate Housing

The right to housing in South Africa is a constitutional right enshrined in section 26 of the Constitution which provides that:

“(1) Everyone has the right to have access to adequate housing.

(2) The state must take reasonable legislative and other measures, within its available resources, to achieve the progressive realisation of this right.

(3) No one may be evicted from their home, or have their home demolished, without an order of court made after considering all the relevant circumstances. No legislation may permit arbitrary evictions.”

The right to adequate housing has been legislated in terms of the Housing Act which is intended to provide for housing development in order to establish and maintain a “habitable, stable and sustainable public and private residential environments.”¹³⁶⁶ The Housing Act ensures:

“viable households and communities in areas allowing convenient access to economic opportunities, and to health, educational and social amenities in which all citizens and permanent residents of the Republic will, on a progressive basis, have access to-

...

(a) potable water, adequate sanitary facilities and domestic energy supply.”¹³⁶⁷

¹³⁶⁶ Section 1(vi) of the Housing Act.

¹³⁶⁷ Section 2 of the Housing Act.

The Housing Act interlinks the constitutional right to water¹³⁶⁸ with “the right to receive electricity as a basic municipal service,”¹³⁶⁹ as established in the *Joseph*. Section 9(1)(a)(iii) of the Act provides:

“(1) Every municipality must, as part of the municipality’s process of integrated development planning, take all reasonable and necessary steps within the framework of national and provincial housing legislation and policy to—
(a) ensure that—
...
(iii) services in respect of water, sanitation, electricity, roads, storm water drainage and transport are provided in a manner which is economically efficient.”

In the *Joseph* case the applicants argued that their right “of access to adequate housing under section 26 of the Constitution”¹³⁷⁰ was materially and adversely affected by the termination of electricity supply. Similarly, in the *Nokotyana* case, the Counsel for the applicants “argued...that the right of access to adequate housing, recognised in section 26 of the Constitution, must be interpreted to include basic sanitation and electricity.”¹³⁷¹ In this context, it was expected that the Constitutional Court’s would have analysed as to whether “electricity is a component of the right to access to adequate housing.”¹³⁷² Instead, Skweyiya J moved to link access to electricity with basic municipal service in order to find the legal obligation on municipalities to provide access to electricity. Skweyiya J remarked that “although, in contrast to water, there is no specific provision in respect of electricity in the Constitution, electricity is an important basic municipal service which local government

¹³⁶⁸ Section 27(1)(b) of the Constitution.

¹³⁶⁹ The *Joseph* at para 33.

¹³⁷⁰ The *Joseph* para at 12.

¹³⁷¹ The *Nokotyana* at 24.

¹³⁷² See, footnote 6 in the *Nokotyana*.

is ordinarily obliged to provide,”¹³⁷³ because “the Housing Act...imposes a specific obligation on municipalities to provide basic municipal services, including electricity.”¹³⁷⁴

The land mark *Grootboom* case in which Yacoob J examined the right to housing and the components of adequate housing¹³⁷⁵ failed to establish a general standard by which to determine what constitute adequate housing in terms of section 26(1) of the Constitution.¹³⁷⁶ Skweyiya J did not find it necessary in the *Joseph* decision to address and rule on access to adequate housing and the right to dignity: “in the view I take of the matter it is not necessary to address this contention. Similarly, it is not necessary to consider the right to human dignity as a self-standing right for the purposes of section 3 of PAJA.”¹³⁷⁷

Although the courts have not established standards by which access to electricity must be considered to become a component of the right to adequate housing, the National Housing Code discerns technical and general¹³⁷⁸ guidelines which include electricity.¹³⁷⁸ For example, the

“norms and Standards in Respect of Standalone Permanent Residential Structures (Houses) Minimum Size and Facilities requires the minimum size of permanent residential structures to be provided by means of the housing subsidy, is 40 square metres of gross floor area. Each house as a minimum must be designed on the basis of:

¹³⁷³ The *Joseph* para at 40.

¹³⁷⁴ The *Joseph* para at 39.

¹³⁷⁵ Mhone G and Edigheji O *Governance in the New South Africa: The Challenges of Globalisation* (2004) 2nd ed at 152.

¹³⁷⁶ In the *Nokotyana* at para 38 Yacoob J held that “municipalities are *obliged* to provide water and *electricity* to the residents in their area *as a matter of public duty*.” Further, O’REGAN J concluded in the *Mazibuko* at para 168 that “...the City has sought to ensure that those with the lowest incomes are provided, not only with an additional free water allowance, but also with relief in relation to the charges levied for other services provided by the City such as electricity, refuse removal and sanitation services.”

¹³⁷⁷ The *Joseph* at para 32.

¹³⁷⁸ The National Housing Code, Technical and General Guidelines-Specified National Housing Programmes Part 3 2009.

- a) Two bedrooms;
- b) A separate bathroom with a toilet, a shower and hand basin;
- c) A combined living area and kitchen with wash basin; and
- d) A ready board electrical installation where electricity supply in the township is available.”¹³⁷⁹

It is clear that a ready board electrical installation is a standardised component of adequate housing. In *Grootboom* Yakoob J stated that:

“...housing entails more than bricks and mortar. It requires available land, appropriate services such as the provision of water and the removal of sewage and the financing of all of these, including the building of the house itself. For a person to have access to adequate housing all of these conditions need to be met: there must be land, there must be services, there must be a dwelling.”¹³⁸⁰

Yakoob J analysed the relevant international law instruments in order to reach the above inference. He identified provisions contemplated in the ICESCR, the UNCRC and further he referred to the UN Committee on Economic, Social and Cultural Rights¹³⁸¹ considering that “every state party is bound to fulfil a minimum core obligation by ensuring the satisfaction of a minimum essential level of the socio-economic rights, including the right to adequate housing.”¹³⁸² In the *Jaftha v Schoeman and Others, Van Rooyen v Stoltz and Others*¹³⁸³ case Mokgoro J followed Yakoob J by seeking guidance from international law. Mokgoro J attempted to examine “the concept of adequacy” which “is particularly significant in

¹³⁷⁹ The National Housing Code, Technical and General Guidelines...” at 27.

¹³⁸⁰ The *Grootboom* at para 35.

¹³⁸¹ The United Nations Committee on Economic, Social and Cultural Rights is consisted “of eighteen independent experts. Its purpose is to assist the United Nations Economic and Social Council to carry out its responsibilities relating to the implementation of the Covenant. See the *Grootboom* at para 29 and footnote 30.

¹³⁸² The *Grootboom* at para 30.

¹³⁸³ (CCT74/03) [2004] ZACC 25; 2005 (2) SA 140 (CC). Hereafter referred to as the *Jaftha*.

relation to the right to housing.”¹³⁸⁴ Mokgoro J confirmed that “while acknowledging that adequacy ‘is determined in part by social, economic, cultural, climatic, ecological and other factors’, it has identified ‘certain aspects of the right that must be taken into account for this purpose in any particular context.’”¹³⁸⁵

Access to electricity has been considered as a fundamental component of the criteria which form adequacy attached to access to housing. The National Housing Code, the Housing Act and the ICESCR contemplated access to electricity as an integral part of adequate housing. If the investigation into what constitutes integral components of the right to adequate housing was extended to include the obligations prescribed by Article 14.2.h of CEDAW, as well as the ICESCR provisions, the courts would have to embrace the right to access to electricity as protected by international human rights, and thus equally protected by the South African Constitution. Further, if Mokgoro J and Yakoob J had fully considered the inference made in *City Council of Pretoria v Walker*,¹³⁸⁶ where the court stated that “the white area had adequate facilities and the necessary infrastructure; it was equipped with meters which were relied on for the calculation of service charges for water and electricity,”¹³⁸⁷ it would have been possible to make the deduction that electricity installations ensuring supply are components of adequate housing whereby the definition of what constitutes adequate housing would have been better clarified and advanced.

It is clear that many factors including social, economic, cultural, climatic, ecological, sustainable development, etc. play a fundamental role in determining the notion of adequacy. Constitutional and International normative rules as well as the national statutory norms contained in the Municipal Services and Housing Acts have attributed qualitative and quantitative objectives to electricity which have thus become a requirement in the determination of the balance to be struck between the need achieve socio-economic rights and the equally protected preservation of the environment.

¹³⁸⁴ See, The Right to Adequate Housing (Art.11(1)) UNCESCR General Comment 4 (1991) 13 December 1991 E/1992/23 at para 8.

¹³⁸⁵ The *Jaftha* at para. 24.

¹³⁸⁶ (CCT8/97) [1998] ZACC 1.

¹³⁸⁷ *Id* at para 24.

The post-apartheid normative legal rules governing energy supply have driven the electrification programme, which is part of the reconstruction and transformative goal of South Africa's new dispensation. South Africa's courts have examined the right to access to electricity on the basis of constitutional and statutory obligations and have confirmed the responsibilities of the South African authorities to guarantee equality, development, and adequate housing including all their constitutive components.

However, the constitutional requirement to guarantee access to adequate housing as enshrined in Section 26(1) needs to be further developed by the Courts so as to clarify the standards which define the principle of adequate housing. Although the Constitution guarantees to everyone "the right to have access to adequate housing," it is at this stage not clear from the South African case law whether access to electricity is included.¹³⁸⁸ In the *Nokotyana* case

"it was argued on behalf of the applicants that the right of access to adequate housing, recognised in section 26 of the Constitution, must be interpreted to include basic sanitation and electricity. Counsel for the applicants also urged this Court to find that its previous decisions on section 26 were wrong in as much as the right of access to adequate housing was not given content and to find that the right in fact has a minimum content."¹³⁸⁹

The cluster of socio-economic rights has thus far not developed the specific constitutional standards that would be required to allow for an indisputable inclusion of the access to electricity in the definition of adequate housing. The Constitutional Court saw a problem in so including access to electricity because "in contrast to water," Skweyiya J did not find any "specific provision in respect of electricity in the Constitution."¹³⁹⁰ It seems that the Constitutional Court hesitated in its approach to access to electricity following interpretive maxim "*expressio unius est exclusio alterius*," because access to electricity is an un-spelled

¹³⁸⁸ The *Grootboom* para 19.

¹³⁸⁹ The *Nokotyana* at 24.

¹³⁹⁰ The *Joseph* para 40.

out provision.¹³⁹¹ However, the interpretation technique of “*expressio unius est exclusio alterius*” can only be applied why it would not frustrate the legislative intent of a norm, and it is secondary (or subsidiary) to the express interpretation rule contained in Article 39(1) of the Constitution whereby, “when interpreting the Bill of Rights, a court, tribunal or forum(a) must promote the values that underlie an open and democratic society based on human dignity, equality and freedom; (b) must consider international law; and(c) may consider foreign law”. Hence Skweyiya J reasoned that access to electricity must be managed according to “rights to equality of, and to justly administered, electricity services”¹³⁹².

5.3.2 The Equality Test Relating to Access to Electricity

The right to equality theoretically prescribes an equal and fairly administered distribution of electricity because “everyone is equal before the law and has the right to equal protection and benefit of the law.”¹³⁹³ Further, “the state may not unfairly discriminate directly or indirectly against anyone on one or more grounds, including race, gender, sex, pregnancy, marital status, ethnic or social origin, colour, sexual orientation, age, disability, religion, conscience, belief, culture, language and birth.”¹³⁹⁴ This means that electricity providers in principle are held to maintain an equal distribution of electricity supply without discrimination on prohibited grounds.

Although Yacoob J considered in *Grootboom* that “the state’s obligation to provide access to adequate housing depends on context, and may differ from province to province, from city to city, from rural to urban areas and from person to person,”¹³⁹⁵ it must also be considered that the post-apartheid legal construct of equality is restorative in nature, designed to achieve qualitative objectives and quantitative goals. These goals have been emerging to deal with amongst other things the historical background of access to electricity which was marked by gross discrimination. Electricity supply before 1994 was intended to serve “a

¹³⁹¹ Malzbender D “Domestic electricity provision in the democratic South Africa” (September 2005) *University of Pretoria* at 14- 15.

¹³⁹² *Ibid.*

¹³⁹³ Section 9(1) of the Constitution.

¹³⁹⁴ Section 9(3) of the Constitution.

¹³⁹⁵ The *Grootboom* at para 37.

modern industrial urban society to meet the needs of the industrial sector”¹³⁹⁶ including “mining, chemical and agricultural industries, which formed the backbone of the South African economy”¹³⁹⁷ and the needs of “a privileged white minority.”¹³⁹⁸ “The low-income households, particularly black people were only given underprivileged electricity access by apartheid.”¹³⁹⁹ In 1991, only 10% of “black South Africans in urban areas had access to domestic electricity.”¹⁴⁰⁰ The 1994 RDP highlighted the electricity inequality in the country and questioned the fact that:

“Although energy is a basic need and a vital input into informal sector, the vast majority of South African households and entrepreneurs depend on inferior and expensive fuels. Rural women in particular face a heavy burden of collecting wood, which is inefficient and unhealthy fuel. Coal, where it is available, is cheap but results in severe health problems, an underpaid workforce and the failure to access and internalise environmental costs. Although Eskom has excess generating capacity, only 36 per cent of South African households have access to electricity leaving more than three million households unelectrified. Further, some 19 000 black schools (86 per cent) and 4 000 clinics are currently without electricity...”¹⁴⁰¹

Inevitably the equality principle enshrined in the Constitution strongly influenced the reform of the energy sector, focusing it on fair distribution of electricity, electrification, and access to affordable electricity.

¹³⁹⁶ Para 3.3.1 of the 1998 White Paper on Energy Policy.

¹³⁹⁷ See, Malzbender “Domestic electricity provision in the democratic South Africa” at 2.

¹³⁹⁸ Section 3(3)(1) of the 1998 White Paper on Energy Policy. Further, in the *City Council of Pretoria v Walker* it was remarked that “Atteridgeville and Mamelodi are no different from other poverty-stricken black townships in South Africa; there are glaring disparities between the two townships on the one hand, and old Pretoria on the other...” (para 9). “The present case concerns two areas which were black and one that was white. The former were poorly developed in terms of infrastructure for municipal services; they had no meters to record consumption of electricity and water.” (*Id* at para 4).

¹³⁹⁹ Winkler H “Energy policies for sustainable development in South Africa” *Energy for Sustainable Development* Vol XI, no 1 (March 2007) at 26.

¹⁴⁰⁰ Lee R *African Women and Apartheid: Migration and Settlement in Urban South Africa* (2009) at 106.

¹⁴⁰¹ Para 2(7)(1) of the RDP.

The 1998 White Paper on Energy Policy set the transformative objective which marked the energy sector in South Africa. As a direct result, electricity demand expanded to include new consumers which were excluded before 1994, namely “disadvantaged households, small businesses, small farms and community services.”¹⁴⁰² The then Minister of the DME Dr P M Maduna stated in his Ministerial Forward of the 1998 White Paper on Energy Policy that the “government is committed to the promotion of access to affordable and sustainable energy services for small businesses, disadvantaged households, small farms, schools, clinics, in our rural areas and a wide range of other community establishments.”¹⁴⁰³ The short-term policy of the 1998 White Paper on Energy Policy focused on the disadvantaged population of South Africa. This materialised by “increasing access to affordable energy services”¹⁴⁰⁴ by promoting “access to affordable energy services for disadvantaged households, small businesses, small farms and community services”¹⁴⁰⁵

Quantitative goals were set to enhance the various aspects of service delivery, in order to improve the living standards of South African citizens.¹⁴⁰⁶ The quantitative goals are reflected in the electrification programme lead by Eskom. Eskom’s Integrated Report for 2011 reported on its rural development and land reform initiatives whereby rural areas were successively electrified and investing sum of R24 billion invested by Eskom to reduce the backlog in connections by 984 000 until 2016/17.”¹⁴⁰⁷

The Free Basic Electricity Policy breaks down the cost of 50KWh which is allocated to all qualifying households that meet the requirements of self-targeting.¹⁴⁰⁸ “The DME in consultation with the Department of Provincial and Local Government and the National

¹⁴⁰² Para 3(2)(2)(1) of the 1998 White Paper on Energy Policy.

¹⁴⁰³ See, Ministerial Forward of the 1998 White Paper on Energy Policy.

¹⁴⁰⁴ Para 3(2)(2) of the 1998 White Paper on Energy Policy.

¹⁴⁰⁵ Para 3(2)(2)(1) of the 1998 White Paper on Energy Policy.

¹⁴⁰⁶ Section (4)(1)(d) the Promotion of Equality and Prevention of Unfair Discrimination Act.

¹⁴⁰⁷ IRP at.6.

¹⁴⁰⁸ See, para 5(1) of the Free Basic Electricity Policy.

Treasury will determine the extent of provision of free basic electricity, which can be funded through inter-governmental transfers on an annual basis.”¹⁴⁰⁹

The evaluation mechanisms of the free basic electricity plan follow the listing of objectives of the Free Basic Alternative Energy Policy. Paragraph 3(3) of The Free Basic Alternative Energy Policy reads as follows:

“With respect to evaluation criteria, it is proposed that the following broad criteria should form the basis for the evaluation of Free Basic Services Policy at National, Provincial and Local levels (qualitative measures.):

- (a) Effectiveness: Were the results envisaged in the vision, mission and goals achieved?
- (b) Efficiency: Were human, financial, institutional and technical resources used in the most efficient and cost-effective way?
- (c) Adequacy: To what extent were core policy problems resolved by Free Basic Services strategies?
- (d) Equity: To what extent have Free Basic Services policies and strategies served to eliminate existing disparities, to promote greater representivity, and to ensure greater equity in employment and service delivery?
 - Black Economic Empowerment (BEE), Small, Medium and Micro-Enterprises (SMME's) and Job creation: How supportive is the policy to the BEE and job creation?
 - Quality of life of the indigent: What is the socioeconomic impact of the policy to the indigent?
- (e) Responsiveness: How responsive has the implementation of Free Basic Services Policies and strategies been to the actual needs and preferences of the stakeholders, in particular Municipalities?
- (f) Appropriateness: Have Free Basic Services Policies and strategies been appropriate to meeting the requirements of the overall policy context set by the Government?”

¹⁴⁰⁹ See, the Free Basic Electricity Policy at 25.

Although, electricity providers are obliged to endeavour promoting and achieving equality in electricity services,¹⁴¹⁰ the nature of electricity services in South Africa as a commercially produced commodity will contradict the objectives of substantive equality. Dugard J argues that leaving electricity to the rules of free market means that many people who are not able to pay will be deprived from a basic service.¹⁴¹¹ As a result, electricity becomes “environmentally unfriendly, unavailable or too expensive, especially for cooking and heating so liquid petroleum gas (LPG), paraffin, coal, wood fuels and even crop residues and animal manure are used for these purposes.”¹⁴¹² The role of access to electricity in restoring social justice and improving the quality of life of the people of South Africa thus remains significant in many ways. The constitutional right to equality, under the current circumstances remains limited to the obligations of any electricity producers, distributors and providers to administer the supply fairly and without discrimination on any of the forbidden grounds, as affordably as possible, whilst at the same time giving effect to the rights to a clean environment and the preservation of the environment generally. These three factors thus become the key determinants of the profile of the electricity supply infrastructure. In simple words, the administration of the country is required to manage the electricity supply infrastructure dynamics and balance them with environmental issues resulting from the inescapable need for base-load-coal-fired power plants, the threat of fossil resources exhaustion, uncontrollable price volatility of petrol and gas, and the intransigently limited reliability of renewable energy.

5.4 RECONCILING ENVIRONMENTAL PROTECTION WITH ACCESS TO ELECTRICITY

The development of electricity supply infrastructure is the responsibility of the government. Section 6 of the National Energy Act entrusts the Minister of Energy to deal with issues relating to the energy supply. However, the priority to uphold access to affordable electricity principle may not override environmental commitments. As both are legally protected, normative values are required to be balanced in such a manner that will ensure

¹⁴¹⁰ Section 9(2) of the Constitution.

¹⁴¹¹ Dugard J “Power to the people? A rights-based analysis of South Africa’s electricity services” 264 in McDonald DA ed *Electric Capitalism: Recolonizing Africa on the Power Grid* (2011) at 265.

¹⁴¹² Clark A and Drimie S “Energy sustainability for South Africa’s poor: weighing up the alternative” HSRC (2002) at 11.

the relative greatest fulfilment of both. Environmental commitments are constitutionally and universally relevant and they continue to influence energy supply infrastructure components. Section 24 of the Constitution guarantees for everyone the right:

- “a) to an environment that is not harmful to their health or well-being; and
- b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that-
 - i) prevent pollution and ecological degradation;
 - ii) promote conservation; and
 - iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.”

Section 24 of the Constitution has produced qualitative environmental goals, with accompanying quantitative normative objectives. These function as a dynamic system intended to regulate two types of environmental rights namely the right of human beings “to a healthy and safe environment, and the rights of the environment itself not to be degraded.”¹⁴¹³ Nonetheless, human activities have conflicted with environmental concerns. Therefore, the constitutional structure of the environmental clause has been interwoven with sustainable development objectives and reconciled with socio-economic rights in order to rationalise inevitable adverse environmental impacts concomitants with development.

Section 24(a) sets qualitative environmental goals which provide for a none-harmful environment to the health or the well-being of individuals, as a human right which requires protection. The health of individuals includes “mental and physical integrity,” while the well-being may involve a wider spectrum of environmental elements including “spiritual and psychological aspects.”¹⁴¹⁴ Nonetheless, South African courts have not established the definite interpretation of the concepts of health and well-being,¹⁴¹⁵ rather they linked

¹⁴¹³ Kidd M *Environmental Law* (2011) at 19.

¹⁴¹⁴ Feris L “Environmental rights and *locus standi*” (129-151) in Paterson A and Kotzé L eds *Environmental Compliance and Enforcement in South Africa: Legal Perspective* (2010) at 135-136.

¹⁴¹⁵ Summers R “Common Law remedies for environmental protection” (339-369) in Paterson and Kotzé eds *Environmental Compliance* (2010) at 366.

section 24 to sustainable development and socio-economic rights. In the *BP Southern Africa (Pty) Ltd v MEC for Agriculture, Conservation, Environment and Land Affairs*¹⁴¹⁶ the court held that:

“The concept of ‘sustainable development’ is the fundamental building block around which environmental legal norms have been fashioned, both in South Africa, and is reflected in s 24(b)(iii) of the Constitution.

Pure economic principles will no longer determine, in an unbridled fashion, whether a development is acceptable. Development, which may be regarded as economically and financially sound, will, in future, be balanced by its environmental impact, taking coherent cognisance of the principle of intergenerational equity and sustainable use of resources in order to arrive at an integrated management of the environment sustainable development and socio-economic concerns. By elevating the environment to a fundamental justiciable human right, South Africa has irreversibly embarked on a road, which will lead to the goal of attaining a protected environment by an integrated approach, which takes into consideration, *inter alia*, socio-economic concerns and principles”¹⁴¹⁷

The inclusion of the “environmental rights as fundamental, justiciable human rights” in the Constitution requires “environmental consideration to be accorded appropriate recognition and respect in the administrative process.”¹⁴¹⁸ Section 24(b) prescribes quantitative environmental protection principles which are intended to be affected by environmental statutes. The state is mandated to take the necessary measures required to accomplish the procedural right contemplated in section 24(a). That is to say, the South African constitutional dispensation has dictated the shape of environmental legal construct of the

¹⁴¹⁶ (03/16337) [2004] ZAGPHC 18 (31 March 2004).

¹⁴¹⁷ *BP Southern Africa (Pty) Ltd v MEC for Agriculture, Conservation, Environment and Land Affairs* at 25.

¹⁴¹⁸ *Director: Mineral Development, Gauteng Region, and Another v Save the Vaal Environment and Others* (133/98) [1999] ZASCA 9; [1999] 2 All SA 381 (A) (12 March 1999) at para 20.

country. Consequently, the South Africa's environmental law is predicated by realising the constitutional ideal of "ecologically sustainable development."¹⁴¹⁹

South Africa's environmental law has become a matrix of legal normative rules, where the NEMA is centred in the architecture of norms providing "co-operative, environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of state..."¹⁴²⁰ This has been complemented by myriad of legislations including Marine Living Resources Act,¹⁴²¹ MPRDA, National Forest Act,¹⁴²² National Heritage Resources Act,¹⁴²³ Genetic Organism Modification Act,¹⁴²⁴ National Environmental Management: Biodiversity Act,¹⁴²⁵ National Environmental Management: Protected Areas Amendment Act,¹⁴²⁶ National Environmental Management Air: Quality Act,¹⁴²⁷ National Environmental Management: Waste Act,¹⁴²⁸ National Environmental Management: Integrated Coastal: Management Act¹⁴²⁹ and National Radioactive Waste Disposal Institute Act.

The energy sector is unequivocally the main contributor to global warming accounting "for two-thirds of total greenhouse emissions."¹⁴³⁰ Although the energy sector has larger environmental impacts than most other economic sectors,¹⁴³¹ the development of energy is vital for all economic sectors and for promoting adequate living standards of all citizens.

¹⁴¹⁹ Section 24(b)(iii) of the Constitution.

¹⁴²⁰ See, the preamble of the NEMA.

¹⁴²¹ 18 of 1998.

¹⁴²² 84 of 1998.

¹⁴²³ 25 of 1999.

¹⁴²⁴ 15 of 1997.

¹⁴²⁵ 10 of 2004.

¹⁴²⁶ 31 of 2004.

¹⁴²⁷ 39 of 2004.

¹⁴²⁸ 59 of 2008.

¹⁴²⁹ 24 of 2008. See also, Paterson A and Kotzé L "Introduction" in Paterson and Kotzé eds *Environmental Compliance* (2010) at 2.

¹⁴³⁰ Strydom HA and King N *Environmental Law Management in South Africa* (2009) 2nd ed at 792.

¹⁴³¹ The 1998 White Paper on Energy policy at 7.

Thus, the electricity supply infrastructure involves two competing interests, namely access to electricity and the protection of the environment. The maintenance of the principle of access to affordable electricity requires the development of an adequate electricity supply infrastructure so as to advance “justifiable economic and social development.”¹⁴³² The rationalisation of negative environmental impacts accompanying the development of an electricity supply infrastructure lies in the reconciliation of “ecology and economics by directing economic development towards less polluting production methods at the same time ensuring optimal resource distribution economy.”¹⁴³³ Governments are thus obliged to favour the less polluting component of the electricity supply infrastructure when enabling electricity enterprises to build adequate electricity supply infrastructures, capable of enhancing electricity service delivery, so as to achieve the modern objectives and normative values pertaining to electricity.

Taking into consideration that the “justifiable economic and social development” contemplated in Section 24(b)(iii) of the Constitution is “no longer” the only determinant factor as to “whether a development is acceptable,” the Government has to reconcile the electricity supply infrastructure with the environment by “taking coherent cognisance of the principle of intergenerational equity and sustainable use of resources in order to arrive at an integrated management of the environment sustainable development and socio-economic concerns.”¹⁴³⁴

The socio-economic concerns pertaining to affordable electricity require the government to ensure access to affordable electricity and the continuity of electricity supply in order to avoid potential legal scrutiny. This entails the government to enable electricity enterprises to build an adequate electricity supply infrastructure. AT the same time, the government is responsible for the protection of the environment.

¹⁴³² 24(b)(iii).

¹⁴³³ Streimikiene D and Ciegis R “Sustainable energy development and climate change mitigation” 7 in Larson B ed *Sustainable Development: Research Advances* (2007) at 17.

¹⁴³⁴ *BP Southern Africa (Pty) Ltd v MEC for Agriculture, Conservation, Environment and Land Affairs*.

The management of the environment in the context of the operations of the South Africa's electricity utilities is provided by subjecting their operations to licencing and authorisation regimes:

- **The licencing regime** which is granted by the NERSA¹⁴³⁵ and the NNR. The former undertakes, "the functions of the Gas Regulator as set out in section 4 of the Gas Act,"¹⁴³⁶ the functions of the Petroleum Pipelines Regulatory Authority as set out in section 4 of the Petroleum Pipelines Act,¹⁴³⁷ and the functions of the National Electricity Regulator as set out in section 4 of the Electricity Regulation Act of 2006."¹⁴³⁸ The latter is "a juristic person"¹⁴³⁹ mandated to "grant or amend nuclear authorisations."¹⁴⁴⁰ "Nuclear authorisation means a nuclear installation licence, nuclear vessel licence, certificate of registration or certificate of exemption."¹⁴⁴¹ The NNR "provides for the protection of persons, property and the environment against nuclear damage..."¹⁴⁴² which may occur at a licenced power plant through its life span.
- **The authorisation regime** which is entrusted to various departments involved in environmental management, in particular the Department of Environmental Affairs, the Department of Tourism, the Department of Water Affairs and Forestry, the Department of Minerals and Energy, the Department of Land Affairs, the Department of Health, the Department of Labour."¹⁴⁴³ Added to these are the

¹⁴³⁵ Section 40 of 2004 of the NERSA.

¹⁴³⁶ Section 4(1)(a) of NERSA.

¹⁴³⁷ Section 4(1)(b) of NERSA.

¹⁴³⁸ Section 4(1)(c). See also section 4(1)(c) of the National Energy Regulator Amendment Bill 8 December 2011.

¹⁴³⁹ Section 3 of the NNRA.

¹⁴⁴⁰ Section 7(1)(a) of the NNRA.

¹⁴⁴¹ Section 1(xiv) of the NNRA.

¹⁴⁴² Section 5(1) of the NNRA.

¹⁴⁴³ Schedule 2, section 11(2) of the NEMA.

relevant sub-national authorities including municipalities, provincial¹⁴⁴⁴ and local government.¹⁴⁴⁵

The analysis of licensing request by electricity enterprises is not intended to enforce stringent environmental guidelines. Rather is intended to promote sustainable development by applying a concept of environmental management which:

- Prioritises “people and their needs” serving “their physical psychological, developmental, cultural and social interests equitably.”¹⁴⁴⁶
- Demonstrates that they are “socially, environmentally and economically sustainable.”¹⁴⁴⁷
- Requires avoiding “all relevant factors”¹⁴⁴⁸ which may have adverse impacts on the environment. In the case, these factors “cannot be altogether avoided, are minimised and remedied.”¹⁴⁴⁹
- Requires transparency and access to information according to the law.¹⁴⁵⁰
- Requires a fair and just administrative act according to the law.¹⁴⁵¹
- Requires the assessment of environmental impacts according to the law.¹⁴⁵²
- Creates new rules pertaining to *locus standi*, by which “any person or group of persons may seek appropriate relief in respect of any breach or threatened breach of any provision of this Act...”¹⁴⁵³

¹⁴⁴⁴ Schedule 4 of the Constitution recognises the legislative competence of the provincial government in the context of environment.

¹⁴⁴⁵ In terms of section 152(2)(d) Constitution, the promotion of “safe and healthy environment” is one of the objects of local government.

¹⁴⁴⁶ Section 2(1)(2) of NEMA.

¹⁴⁴⁷ Section 2(1)(3) of NEMA.

¹⁴⁴⁸ Section 2(1)(4)(a) of NEMA.

¹⁴⁴⁹ Section 2(1)(4)(a)(i) of NEMA.

¹⁴⁵⁰ Section 2(4)(k) of NEMA.

¹⁴⁵¹ Section 2(4)(c) NEMA.

¹⁴⁵² “In terms of s 22(2), read with the applicable regulations, the DG was required first to consider environmental impact reports (EIRs)...” See, the *Earthlife Africa* at para 19.

¹⁴⁵³ Section 32(1) the NEMA.

- Creates continuous control over all activities through the powers vested in the regulators to amend the granted licence or revoke it.
- Creates emission constraint framework according to the country's commitments emanating from the ozone layer¹⁴⁵⁴

The electricity supply infrastructure of South Africa has put the country “at a critical turning point” rendering economic growth at risk, which requires “a collaborative effort to meet the country’s energy demands and diversify its generation portfolio.”¹⁴⁵⁵

Figure V- 1: South Africa’s energy supply infrastructure¹⁴⁵⁶

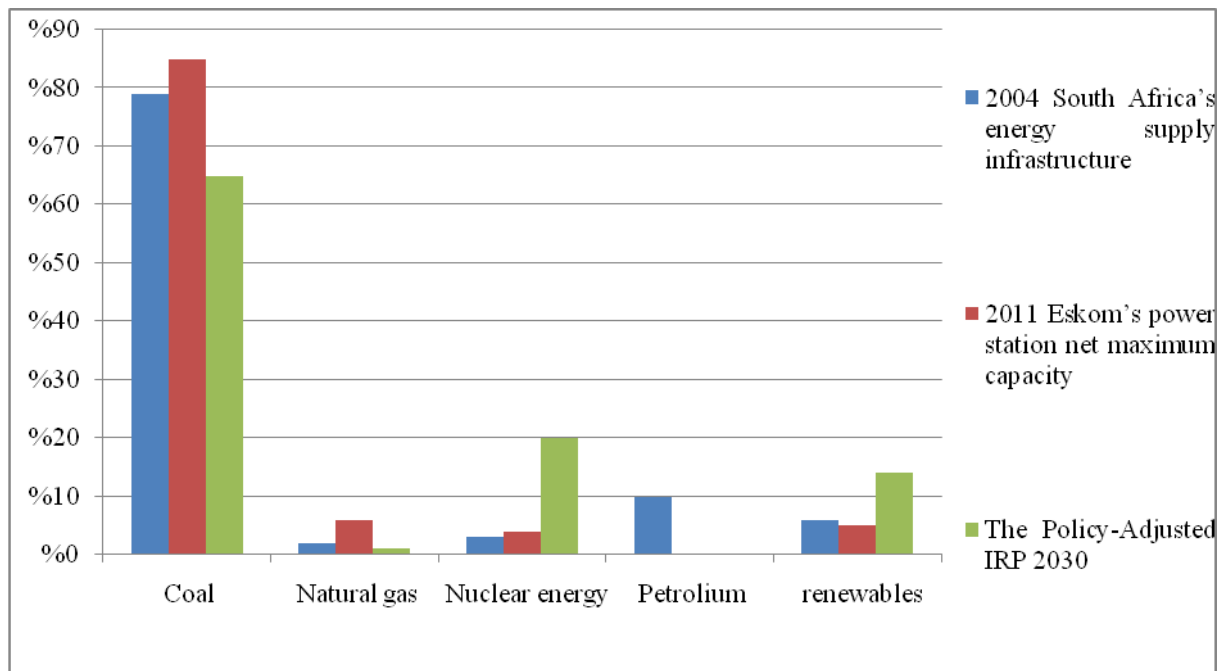


Figure 5.1 shows the country’s energy infrastructure components include coal, natural gas, nuclear energy, petroleum, and renewables. The South Africa’s total generating capacity amounts to just over 40 GW, and this is intended to reach 85,241 GW by 2035.¹⁴⁵⁷

¹⁴⁵⁴ South Africa acceded to the UN Framework Convention on Climate Change in August 1997 and the Kyoto Protocol in February 2004.

¹⁴⁵⁵ Saylor S, Agilonu B, and Pichard S “Power in South Africa: restructuring the South African power industry” (1-65) (December 2011) *Global Business Report* at 65.

¹⁴⁵⁶ IRP at 11.

¹⁴⁵⁷ IRP at 11.

The IRP proposed four policy priorities including nuclear options, emission constraints, import option, and energy efficiency.¹⁴⁵⁸ The RBS envisioned in the IRP should consider an “appropriate balance between the expectations of different stakeholder considering a number of key constraints and risks including

- a) Reducing carbon emissions;
- b) New technology uncertainties such as costs, operability, lead time to build etc;
- c) Water usage;
- d) Localisation and job creation;
- e) Southern African regional development and integration; and
- f) Security of supply.”¹⁴⁵⁹

The IRP considers the reduction of carbon emissions in Policy Issue 2 which deals with emission constraints. The DoE conceded to “commit to the emission constraint as reflected in the RBS.”¹⁴⁶⁰ Consequently, “the acceleration of the coal options in the Policy-Adjusted IRP should be allowed with an understanding of the impact on emission targets and the carbon tax policy.”¹⁴⁶¹ Nevertheless, “the current high fossil fuel prices and the measures to reduce greenhouse gas emissions seem to give a new impetus to generation technologies that do not use fossil fuels.”¹⁴⁶² South Africa’s Long Term Mitigation Scenarios contemplates nuclear energy as the most significant mitigation component which is endorsed by Cabinet’s “vision of a carbon zero electricity grid comprising renewables and nuclear in equal part.”¹⁴⁶³

¹⁴⁵⁸ IRP at 11.

¹⁴⁵⁹ Para 2.1 of the IRP.

¹⁴⁶⁰ Para 4.6.a of the IRP.

¹⁴⁶¹ Para 8.4 of the IRP.

¹⁴⁶² Appendix 9: Documentation from the Legal Resources Centre (LRC), Submission on the Legal Compliance Analysis of the Draft Environmental Scoping Report (“DSR”) for A proposed 400 MW(T) Pebble Bed Modular Reactor Demonstration Power Plant (PBMR DPP) (Rev 1 Jan 2006) at the Koeberg Power Station Site. Submitted in Cape Town on behalf of Earthlife Africa (Cape Town) (7 March 2006).

¹⁴⁶³ Tyler E “Aligning South African energy and climate change mitigation policy” (December 2009) *Energy Research Centre, University of Cape Town* at 5.

The Strategic options for climate change mitigation contemplated in the UN guide to climate neutrality identify nuclear energy as a mitigating technology against GHGs.¹⁴⁶⁴ South Africa thus intends to benefit from nuclear energy as an environmental friendly technology which can be deployed in electricity supply and transport systems as for instance in France where all trains run on electricity generated by nuclear power.¹⁴⁶⁵

Nuclear energy represents a reconciliatory environmental wedge in the energy mix and enhances access to electricity significantly. Advantageously, nuclear energy functions as a double edged tool achieving important constitutional purposes, in particular human dignity, socio-economic rights, GHGs reduction and climate change.

5.5 CONCLUSION

Nuclear energy can under certain conditions, as they are prevailing in South Africa, be the only option for the government to achieve the constitutional and statutory developmental objectives whilst mitigating adverse environmental impacts resulting from electricity generation. Most of the attempts to identify the legal foundations for the right to access to electricity lead to breaking down the qualitative and quantitative objectives of electricity supply, drawing the linkage between electricity supply infrastructure and constitutional governance of human dignity, socio-economic rights and environmental protection.

The universal right to access to affordable electricity has found its way into international legal instruments and into a number of South Africa's statutory provisions. International normative rules stipulate the right to access to affordable electricity in the context of the UN Programmes pertaining to health, poverty elevation, water shortage, education, and in particularly women.¹⁴⁶⁶ International instruments have provided guidance relating to both socio-economic rights and access to electricity. The meaning of adequate housing has been dealt with by "the United Nations Committee on Economic, Social and Cultural Rights (the

¹⁴⁶⁴ *Kick the Habit: A UN Guide to Climate Neutrality* (2008) UNEMG, UNEP/GRID-Arendal at 18.

¹⁴⁶⁵ *Ibid* at 121.

¹⁴⁶⁶ The UNIFEM was established by the UNGA resolution 39/125 (1984). <http://www.dfa.gov.za/foreign/Multilateral/inter/unifem.htm> (accessed 29 January 2012).

Committee) in the context of the" ICESCR of 1966. Article 11(1) of the Covenant in the following terms:

"The States Parties to the present Covenant recognize the right of everyone to an adequate standard of living for himself and his family, including *adequate food, clothing and housing*, and to the continuous improvement of living conditions. The States Parties will take appropriate steps to ensure the realization of this right, recognizing to this effect the essential importance of international co-operation based on free consent."

Access to electricity is an integral part of "adequate standard of living," which "has become virtually indispensable..."¹⁴⁶⁷ Access to electricity is essential in promoting the standard of life targets and impacts on the rights of women and children. The CEDAW outlines electricity supply explicitly as a reference in the universal endeavour to end discrimination against women.¹⁴⁶⁸ The Southern African Development Community (SADC) Protocol on Energy¹⁴⁶⁹ obliges the government "to ensure, through collective action, the progress and well-being of the people of SADC Region through the provision and use of energy for people throughout the SADC Region, particularly ensuring that low income residents have access to energy."¹⁴⁷⁰ In terms of Annex 1(1)(f) of the Protocol "the provision of universal and affordable service to all citizens and the importance of quality customer service in national electricity policies" should be emphasised.¹⁴⁷¹

¹⁴⁶⁷ The *Joseph* at para 34.

¹⁴⁶⁸ The MDGs have interwoven access to electricity with development propagating universal access to electricity provisions as a pivotal element in the restoration of socio-economic commitments. The MDGs including access to electricity can be argued that they have become part of international customary law. It is submitted that access to electricity has developed to become part of international customary law which has gained the criteria of the North Seas Shelf cases. That is to say, access to electricity requires a settled practice that is accompanied by the *opinio juris sive necessitates* ("an opinion of law or necessity"). See, Brownlie I *Principles of Public International Law* (2008) at 9-10.

¹⁴⁶⁹ SADC Protocol on Energy which was established in accordance with Article 22 of the Treaty establishing SADC.

¹⁴⁷⁰ See the preamble of SADC Protocol on Energy.

¹⁴⁷¹ Annex 1(1)(f) of SADC Protocol on Energy.

The South African Constitutional Court has undertaken many steps to secure the enforcement of international human rights obligations in the hierarchy of legal norms and has opened new legal avenues for the defense of socio-economic rights through litigation, including the energy supply infrastructure. That is to say, the government is under scrutiny to uphold the right to access to affordable electricity as a condition of adequate living conditions. In a very similar manner the government's policies and actions regarding the protection of the environment are also justiciable.

The South African government has endeavoured to achieve the fulfilment of socio-economic rights, equality and human dignity through its multifaceted reconstruction programme which has been defined in several policy documents. The National Infrastructure Plan (NIP)¹⁴⁷² identifies eighteen Strategic Integrated Projects (SIPs) in order to achieve economy transformation, job creation, enhancing the delivery of basic services, and promoting "the integration of African economies." SIP 10 is concerned with "electricity transmission and distribution for all."

- "Expand the transmission and distribution network to address historical imbalances, provide access to electricity for all and support economic development.
- Align the 10-year transmission plan, the services backlog, the national broadband roll-out and the freight rail line development to leverage off regulatory approvals, supply chain and project development capacity."¹⁴⁷³

The post-apartheid norms which are intended to remedy the previous injustices¹⁴⁷⁴ identify the connection between access to energy and poverty alleviation, development and social welfare. In her ministerial forward to the 1998 White Paper on the Energy Policy of the Republic of South Africa, the then Deputy Minister of Minerals and Energy Ms S. Shabangu

¹⁴⁷² South African Government Information, National Infrastructure Plan of 2012.

¹⁴⁷³ The National Infrastructure Plan of 2012.

¹⁴⁷⁴ Hathaway T and Pottinger L "The great hydro-rush: the privatisation of South Africa's rivers" (149-179) in McDonald D ed *Electric Capitalism: Recolonising Africa on the Power Grid* (2009) at 166.

stated that “energy ... is about reducing poverty and about increasing access to basic needs so as to allow people the freedom of self-development.”¹⁴⁷⁵

The South African government is aware of the energy inherited imbalances and envisions the extension of the electrification concept in order to include the affordability concept. In her ministerial forward of the Free Basic Electricity Policy for the Republic Of South Africa of 2003 Minister Phumzile Mlambo-Ngcuka stated the following:

“In addressing the energy imbalance in the domestic sector, we have' embarked on an aggressive Integrated National Electrification Programme (electrification programme), which seeks to address the electrification backlog by 2012. While the electrification programme is progressing well, we soon realised that there is a need to address affordability issues in electrified households.”¹⁴⁷⁶

The government has drafted policies relating to redistribution of electricity in order to electrify all South African citizens. These include the Integrated National Electrification Programme, Free Basic Electricity and Free Basic Alternative Energy which are intended to address the inherited imbalances pertaining to electricity.¹⁴⁷⁷ These three documents are premised upon the acknowledgement of the universal access to affordable and reliable electricity as part and parcel of the objectives of international human rights instruments. The first statutes to have incorporated these objectives are the National Energy Act and the Electricity Regulation Act.

The guarantees of the Bill of Rights specifically include socio-economic rights which on proper interpretation imply the right to access to electricity. This view is confirmed by the underlying assumptions of a transformative constitutional order that “tends to favour

¹⁴⁷⁵ The 1998 White Paper on Energy policy at 4.

¹⁴⁷⁶ See, the ministerial forward by Minister Phumzile Mlambo-Ngcuka in the Free Basic Electricity Policy.

¹⁴⁷⁷ The government of South Africa combined three programmes in order to address the inherited electricity imbalances namely Integrated National Electrification Programme, Free Basic Electricity and Free Basic Alternative Energy. See, the Ministerial forward of the Free Basic Alternative Energy Policy by the then Minister of DME Buyelwa Sonjica.

egalitarianism and a social welfare dispensation”¹⁴⁷⁸ “inducing large-scale social change.”¹⁴⁷⁹

The issue of access to amenities assimilated into the socio-economic rights cluster and the right to access to electricity have been considered by the Constitutional Court “on several occasions.”¹⁴⁸⁰

In terms of the National Energy Act, the government is required “to ensure that diverse energy resources are available, in sustainable quantities and at affordable prices, to the South African economy in support of economic growth and poverty alleviation...”¹⁴⁸¹ The Act requires the Minister of Energy to develop an Integrated Energy Plan annually¹⁴⁸² intended “to deal with issues relating to the supply, transformation, transport, storage of and demand for energy in a way that accounts for security of supply within the available economically available energy resources providing affordable and reliable clean electricity supply.

The Electricity Regulation Act is intended “to establish a national regulatory framework for the electricity supply industry...” In terms of section 2(d) of the Act the “universal access to electricity” should be facilitated which requires the expansion of “efficient, effective, sustainable and orderly development and operation of electricity supply infrastructure...,”¹⁴⁸³ taking into consideration “the interests and needs of present and future electricity customers...,” and “having regard to the governance, efficiency, effectiveness and long-term sustainability of the electricity supply industry within the broader context of economic energy regulation in the Republic.”¹⁴⁸⁴

According to Eskom fuel cost estimates “average coal costs have risen to R66/MWhe. Coal costs are projected to rise 2 percent a year.” The open-cycle gas turbine cost of

¹⁴⁷⁸ Venter F *Constitutional comparison: Japan, Germany, Canada and South Africa as Constitutional States* (2007) 4th ed at 141.

¹⁴⁷⁹ Quinot G *State Commercial Activity: A Legal Framework* (2009) 1st ed at 129.

¹⁴⁸⁰ The *Mkontwana* para 97.

¹⁴⁸¹ See, the preamble of the National Energy Act.

¹⁴⁸² *Id* section 6(1).

¹⁴⁸³ Section 2(a) of the Electricity Regulation Act.

¹⁴⁸⁴ Section 2 (b) of Electricity Regulation Act.

R1,500/MWhe confirms the impact of recent oil price rise. The fuel cost of nuclear power has risen to R70/MWhe.¹⁴⁸⁵ The CEO Ayanda Myoli of the Nuclear Industry Association of South Africa (Niasa) “argued that nuclear should not be considered more expensive than coal or gas, citing a joint study conducted by the International Energy Agency (IEA) and the Nuclear Energy Agency that showed nuclear to be competitive with both base-load alternatives.”¹⁴⁸⁶

¹⁴⁸⁵ Newbery D and Eberhard A “South African network infrastructure review: electricity” (1-86) (2007 updated 2008) *A Paper Written for National Treasury and the Department of Public Enterprises of South Africa* at 20.

¹⁴⁸⁶ Creamer T “Nuclear body defends role of technology in SA’s energy future” (17th January 2013) *Engineering News* <http://www.engineeringnews.co.za/> (accessed 12 February 2013).

CHAPTER VI

South Africa's governance of access to electricity and nuclear energy

6.1 INTRODUCTION

The normative rules governing the South African electricity supply infrastructure and access to electricity supply is made up of the following policy documents and legal instruments:

- The 1998 White Paper on Energy Policy.
- The 2003 Renewable Energy Policy.
- The 2008 Nuclear Energy Policy.
- The Integrated Resource Plan (IRP).
- The National Development Plan (NDP).
- Public Administrative Justice Act (PAJA).
- Electricity Regulation Act.
- The National Energy Regulator Act (NERSA).
- National Energy Act.
- National Nuclear Regulator Act (NNRA)
- Nuclear Energy Act (NEA).
- Eskom Conversion Act.
- The National Environmental Management Act (NEMA).
- The Housing Act.
- Municipal System Act.

In the *Joseph* case, Skweyiya J identified three points of reference in resolving the issue of access to electricity:

- Section 26 of the Constitution to show the right to access to adequate housing which is effected by the Housing Act.
- Section 153 of the Constitution defines the obligations of the local governments which are detailed in Municipal System Act.

- Section 33 of the Constitution which draws the linkage between rights of citizens and obligations of the administration to facilitate such rights creating expectations predicted by procedures embodied in PAJA.

A further most important finding in the *Joseph* case, in the words of Skweyiya J was “... that this matter concerns the relationship between a public service provider and consumers with whom it has no contractual relationship, and that principles of administrative and constitutional law – and not the law of contract – govern the issues that arise.”¹⁴⁸⁷ Further, “the respondents accepted that the decision to terminate the electricity supply constituted administrative action *vis-à-vis* Mr Nel with whom City Power contracted to provide electricity.”¹⁴⁸⁸ This means that the administrative act to cut the supply of electricity must comply with the elements of just administrative action as defined in PAJA. This is why Skweyiya J inquired about the application of section 3 of PAJA in order to settle the issues arising from the “constitutional relationship that exists between a public service provider and the members of the local community.”¹⁴⁸⁹

The findings in the *Joseph* case revolved around the right of the applicants to access to electricity as part of the “special cluster of relationships” that exist between a municipality and citizens¹⁴⁹⁰ and the Court the local government as the service provider. Skweyiya J in the *Jospeh* judgment did not need to investigate the power generation process and electricity distribution through the national grid and the sub-grid.

The legal framework which governs electricity supply in South Africa is not unique and corresponds to the composition of the government which “is constituted” of “national, provincial and local spheres of government which are distinctive, interdependent and interrelated.”¹⁴⁹¹ These three spheres of government are bound by the co-operative principle which is required to secure among other things “the well-being of the people of

¹⁴⁸⁷ The *Joseph* at para 18.

¹⁴⁸⁸ The *Joseph* at para 26.

¹⁴⁸⁹ The *Joseph* para 18.

¹⁴⁹⁰ The *Joseph* para 25.

¹⁴⁹¹ Section 40(1) of the Constitution.

the Republic”¹⁴⁹² and the adherence “to agreed procedures.”¹⁴⁹³ In simple words, the electricity provision is required to be supplied by the administration which has established “minimum standards required for the rendering of services.”¹⁴⁹⁴

This chapter is intended to explore the role of the structures involved in the planning of the electricity supply infrastructure and in the distribution of electricity. Of course the role of the DoE is the most significant because the National Energy Act mandates the Minister of Energy to develop energy planning, institutions, and human resources involving in energy governance which are adequate to the country’s need. As the Minister embarks on his duties, the components of electricity supply infrastructure are factorised in the “integrated energy planning” which requires the Minister to “develop and, on an annual basis, review and publish the Integrated Energy Plan the Gazette.”¹⁴⁹⁵ The Integrated Energy Plan is technical and will be based on the collected, collated, and analysed “energy data and information.”¹⁴⁹⁶ The introduction of new generation capacity which “is needed to ensure the continued uninterrupted supply of electricity”¹⁴⁹⁷ is determined by Minister. The new generation capacity is based on the consultation with the Regulator¹⁴⁹⁸ taking into consideration the requirements of the Environmental Conservation Act and NEMA.¹⁴⁹⁹

The chapter therefore examines two factors in the electricity supply provision namely the electricity supply infrastructure and the various structures responsible for supply.

- Local governments, Eskom, and the DoE are responsible for supplying electricity according to acceptable standards attached to electricity supply. Achieving these standards requires an adequate electricity supply infrastructure. Inevitably, the

¹⁴⁹² Section 41(1) (b) of the Constitution.

¹⁴⁹³ Section 41(1)(h)(v) of the Constitution.

¹⁴⁹⁴ Section 44(2)(d) of the Constitution.

¹⁴⁹⁵ Section 6(1) of the National Energy Act.

¹⁴⁹⁶ Section 3(4)(a) of the National Energy Act.

¹⁴⁹⁷ Section 46(1)(a) of the Electricity Regulation Act.

¹⁴⁹⁸ Section 46(1) of the Electricity Regulation Act.

¹⁴⁹⁹ Section 46(2)(c) of the Electricity Regulation Act.

selection of the components of the electricity supply infrastructure has the greatest impact on the electricity supply standards.

- The criteria of electricity supply provision determine the quality of the electricity current which passes through both the national and sub-national grids. The electricity supply infrastructure is the main structure responsible for the electricity current. The quality of the current influences the economic, environmental, technological, social and political analysis of the selection criteria for the components of the electricity supply infrastructure.

The examination of these two factors is intended to illustrate the following:

- The significant impact of the deployment of nuclear energy as a component of the electricity supply infrastructure, on the quality of the electricity current.
- The availability of uranium in South Africa as a contributing factor towards the security of supply required by the law.
- Environmental commitments and sustainable development objectives which require the diversification of energy components.
- The introduction of further rationalisation for the development of nuclear power.

6.2 LOCAL GOVERNMENTS' RESPONSIBILITY TO SUPPLY ELECTRICITY

The local governments are mandated “to develop service delivery capacity in order to meet the basic needs of all inhabitants of South Africa, irrespective of whether or not they have a contractual relationship with the relevant public service provider.”¹⁵⁰⁰

The legal frameworks governing the functionality of local governments “impose constitutional and statutory obligations on local governments to provide basic municipal services,¹⁵⁰¹ which include electricity.”¹⁵⁰² Two main pieces of legislations give effect to the constitutional requirement to access to basic services and regulate access to electricity:

¹⁵⁰⁰ The *Joseph* at para 34.

¹⁵⁰¹ Municipalities have developmental duties towards local communities which require structuring and managing their “administration and budgeting and planning processes to give priority to the basic needs of the community, and to promote the social and economic development of the community.”

Firstly: The Municipal Systems Act which provides “for the core principles, mechanisms and processes that are necessary to enable municipalities to move progressively towards the social and economic upliftment of local communities, and ensure universal access to essential services that are affordable to all...”¹⁵⁰³ The Act requires “the council of a municipality, within the municipality’s financial and administrative capacity and having regard to practical considerations, has the duty to”¹⁵⁰⁴...“give members of the local community equitable access to the municipal services to which they are entitled”¹⁵⁰⁵ These municipal services are intended to give effect to the Constitutional requirements including:¹⁵⁰⁶

- Prioritising “the basic needs of the local community.”¹⁵⁰⁷
- Promotion of “the development of the local community.”¹⁵⁰⁸ and
- Ensuring “that all members of the local community have access to at least the minimum level of basic municipal services.”¹⁵⁰⁹

Secondly: The Housing Act which “imposes a specific obligation on municipalities to provide basic municipal services, including electricity.” Section 9(1)(a)(iii) of the Act provides that “every municipality must, as part of the municipality’s process of integrated development planning, take all reasonable and necessary steps within the framework of national and provincial housing legislation and policy to”¹⁵¹⁰ ...“ensure that”¹⁵¹¹ ...“services in respect of water, sanitation, electricity, roads, storm-water drainage and transport are provided in a manner which is economically efficient.”¹⁵¹²

¹⁵⁰² The *Joseph* at para 40.

¹⁵⁰³ See, the preamble of Municipal Systems Act.

¹⁵⁰⁴ Section 4(2) of the Municipal Systems Act.

¹⁵⁰⁵ Section 4(2)(f) of the Municipal Systems Act.

¹⁵⁰⁶ Section 73(1) of the Municipal Systems Act.

¹⁵⁰⁷ Section 73(1)(a) of the Municipal Systems Act.

¹⁵⁰⁸ Section 73(1)(b) of the Municipal Systems Act.

¹⁵⁰⁹ Section 73(1)(c) of the Municipal Systems Act.

¹⁵¹⁰ Section 9(1) the Housing Act.

¹⁵¹¹ Section 9(1)(a) the Housing Act.

¹⁵¹² Section 9(1)(a)(iii) the Housing Act.

In the *Joseph* case Skweyiya J concluded that the right to access to electricity has its “basis in public law” because “electricity is an important basic municipal service which local government is ordinarily obliged to provide.”¹⁵¹³ In his opinion, the fact that “electricity”, unlike “water” has not been specifically mentioned in the Constitution does not deny the right of the residents, within the jurisdiction of their local government to demand access to electricity.¹⁵¹⁴ That is to say that it is the local government which is obliged to ensure access to electricity to the people residing within its jurisdiction. Further, in rendering its municipal services the local government is bound by certain guidelines. Section 73(2) of the Municipal Systems Act prescribes that municipal services should:

- “(a) Be equitable and accessible.
- (b) Be provided in a manner that is conducive to:
 - (i) the prudent, economic, efficient and effective use of available resources; and
 - (ii) the improvement of standards of quality over time
- (c) Be financially sustainable.
- (d) Be environmentally sustainable.
- (e) Be regularly reviewed with a view to upgrading, extension and improvement.”¹⁵¹⁵

The dilemma of the focus on local governments lies in the lack of control over electricity supply and the national grid by the municipalities. The local government buys electricity from an electricity provider which is mainly Eskom and distributes electricity to the citizen in its jurisdiction. Therefore, the problems which face Eskom will also reflect on the ability of local governments to supply electricity to citizens.

6.3 ESKOM’S ROLE IN ELECTRICITY SUPPLY

The Second Respondent in the case of *Joseph* case was the commercial company City Power (Pty) Ltd. According to the applicants, City Power should have notified them and given them the “opportunity to make representations to City Power “before the electricity supply was

¹⁵¹³ The *Joseph* at para 40.

¹⁵¹⁴ The *Joseph* at para 40.

¹⁵¹⁵ Section 73(2) of the Municipal Systems Act.

terminated.”¹⁵¹⁶ Therefore, City Power violated procedural fairness which is required by a public entity. City Power is “a parastatal that is wholly-owned by the City and responsible for providing electricity to people within the jurisdiction of the City.”¹⁵¹⁷ Skweyiya J held that City Power is “a public service provider” and he focused his enquiry on “the relationship, if any, between City Power” and “users of the service with whom it has no formal contractual relationship.”¹⁵¹⁸ In the judgment, Skweyiya J invoked Sachs J who observed that the question of the occupation of municipal council land by homeless families in the Residents of Joe Slovo¹⁵¹⁹

“must be located not in the framework of the common law rights of landowners, but in the context of the special cluster of legal relationships between the council and the occupants established by the Constitution and the Housing Act...The very manner in which these relationships are established and extinguished will be different from the manner in which these relationships might be created by the common law...They flow instead from an articulation of public responsibilities...and possess an ongoing, organic and dynamic character that evolves over time.”¹⁵²⁰

The manner in which public responsibilities were characterized by Sachs J has been reconfigured by Skweyiya J as meaning: “constitutional and statutory duties of local government to provide basic municipal services to all persons living in its jurisdiction.”¹⁵²¹ Skweyiya J considered the reception of electricity by the applicants as a “corresponding public law right to receive this basic municipal service.”¹⁵²² Consequently, in depriving the applicants “of a service which they were already receiving as a matter of right, City Power was obliged to afford them procedural fairness before taking a decision which would

¹⁵¹⁶ The *Joseph* at para 1.

¹⁵¹⁷ The *Joseph* at para 4.

¹⁵¹⁸ The *Joseph* at para 4.

¹⁵¹⁹ *Residents of Joe Slovo Community, Western Cape v Thubelisha Homes and Others* (CCT 22/08) [2009] ZACC 16; 2009 (9) BCLR 847 (CC); 2010 (3) SA 454 (CC) (10 June 2009).

¹⁵²⁰ *Residents of Joe Slovo Community, Western Cape v Thubelisha Homes and Others* at para 343.

¹⁵²¹ The *Joseph* at para 47.

¹⁵²² The *Joseph* at para 47.

materially and adversely affect that right.”¹⁵²³ Hence, the statutory right to access to electricity as a basic municipal service may be denied by administrative action thus is not procedurally fair and materially justified, by whomever the electricity provider may be.

Skweyiya J reached his conclusion without the need to investigate the technical issues pertaining to electricity supply. Nonetheless, the right to justly administered electricity services which imposes administrative obligations on the electricity service provider is a complex regime involving electricity generation infrastructure, national grid and subnational grid, supplied by “varying patterns of state ownership and regulation across subsectors,”¹⁵²⁴ including Eskom, municipality-owned power stations, and independent power producers (IPPs).¹⁵²⁵

Although the NDP proposes the diversification “of power sources and ownership in the electricity sector”¹⁵²⁶ and encourages investment in the electricity sector, Eskom remains the main South Africa’s electricity supplier, “accounting for 96 percent of production.”¹⁵²⁷ The process of supplying electricity as a final product involves Eskom in all various stages including:

- The stage where electricity is generated at various type of power stations including nuclear, coal-fired, gas turbine, hydraulic, wind, etc. At this stage electricity is generated with high voltage current which generally amounts 33 kilovolt (kV). This stage is dominated by Eskom.¹⁵²⁸

¹⁵²³ The *Joseph* at para 47.

¹⁵²⁴ NDP at 164.

¹⁵²⁵ The NDP requires “a greater mix of energy sources and a greater diversity of independent power producers (IPPs) in the energy industry.” See, NDP at 169.

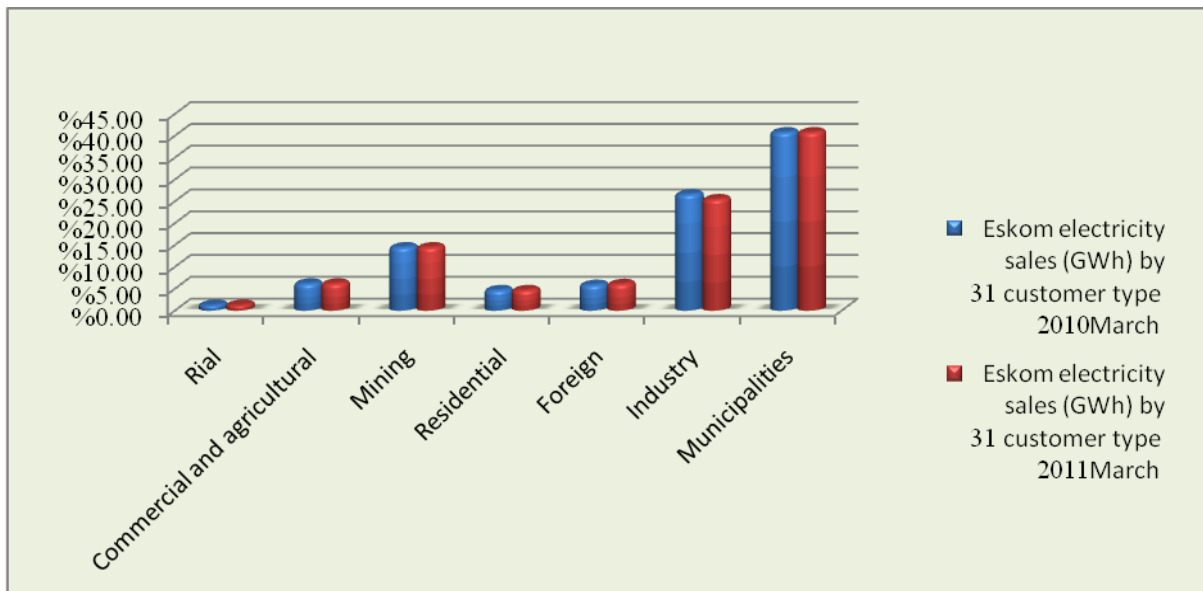
¹⁵²⁶ NDP at 168.

¹⁵²⁷ NDP at 164.

¹⁵²⁸ “Eskom supplies about 96% of South Africa's electricity.” Gradually, the government’s intention is to minimize electricity supply by Eskom to 70% allowing the independent power producers (IPPs) to supply 30%. See, “In 2003, Cabinet approved private-sector participation in the electricity industry.” See, independent power producers http://www.energy.gov.za/files/electricity_frame.html (accessed 12 December 2012). For further reading about the philosophy relating to the “design of overhead power lines for voltages of 132 kv and above, focusing mainly on alternating current (AC) lines” see, Bisnath S *ESKOM Overhead Power Lines: The*

- The stage where electricity is transmitted through the national grid. This involves a transformer which transforms the electricity generated to higher “voltages of 132 kV to 765 kV” in order to minimise losses resulting from transmitting electricity through an “electrical transmission grid of over 25 000 km of overhead power lines.”¹⁵²⁹ This stage is dominated completely by Eskom because the utility company owns the grid and operates it.¹⁵³⁰
- At a certain distribution point another transformer reduces the voltage to 220V and supplies the sub grid which is in most instances controlled by the local government.

Figure IV- 1: Eskom electricity sales (GWh) by customer type 31 March 2010 and 2011¹⁵³¹



According to figure 6.1 Eskom sells 40.8% of the electricity it produces to local governments which provide electricity to end-users in their jurisdictions.¹⁵³² Nevertheless, Eskom still

Planning Design and Construction February (2005) at 1. See also, Lakervi E and Holmes E *Electricity Distribution Network Design* (2003) 2nd ed at 238-240.

¹⁵²⁹ For further reading about South Africa’s grid refer to *Eskom, Volume 1: The Planning, Design and Construction of Overhead Power Lines*.

¹⁵³⁰ DoE “Basic electricity” http://www.energy.gov.za/files/electricity_frame.html (accessed 12 December 2012).

¹⁵³¹ Eskom Audited Annual Results Presentation for the year ended: 31 March 2011 (June 2011) <http://www.eskom.co.za/content/AnnualResultsfinal~1.pdf> (accessed 13 October 2013).

“directly provides electricity to about 45% of all end-users in South Africa. The other 55% is resold by redistributors (including municipalities).”¹⁵³³

Figure 6.1 shows that in 2011 Eskom sold 1.3% of electricity generated to rails, 6.5% to commercial and agricultural sectors, 14.5% to mining sector, 4.7% directly to residents, 6.1% to neighbouring countries, 25.5% to industrial sectors, and 40.8% was sold to municipalities.¹⁵³⁴ Eskom is a vertically integrated state-owned parastatal utility regulated by the NERSA. In 2001 Eskom was converted “into a public company having a share capital as contemplated in section 19(1)(a) of the Companies Act, with its entire share capital held by the State.”¹⁵³⁵ In other words, Eskom is “a state-owned company,”¹⁵³⁶ which enjoys juristic personality,¹⁵³⁷ and is mandated to facilitate “the promotion of universal access to, and the provision of, affordable electricity, taking into account the cost of electricity, financial sustainability and the competitiveness of Eskom.”¹⁵³⁸ Further, the NDP requires Eskom “to provide reliable and competitively priced electricity to mining, industry and business...it also has a mandate to extend affordable access to electricity services to poor households.”¹⁵³⁹ More than that, Eskom owns and operates Koeberg which is the only nuclear power station in South Africa. In the same context, the 9.6 GW nuclear power fleet proposed by the Policy-Adjusted IRP will be owned and operated by Eskom.

¹⁵³² “Eskom also owns and operates the national high voltage transmission grid, which conveys electricity from Eskom power stations to the main load centres across the country. Currently Eskom holds 55% of the distribution and retail market in terms of energy supplied, while the remaining 45% of its energy is sold to Municipalities who retail it to other end-users.” See, Steyn G Administered Prices: Electricity, A report for National Treasury at 6. <http://www.treasury.gov.za/publications/other/epir/Electricity.pdf> (accessed 12 December 2012).

¹⁵³³ Eskom Integrated Report of 2011 at 2.

¹⁵³⁴ Eskom Audited Annual Results Presentation for the year ended: 31 March 2011 (June 2011) <http://www.eskom.co.za/content/AnnualResultsfinal~1.pdf> (accessed 13 October 2013).

¹⁵³⁵ Section 2 of Eskom Conversion Act 13 of 2001.

¹⁵³⁶ Section 8(2)(a) of the Companies Act 71 of 2008.

¹⁵³⁷ Section 19(1)(a) of the Companies Act 71 of 2008.

¹⁵³⁸ Section 6(5)(b) of the Eskom Conversion Act.

¹⁵³⁹ NDP at 442.

6.4 DEPARTMENT OF ENERGY'S RESPONSIBILITY IN ELECTRICITY SUPPLY

The right to access to affordable electricity is the responsibility of the national government. The DoE is mandated to deal with energy issues. Section (5)(1) of the National Energy Act requires the Minister to “adopt measures that provide for the universal access to appropriate forms of energy or energy services for all the people of the Republic at affordable prices.” Although the Minister of Energy was not a respondent in the *Joseph* case, he or she is still responsible for the national energy policy which provides for the facilitation of universal access¹⁵⁴⁰ to affordable,¹⁵⁴¹ reliable,¹⁵⁴² environmentally sustained,¹⁵⁴³ and diversified electricity.¹⁵⁴⁴ In simple words, the Minister is required to establish a policy that facilitates the universal access to electricity in order to electrify the end-users in the country. This policy is guided by legal frameworks intended to promote the socio-economic rights and “achieve the efficient, effective, sustainable and orderly development and operation of electricity supply infrastructure in South Africa.”¹⁵⁴⁵

The Minister of Energy has wide range of powers and duties which are at her/ his disposal to develop energy planning, institutions, and human resources involving in energy governance that is adequate to the country's need. The duties and powers pertaining to electricity supply infrastructure and distribution are contemplated in five pieces of legislations namely the Electricity Regulation Act, National Energy Act, National Energy Regulator Act, National Nuclear Energy Act, and the Nuclear Energy Act.

The duties and powers of the Minister:

- The Minister constitutes and oversees the Energy Regulator, which became the single regulator for electricity, piped-gas and petroleum.¹⁵⁴⁶

¹⁵⁴⁰ Section 2(d) of the Electricity Regulation Act.

¹⁵⁴¹ Section 5(1) of the National ENERGY ACT.

¹⁵⁴² Section 2(a) of the Electricity Regulation Act.

¹⁵⁴³ Section 2(h) of the National Energy Act.

¹⁵⁴⁴ Section 2(d) of the Electricity Regulation Act. See as well, section 2(i) of the National Energy Act.

¹⁵⁴⁵ Section 2(a) of the Electricity Regulation Act.

¹⁵⁴⁶ Section 5 of the NERSA.

- The Minister appoints the members of NNR which is composed of “one representative of organised labour;”¹⁵⁴⁷ “one representative of organised business;”¹⁵⁴⁸ “one person representing communities, which may be affected by nuclear activities;”¹⁵⁴⁹ “an official from the Department of Minerals and Energy;”¹⁵⁵⁰ “an official from the Department of Environmental Affairs and Tourism.”¹⁵⁵¹ Further, the Minister chooses from “among the directors of the board referred to in subsection (4)(a)(vi)” and appoint them as “a chairperson and a deputy chairperson.”¹⁵⁵²
- The Minister involves in Necsa as follows:
 - In terms of section (9)(1) of the Nuclear Energy Act “...the Minister may transfer so much of the State’s shares in a subsidiary company contemplated in section 14(1)(a)(i) as the Cabinet approves to such transferees in such manner and on such terms and conditions as the Cabinet approves.”
 - Appoints the chairperson of the Board of Directors¹⁵⁵³ which governs and controls the Corporation.¹⁵⁵⁴
 - Appoints “...not more than seven suitably qualified directors.”¹⁵⁵⁵
 - Appoints “the chief executive officer, who is a member of the Board by virtue of holding the office.”¹⁵⁵⁶
 - Designates “an official of the Department.”¹⁵⁵⁷
 - Designates “an official of the Department of Foreign Affairs...after consultation with the Minister of Foreign Affairs.”¹⁵⁵⁸

¹⁵⁴⁷ Section 8(4)(a)(i) of the NNRA.

¹⁵⁴⁸ Section 8(4)(a)(i) of the NNRA.

¹⁵⁴⁹ Section 8(4)(a)(i) of the NNRA.

¹⁵⁵⁰ Section 8(4)(a)(i) of the NNRA.

¹⁵⁵¹ Section 8(4)(a)(i) of the NNRA.

¹⁵⁵² Section 8(5) of the NNRA.

¹⁵⁵³ Section 16(2)(a) of the Nuclear Energy Act.

¹⁵⁵⁴ Section 16(1)(b) of the Nuclear Energy Act.

¹⁵⁵⁵ Section 16(2)(b) of the Nuclear Energy Act.

¹⁵⁵⁶ Section 16(2)(c) of the Nuclear Energy Act.

¹⁵⁵⁷ Section 16(2)(d) of the Nuclear Energy Act.

¹⁵⁵⁸ Section 16(2)(e) of the Nuclear Energy Act.

- The Minister develops “and, on an annual basis, reviews and publishes the Integrated Energy Plan in the Gazette,”¹⁵⁵⁹ which deals with various issues relating to energy.
- The Minister produces, based upon informed and scientific data, an analysis of demand and supply and environmental externalities.¹⁵⁶⁰ This is required “for energy planning”¹⁵⁶¹ in order to establish “measures that provide for the universal access to appropriate forms of energy or energy services for all the people of the Republic at affordable prices.”¹⁵⁶²
- The Minister has oversight powers and prescribes the procedure to be followed in “varying, suspending, removing or adding any licence condition,”¹⁵⁶³ “revoking a licence,”¹⁵⁶⁴ and “the mediation and the fees to be paid.”¹⁵⁶⁵
- The Minister determines as to whether the country needs to install new electricity generation capacity¹⁵⁶⁶ and the type of energy source which should be installed.¹⁵⁶⁷

The following normative rules must be applied in the exercise of the above functions:

- achieve the efficient, effective, sustainable and orderly development and operation of electricity supply infrastructure in South Africa;¹⁵⁶⁸

¹⁵⁵⁹ Section 6(1) of the National Energy Act. The IRP was promulgated under the Electricity Regulation Act. It is stated at the top of the document that: “I, Dipuo Peters, Minister of Energy, hereby under the Electricity Regulation Act, 2006 (Act No. 4 of 2006), promulgate IRP 2010 in the Schedule.” However, the IRP is required to be published by the Minister of Energy in terms of section 6(1) of the National Energy Act.

¹⁵⁶⁰ In terms of section 3(1)(b) of the National Energy Act the minister may connect “to any data and information management system, or any other system within the public administration, for the acquisition of energy data and information, in accordance with the Promotion of Access to Information Act and the Statistics Act, 1999 (Act No. 6 of 1999) where such data or information is collected by that public institution.”

¹⁵⁶¹ Section 3(1)(a) of the National Energy Act.

¹⁵⁶² Section 5(1) of the National Energy Act.

¹⁵⁶³ Section 17(2) of Electricity Regulation Act.

¹⁵⁶⁴ Section 18(3) of Electricity Regulation Act.

¹⁵⁶⁵ Section 42(3) of Electricity Regulation Act.

¹⁵⁶⁶ Section 24(1)(a) of the Electricity Regulation Act.

¹⁵⁶⁷ Section 24(1)(b) of the Electricity Regulation Act.

¹⁵⁶⁸ Section 2(a) of the Electricity Regulation Act.

- ensure that the interests and needs of present and future electricity customers and end users are safeguarded and met, having regard to the governance, efficiency effectiveness and long-term sustainability of the electricity supply industry within the broader context of economic energy regulation in the Republic;¹⁵⁶⁹
- facilitate investment in the electricity supply industry;¹⁵⁷⁰
- facilitate universal access to electricity;¹⁵⁷¹
- promote the use of diverse energy sources and energy efficiency;¹⁵⁷²
- promote competitiveness and customer and end user choice;¹⁵⁷³ and
- Facilitate a fair balance between the interests of customers and end users, licensees, investors in the electricity supply industry and the public.¹⁵⁷⁴

These principles encompass the qualitative and quantitative objectives attached the electricity supply including the universal access to electricity, the affordability principle, the reliable uninterrupted supply principle, the diversification principle, the security principle, and the clean and environmentally sustainable principle.

6.4.1 The Universal Access to Electricity

Section 2(d) of the Electricity Regulation Act requires the facilitation of the “universal access to electricity.” In terms of section 2(i) of the National Energy Act, the facilitation of energy access including electricity improves “the quality of life of the people of Republic.” That is to say, the promotion of the universal access to electricity is a requirement to improve the quality of the life of the people of South Africa.

Access to electricity has become a universal right and the United Nations recognises that:

¹⁵⁶⁹ Section 2(b) of the Electricity Regulation Act.

¹⁵⁷⁰ Section 2(c) of the Electricity Regulation Act.

¹⁵⁷¹ Section 2(d) of the Electricity Regulation Act.

¹⁵⁷² Section 2(e) of the Electricity Regulation Act.

¹⁵⁷³ Section 2(f) of the Electricity Regulation Act.

¹⁵⁷⁴ Section 2(g) of the Electricity Regulation Act.

“Access to modern affordable energy services in developing countries is essential for the achievement of the internationally agreed development goals, including the Millennium Development Goals, and sustainable development, which would help to reduce poverty and to improve the conditions and standard of living for the majority of the world’s population.”¹⁵⁷⁵

The universal access to electricity is today “one of the most important goals set for the energy sector by governments” worldwide.¹⁵⁷⁶ The government of South Africa reviewed the electrification programme and committed itself “to implementing reasonable legislative and other measures, within its available resources, to progressively realising the goal of universal household access to electricity.”¹⁵⁷⁷ The government of South Africa:

“recognises that household access to adequate energy services for cooking, heating, lighting and communication is a basic need. Whilst these needs can be met by various fuel-appliance combinations, government recognises that without access to electricity, a clean, convenient and desirable fuel, human development potential is ultimately constrained.

...

Access to electricity is taken to include grid supplies, Solar Home Systems, generators, hybrid systems, battery systems or any other supply solution which provides an appropriate and affordable electricity supply. The decision of which technology to utilise, will be based on life cycle cost analysis and the number of connections made in terms of the budget allocation.”¹⁵⁷⁸

¹⁵⁷⁵ The UNGA resolution on the International Year of Sustainable Energy for All adopted A/RES/65/151 (16 February 2011) Sixty-fifth session Agenda.

¹⁵⁷⁶ “Addressing the electricity access gap” (June 2010) Paper for the World Bank Group Energy Sector Strategy at 8. http://siteresources.worldbank.org/EXTESC/Resources/Addressing_the_Electricity_Access_Gap.pdf (accessed 2 December 2012).

¹⁵⁷⁷ Para 7(1)(4)(1) of the 1998 White Paper on energy Policy.

¹⁵⁷⁸ Para (7)(1)(4)(1) of the 1998 White Paper on energy Policy.

In 2000 the South African government “announced its policy to provide free basic services of water, sanitation and energy to poor households.”¹⁵⁷⁹ This has established an electricity policy which has been affected by the Free Basic Electricity Policy of 2003 by which free basic electricity should be made available for the poor. The local governments and Eskom undertook the major responsibility for the implementation of the policy. The 2003 Integrated Energy Plan for the Republic of South Africa promoted the “universal access to clean and affordable energy, with emphasis on household energy supply being co-ordinated with provincial and local integrated development programmes.”¹⁵⁸⁰

The right to access to electricity is nevertheless challenged by many barriers including the “high costs of supplying rural and peri-urban households, lack of appropriate incentives, weak implementing capacity, electricity generation shortage, population growth,”¹⁵⁸¹ lack of technical support, lack of human resource, lack of appropriate electricity supply infrastructure including sub-grid distribution facilities, and the rising in energy demand resulting from “increased energisation (especially electrification) in households.”¹⁵⁸² Moreover, privatisation of electricity utilities can result in a “conversion of non-commercial energy to commercial energy”¹⁵⁸³ rendering electricity unaffordable¹⁵⁸⁴ particularly in the rural areas.

6.4.2 The Affordable Access to Electricity

Section 5(1) of the National Energy Act requires the Minister to “adopt measures that provide for the universal access to appropriate forms of energy or energy services for all the

¹⁵⁷⁹ Adam F “Free basic electricity: a better life for all” (February 2010) Earthlife Africa Johannesburg at 13 <http://www.earthlife.org.za/wordpress/wp-content/uploads/2010/03/Free-Basic-Electricity-Final-Low-res.pdf> (accessed 2 December 2012).

¹⁵⁸⁰ The 2003 Integrated Energy Plan at 4.

¹⁵⁸¹ “Addressing the electricity access gap” (June 2010) at 8-9.

¹⁵⁸² The 2003 Integrated Energy Plan at 26

¹⁵⁸³ The 2003 Integrated Energy Plan at 26

¹⁵⁸⁴ Dugard j argues that “...a market-driven rationale to electricity is at odds with South Africa’s constitutional framework...” see, Dugard “Power to the people? A rights-based analysis of South Africa’s electricity services” (264-287) in Dugard *Electric Capitalism* at 265.

people of the Republic at affordable prices.” The notion of affordable access to electricity is intended to make cheap electricity available to households in order to promote access to electricity. That is to say when access to electricity “is provided, the cost of the services” should not be high so the poor can still afford to buy electricity.¹⁵⁸⁵ In this context, the affordability principle functions as an enabling mechanism which is intended to promote and achieve the universal access to modern energy services by the grassroots households.

The affordability test for electricity is required for a meaningful discernment between different sources of electricity. Only affordable electricity can contribute to poverty eradication, education, fighting chronic diseases, child mortality, women opportunity enhancement, etc. “Energy is only useful when it is affordable,”¹⁵⁸⁶ because unaffordable tariffs of electricity contribute to the detriment of economic development and social welfare.¹⁵⁸⁷ For example, many South African people, who qualified to obtain an RDP house, are forced to rent them out and remain in their shacks because they cannot afford to pay the electricity bill. The cycle of poverty persists unless the administration finds ingenious ways to bring affordable electricity to poor households.¹⁵⁸⁸

The South African “government is committed to the promotion of access to affordable and sustainable energy services for small businesses, disadvantaged households, small farms, schools, clinics, in our rural areas and a wide range of other community establishments.”¹⁵⁸⁹ The 1998 White Paper on Energy Policy came to the same conclusion of the RDP based document noting that:

“Although energy is a basic household need, the vast majority of South Africans depend on inferior and expensive fuels... Future energy policy must concentrate on

¹⁵⁸⁵ The World Bank, Development on Value and Ethics “Infrastructure Services – Access and Affordability” <http://web.worldbank.org/WBSITE/EXTERNAL/EXTABOUTUS/PARTNERS/EXTDEVIALOGUE/0,,contentMDK:21955896~pagePK:64192523~piPK:64192458~theSitePK:537298,00.html> (accessed 2 December 2012).

¹⁵⁸⁶ Para 5(2)(1) of the 1998 White Paper On Energy Policy.

¹⁵⁸⁷ Winkler *Energy policies for sustainable development in South Africa’s residential and electricity...* at 6.

¹⁵⁸⁸ Clark and Drimie “Energy sustainability for South Africa’s poor: weighing up the alternative” at 2.

¹⁵⁸⁹ The Ministerial forward of the 1998 White Paper on Energy Policy by the then Minister of DME P M Maduna.

the provision of energy services to meet the basic needs of the poor, stimulate productive capacity and urgently meet the energy needs of community services, such as schools, clinics and water supplies.”¹⁵⁹⁰

The governmental approach to the affordability principle is intended to reconcile the price of electricity with achieving equity and economic growth. On the one hand, although Eskom and municipalities have increasingly commercialised electricity supply, the government is still obliged to balance “affordable electricity prices for households, low-cost electricity for industrial consumers, prices which provide efficient market signals by accurately reflecting the cost of supply, and a general price level that ensures the financial sustainability of electricity utilities.”¹⁵⁹¹ On the other hand, the fulfilment of the right to access to electricity imposes a duty on the government to ensure that positive steps are taken to make electricity increasingly accessible and affordable to poor people. It is for this objective that the electrification campaign and the Free Basic Electricity of 50 kWh per household per month campaign were undertaken in South Africa.¹⁵⁹²

The electricity affordability criterion is a complex undertaking which begins at the source of the electricity generation. In other words, as long as the source of energy is cheap the electricity supply can be sold cheap and affordably. Affordability of the electricity supply is part of the integrated energy planning which is the responsibility of the Minister who has to “develop and, on an annual basis, review and publish the Integrated Energy Plan in the *Gazette*”¹⁵⁹³ taking into consideration the affordability¹⁵⁹⁴ of electricity supply.¹⁵⁹⁵

South Africa’s electricity supply infrastructure is challenged by uncertainties surrounding the coal industry which is currently still the main source of energy for the country’s electricity

¹⁵⁹⁰ Para 5(2)(1) of the 1998 White Paper on Energy Policy.

¹⁵⁹¹ Para 7(1)(5) of the 1998 White Paper on Energy Policy.

¹⁵⁹² Ruiters G “Free basic electricity in South Africa: a strategy for helping or containing the poor?” (248- 263) in McDonald D ed *Electric Capitalism* (2009) at 248.

¹⁵⁹³ Section 6(1) of the National Energy Act.

¹⁵⁹⁴ Section 6(2)(c) of the National Energy Act.

¹⁵⁹⁵ Section 6(2) of the National Energy Act.

generation.¹⁵⁹⁶ Gas and renewable energies are still costly. Hence, the government's nuclear energy proposal is premised on the affordability presumption. This is still however contested as cost for the construction of nuclear power plants have escalated sharply. Nevertheless, the ever increasing fuel prices have led governments including in South Africa "to large, often uneconomic investments in synthetic fuel plants and in the nuclear fuels chain."¹⁵⁹⁷ It is clear that the focus of the investigation relating to the electricity supply infrastructure has shifted to find the best combination for the future fuel mix, between affordably¹⁵⁹⁸ and reliability considerations.¹⁵⁹⁹

6.4.3 The Right to Access to Reliable Electricity Supply

The reliability of the electricity supply is not mentioned expressly in any of the said five Acts regulating electricity in South Africa. Nevertheless, the Minister has the responsibility to provide for "measures to ensure operating reliability of all key energy infrastructure, to the minimum standards as may be determined by" him or her.¹⁶⁰⁰ The reliability of electricity requirement reflects the government's responsibility to maintain uninterrupted electricity supply. For example, the interruption of the electricity supply resulting from an inadequate electricity supply infrastructure or failing electricity producers poses various risks including cutting off drinking water supplies, spoiling refrigerated vaccines and medicine particularly in rural areas, cutting life support systems in hospitals, etc. Therefore, electricity supply disconnections are "only permissible in certain defined circumstances (e.g. non-payment,

¹⁵⁹⁶ "Eskom has also been discussing coal industry concerns with the government. These issues revolve around the supply of our power stations now and in the future. We are confident that the bulk of our coal supplies are secured up to 2018, but policy clarity is needed on a longer-term framework for the industry that strikes a balance between the need to develop the country's coal exports, and to ensure continuous supply for power generation at an affordable cost." See, *Eskom annual report of 2011* at 62.

¹⁵⁹⁷ Malzbender "Domestic electricity provision in the democratic South Africa" at 3.

¹⁵⁹⁸ Human rights implications of load-shedding health facilities, social justice in health, Centre for Health, Human Rights and Development CEHURD www.cehurd.org (accessed 20 December 2012).

¹⁵⁹⁹ Eskom nuclear power station and associated infrastructure, Final scoping report, Department of Environmental Affairs and Tourism, Reference Number: 12/12.20/944, prepared by Acrus Gibb (Pty) Ltd, Project Number J27035 (July 2008) p. chapter 4-27. Hereafter referred to as the Final scoping report.

¹⁶⁰⁰ Section 19(1)(9) of the National Energy Act.

illegal use and risk to human health or safety), and must be exercised consistent with proper procedures (e.g. notification and opportunity to rectify).¹⁶⁰¹ Eskom's mission namely to provide reliable and affordable electricity cannot be reduced to an exclusively commercial undertaking. It is a mission that is critical to the hopes and dreams of the entire South African nation.¹⁶⁰² However, the fulfilment of these "hopes and dreams" by Eskom require to "ensure reliable and affordable energy supply and specifically focus on the balancing of the supply of, and demand for, electricity until 2015."¹⁶⁰³

The public and various economic sectors in South Africa have been experiencing supply constraints and even so-called load shedding to reduce the demand in a system emergency situation.¹⁶⁰⁴ The shortage of generating capacity forces Eskom to resort to these measures in order to prevent "a collapse of the national electricity supply system."¹⁶⁰⁵ Load shedding has triggered "anger and frustration" which may lead to litigation "claiming damages against Eskom for losses sustained in business and agriculture as a consequence of the interruption of power supply."¹⁶⁰⁶

Load shedding is permitted by South Africa's legal regime governing electricity by implication. Skweyiya Jin the *Joseph* case conceded that "government regulation is implicit in the notion of providing electricity."¹⁶⁰⁷ Of course such regulation and the decisions taken on the basis of such regulation must be procedurally fair and substantially sound, in terms of due administrative process, to respect the "several rights guaranteed" in the constitutional context of socio economic rights, in particular the right to water and the further rights

¹⁶⁰¹ Tully S "The Human Rights to Access Electricity" (30-39) Vol 9, no 3 (2006) *the Electricity Journal* at 30.

¹⁶⁰² *Eskom Annual Report of 2011* at 6

¹⁶⁰³ *Ibid* at 52.

¹⁶⁰⁴ DME, National Response to South Africa's Electricity Shortage at 1.

¹⁶⁰⁵ *Ibid*.

¹⁶⁰⁶ Eskom's "load shedding" is a human rights issue" Centre for Constitutional Rights www.fwdeklerk.org/cgi-bin/giga.cgi?cmd=cause_dir_news_item&cause_id=2137&news_id=72155&cat_id (accessed to 10 December 2012).

¹⁶⁰⁷ The *Joseph* para 52.

implied e.g. dignity, life, security, etc. “which can be seriously adversely affected by the absence of electrical power.”¹⁶⁰⁸

Skweyiya J utilised in his argument the then Department of Minerals and Energy’s report of 2008 relating to Electrification Policy Development and Management in which electrification shows great improvements of the quality of life and welfare of households. The key findings are:

1. “Over 90% of households use electricity as their main source of lighting.
2. Lighting brings benefits such as increased study time for school children and greater security.
3. Electricity increases access to media which, in turn, increases awareness of several opportunities such as education.
4. 63% of households use electricity as their main source of energy for cooking, and refrigerator ownership is high at 65%.
5. A number of enterprises were created as a result of electrification, and businesses were able to operate for more hours.”¹⁶⁰⁹

The inferred legal requirements to a reliable and uninterrupted electricity supply always find their factual limitations in reality. South Africa’s electricity supply infrastructure was not adequate already in 2008 when the reserve margin declined between 8-10%.¹⁶¹⁰ The “decline in the reserve margin” limits opportunities for maintenance and exposes power stations to high stress operation.¹⁶¹¹ In such events the system operator may finally resort to load shedding in order “to maintain the integrity of the national electricity supply system” and “to prevent a system-wide blackout.”¹⁶¹² Nevertheless, the responsibility of the

¹⁶⁰⁸ See, Eskom’s “load shedding” is a human rights issue” Centre for Constitutional Rights.

¹⁶⁰⁹ See footnote 27 of the *Joseph*.

¹⁶¹⁰ DME, National Response to South Africa’s Electricity Shortage.

¹⁶¹¹ *Ibid* at 1.

¹⁶¹² In order to maintain the integrity of the national electricity supply system, the system operator may “run all available Generation at Maximum Rating,” introduce “Demand Market Participation,” “bring Gas Plant into the systems,” bring “Emergency Water Resources,” and introduces “Interruptible Contracts” strategy and “Load Shedding (last resort).” DME, National Response to South Africa’s Electricity Shortage at 5-6.

government is at odds with unreliable electricity supply, load shedding, and blackouts because it is obliged to

“ensure that the interests and needs of present and future electricity customers and end users are safeguarded and met, having regard to the governance, efficiency, effectiveness and long-term sustainability of the electricity supply industry within the broader context of economic energy regulation in the Republic.”¹⁶¹³

The National Response to South Africa’s Electricity Shortage suggested many solutions including Demand Side Management, Power Conservation Programmes, and others.¹⁶¹⁴ Nevertheless, avoiding the unreliability of electricity supply fundamentally depends upon the electricity generation infrastructure. As it has been explained earlier the electricity generation infrastructure comprises base-load power stations, mid-merit power stations, and peak-load power plants. This combination of types of power plants is required by electrical utility operating engineers to guarantee sufficient supply to meet demand variations demand during the year.¹⁶¹⁵

Electrical utility operating engineers are instructed to utilise those plants first that operate with the lowest running costs.¹⁶¹⁶ Fundamentally, Eskom’s coal-fired power plants provide 85% base-load of the total generation. Eskom’s coal-fired power plants are economic and reliable. They are not like renewable source of energy e.g. wind and solar, which are expensive and “inadequately developed to provide large scale power generation facilities that can supply a reliable base load and easily integrate into the existing power network in South Africa.”¹⁶¹⁷

The IRP intertwines the reliability of electricity supply with the reserve margin. In 2010 the total system capacity was 44535 MW and the reliable reserve margin was 15.18%.

¹⁶¹³ See, para b of the Regulator guidelines. NERSA Consultation Paper Review of Renewable Energy Feed - In Tariffs (March 2011) http://green-cape.co.za/upload/NERSA_Consultation_Paper.pdf (accessed 28 October 2012).

¹⁶¹⁴ For more details see, DME, National Response to South Africa’s Electricity Shortage.

¹⁶¹⁵ Brookes *The Economics of Nuclear Energy* at 3.

¹⁶¹⁶ *Ibid.*

¹⁶¹⁷ The Final scoping report at viii.

According to the Tax Carbon Scenario the total capacity system would grow to 61883 MW and the reliable reserve margin would amount to 18.3% in 2020. In 2030 the total capacity system should grow up to 86423 MW and the reliable reserve margin would decline to 12.35%. Under these circumstances, nuclear energy is the only available alternative power generation technology that can offer the reliability required for base-load generation, in South Africa's carbon constrained economy. In his Forward, Yukiya Amano the Director General of the IAEA stated that "the advantages of nuclear power in terms of climate change are an important reason why many countries intend to introduce nuclear power in the coming decades, or to expand existing programmes."¹⁶¹⁸ The expansion of the existed South Africa's nuclear programme is required to promote the reliability of electricity supply and contribute to the solution energy challenges "over the next 10–20 years" and "keep promoting economic development by providing reliable, safe and affordable energy services while significantly reducing GHG emissions."¹⁶¹⁹

6.4.4 The Diversification Principle

The diversification of sources of electricity supply is a technical requirement intended to contribute to the universal access to electricity, the security of supply, and management of the environment. Section 2(e) of the Electricity Regulation Act promotes "the use of diverse energy sources..." and section 2(b) of the National Energy Act promotes "diversity of supply of energy and its sources." The National Energy Act ensures "that diverse energy resources are available."¹⁶²⁰ The 1998 White Paper on Energy Policy follows the international shifts which have "occurred in post-oil-crisis energy policies" and proposes the realisation of energy security "through greater diversification and flexibility of supply,"¹⁶²¹ "including increased cross-border energy trade."¹⁶²²

Technically, diversification refers to the components of the electricity supply infrastructure which depend on fossil fuels, nuclear energy, and renewables. South Africa's electricity

¹⁶¹⁸ IAEA, Climate change and nuclear power (2012) at 3.

¹⁶¹⁹ *Ibid* at 6.

¹⁶²⁰ The preamble of the National Energy Act.

¹⁶²¹ Para (3)(2)(1)(1) of the 1998 White Paper on Energy Policy.

¹⁶²² Para (5)(1)(1) of the 1998 White Paper on Energy Policy.

supply infrastructure depends on coal-fired power stations, nuclear power stations, gas turbines, hydraulic, pump-storage, and renewables. These types of power generation are diversified and each type corresponds to the needs of electrical utility (Eskom) operating engineers. That is to say, coal-fired power stations and nuclear power station are base-load power stations intended to meet the demand throughout the year. Pump storage and gas turbines which can run up to full capacity in a few seconds and can be started remotely are peak-load power plants intended to meet the sudden demand. The CCGT are mid-merit power stations as proposed by the IRP. “CCGT provides a strong mid-merit alternative until nuclear is commissioned, especially providing higher load factors than wind, with some dispatchability.”¹⁶²³ Or “CCGT is constructed as a lower emission mid-merit capacity along with 6,5 GW of OCGT peakers.”¹⁶²⁴ Nevertheless, “with Kusile not built, the IRP software can optimise the capacity utilisation even further, using mid merit and peaking options more efficiently to obtain the lower electricity prices.”¹⁶²⁵

The 2003 Integrated Energy Plan proposed the further diversification of the energy supply through the deployment of natural gas, nuclear energy, and renewable energies¹⁶²⁶ in order to move away from coal¹⁶²⁷ as the primary fuel source.¹⁶²⁸ Although all scenarios showed that coal-fired power stations remain the major component of electricity supply infrastructure,¹⁶²⁹ diversification is still a necessity required to “improve supply security,” enhance reliability of electricity supply, and mitigate environmental issues accompanying power generation.¹⁶³⁰

¹⁶²³ IRP at 23.

¹⁶²⁴ IRP at 24.

¹⁶²⁵ IRP at 70.

¹⁶²⁶ The “‘Siyaphambili Simulated’ scenario promotes fuel diversification away from coal, prescribing other energy technologies at set times.” See, the 2003 Integrated Energy Plan at 4.

¹⁶²⁷ The 2003 Integrated Energy Plan at 11.

¹⁶²⁸ *Ibid* at 22.

¹⁶²⁹ *Ibid* at 22.

¹⁶³⁰ *Ibid* at 25.

The diversification of power generation becomes a necessity in the South African context due to externalities and coal depletion.¹⁶³¹ The Minister can influence the diversification of electricity supply on annual basis through the review process of the IRP in which he has to take into account “economically available energy resources,”¹⁶³² and investigate the “optimal use of indigenous and regional energy resources,”¹⁶³³ and guide “the selection of the appropriate technology to meet energy demand.”¹⁶³⁴ The IRP 2010-2030 proposes the diversification of power resources under the Policy-Adjusted IRP.¹⁶³⁵

The NDP proposes a comprehensive diversification setup including energy mix,¹⁶³⁶ regional “geographic diversification of South Africa's power sources”,¹⁶³⁷ and “the introduction of independent power producers.”¹⁶³⁸ The IRP proposed “capacity expansion programme aims to both meet increasing demand and to diversify...energy sources” in particular Eskom’s electricity supply infrastructure.¹⁶³⁹ The diversification of energy sources allows the national electricity utility to “make a meaningful contribution to the sustainability of energy supply and to better environmental management.”¹⁶⁴⁰

Diversification of energy sources “mitigates the set of risks associated with an expanding power-supply system.”¹⁶⁴¹ To this end, the inclusion of nuclear power as a major component of the electricity supply infrastructure moderates energy security risks and lessens the impact of “volatility in fossil fuel prices.” It is proposed that “the best way to strengthen a

¹⁶³¹ Para (7)(7)(1) of the 1998 Energy Policy White Paper.

¹⁶³² Section (6)(2)(b) of the National Energy Act.

¹⁶³³ Section (6)(4)(b) of the National Energy Act.

¹⁶³⁴ Section (6)(6)(c) of the National Energy Act.

¹⁶³⁵ Para 6 of the IRP.

¹⁶³⁶ NDP at 46. See also, NDP at 115: Diversification of electricity supply infrastructure is part of the country's comprehensive development policy of a more competitive and diversified economy.

¹⁶³⁷ NDP at 130.

¹⁶³⁸ “Eskom supports the introduction of independent power producers...contribute to diversifying the source and nature of energy production, introduce new skills and capital into the industry, and enable the benchmarking of pricing and performance.” See, NDP at 34.

¹⁶³⁹ Eskom Holdings Limited Integrated Report 2011 at 3.

¹⁶⁴⁰ *Ibid* at 16.

¹⁶⁴¹ Para 6(6) of IRP.

country's energy supply security is diversification: increasing the number and resilience of energy supply options."¹⁶⁴² For South Africa the introduction of 9.6 GW of nuclear power is intended to increase the diversity and the security of energy and electricity supplies."¹⁶⁴³

6.4.5 The security principle

The security of sources of electricity supply is integral to the comprehensive national policy which aims at providing the energy security of the country. The regulatory framework governing the security of electricity intends to "provide for optimal supply, transformation, transportation, storage and demand of energy that are planned, organised and implemented in accordance with a balanced consideration of security of supply, economics, consumer protection and a sustainable development."¹⁶⁴⁴ The integrated energy planning by the Minister contemplates the security of energy supply which is reviewed on annual basis.¹⁶⁴⁵

The Minister is authorised to ensure the security of supply through "acquisition and maintenance of national strategic energy feedstocks and carriers"¹⁶⁴⁶ and "investment in and maintenance of Energy Infrastructure"¹⁶⁴⁷

- **Section 17 of the National Energy Act reads as follows:**

- (1) "The Minister may, in a prescribed manner, for the purposes of ensuring security of supply, direct any state-owned entity to acquire, maintain, monitor and
- (2) manage national strategic energy feedstocks and carriers. (2) The nominated state-owned entity must perform the functions contemplated in subsection (1) in accordance with the relevant published security of supply strategies or policies.

¹⁶⁴² IAEA, Climate change and nuclear power (2012) at 15.

¹⁶⁴³ *Ibid.*

¹⁶⁴⁴ Section 2(g) of the National Energy Act.

¹⁶⁴⁵ Section (6)(2)(a) of the National Energy Act.

¹⁶⁴⁶ Section 17 of the National Energy Act.

¹⁶⁴⁷ Section 18 of the National Energy Act.

- (3) The strategies or policies contemplated in subsection (2) may contain but not be limited to
- (a) the minimum level of energy carrier or energy feedstock for the production of an energy carrier;
 - (b) the conditions under which—
 - (i) the strategic energy feedstocks and carriers may be built; and
 - (ii) withdrawals may be made from such strategic energy feedstocks and carriers;
 - (c) cost and benefit analysis;
 - (d) funding mechanism for such energy feedstock or carrier; and
 - (e) obligations to be imposed, on producers of energy feedstocks, to supply to the nominated state-owned entity the requisite energy feedstock, in a manner prescribed by regulation.”

- **Section 18 of the National Energy Act reads as follows:**

“The Minister may, for the purposes of ensuring security of supply, direct any state-owned entity, in a prescribed manner, to—

- (a) undertake security of supply measures;
- (b) provide for adequate investment in energy infrastructure;
- (c) invest in critical energy infrastructure; and
- (d) ensure upkeep of all critical energy infrastructure.”

South Africa is challenged by the continuous rapid increase in electricity demand which is driven by economic growth and population growth. This poses many hurdles including:

- 1) Inadequate energy supply infrastructure which includes both the generation infrastructure and transmission infrastructure. Both the electricity generation infrastructure and electricity supply and distribution network are aging.¹⁶⁴⁸ Interventions required to achieve adequacy measures, required to meet increasing demand, include grid expansion, demand side management, and generation infrastructure expansion.

¹⁶⁴⁸ Eskom Holdings Limited Integrated Report (2011) at 144. The issue of aging electricity transmission and distribution network is beyond the scope of this research. Nevertheless the IRP suggests the maintenance, upgrade, and extension of the national grid. See chapter 7 of the IRP, section 6(2) and the comments on table 5 of the IRP etc.

The IRP proposes the expansion of electricity generation infrastructure by new build fleet for the country “for the period 2010 to 2030” which “include a nuclear fleet of 9,6 GW; 6,3 GW of coal; 11,4 GW of renewables; and 11,0 GW of other generation.”¹⁶⁴⁹ The IRP Policy Issue 1 suggests the expansion of power supply infrastructure without nuclear capacity. Nevertheless, the DoE is committed “to a full nuclear fleet of 9600 MW because it will “provide acceptable assurance of security of supply in the event of a peak oil-type increase in fuel prices and ensure that sufficient dispatchable base-load capacity is constructed to meet demand in peak hours each year.”¹⁶⁵⁰

2) Energy resources availability poses a serious challenge for the country. Although coal is extensively available, the accompanying factors e.g. the environmental consequences and the exhaustible nature of coal render coal-fired power plants uneconomic. Section 6(1)(b) requires the Minister to take into account “economically available energy resources.” Consequently, the deployment of economically available energy resources in generating electricity is influenced by affordability, security, reliability, and environmental factors. That is to say, the Minister has find the combination of power supplies which provide the country’s needs with maximum security of electricity supply which is available, affordable, reliable, and clean.¹⁶⁵¹ The 2008 Nuclear Energy Policy proposes nuclear energy as an attractive energy to be deployed for many reasons including:

- “a) South Africa has sizeable uranium (and other potential nuclear material) reserves and a vibrant mining industry.
- b) The extraction of uranium ore does not present any major challenges.
- c) Low carbon emissions based on full life cycle and significant role in achieving clean air by avoiding polluting emissions as compared to fossil fuels.
- d) The availability of safer more efficient new generation nuclear power technologies.
- e) Available energy resources for bulk electricity generation.”¹⁶⁵²

¹⁶⁴⁹ IRP at 6.

¹⁶⁵⁰ See, sections 4(2), 4(3)(a) and 4(4) of the IRP.

¹⁶⁵¹ Eskom Final Scoping Report Chapter 4 at 27.

¹⁶⁵² The 2008 Nuclear Energy Policy at 8.

- 3) Diversification of the electricity supply is required to mitigate “the set of risks associated with an expanding power-supply.”¹⁶⁵³ The promotion of the “diversity of supply of energy and its sources is a legal requirement which is intended to lessen the country’s reliance on coal and introduce variable options of economic and indigenous resources within the country and the region. The 2007-2025 Energy Security Master Plan¹⁶⁵⁴ identifies nuclear energy as “an opportunity for South Africa to introduce diversity in base-load electricity generation capacity. Nuclear Energy presents a viable alternative to coal and there exists “abundant uranium resources in the country.”¹⁶⁵⁵ Based upon the call of the 1998 White Paper on Energy policy to achieve energy security through the diversification of primary energy sources, the first policy principle for nuclear energy use in South Africa is the deployment of nuclear energy “as part of South Africa’s diversification of primary energy sources and to ensure security of energy supply.”¹⁶⁵⁶ Nevertheless, the Energy Security Master Plan regards that “increasing energy diversification, with gas plant and move towards big nuclear and renewable energy system” is still a challenge.
- 4) Diversification of the electricity suppliers is required to develop a comparative electricity market and to give the end user a choice of electricity suppliers.¹⁶⁵⁷ In order to overcome the energy gap Eskom considers that “the signing up of ‘independent power producers’ IPPs nationally...is critical.”¹⁶⁵⁸ The IPPs is proposed as part of the security of supply standards.¹⁶⁵⁹ Section 6(1) of the IRP states that:

¹⁶⁵³ Section 6(6) of the IRP.

¹⁶⁵⁴ DME, Energy Security Master Plan-Electricity 2007- 2025. Hereafter referred to as Energy Security Master Plan.

¹⁶⁵⁵ *Ibid* at 42.

¹⁶⁵⁶ Para 7 of the Nuclear Energy Policy at “The Nuclear Energy Policy aims to increase the role of nuclear energy as part of the process of diversifying South Africa's primary energy sources to ensure energy security.” See, Southafrica.info “South Africa's energy supply” <http://www.southafrica.info/business/economy/infrastructure/energy.htm> (accessed 27 November 2012).

¹⁶⁵⁷ McDonald D “*Electric capitalism: conceptualising electricity capital accumulation in South Africa*” (1-49) in McDonald D ed *Electric Capitalism* (2009) at 31.

¹⁶⁵⁸ *Eskom Holdings Limited Integrated Report 2011* at 172. “Eskom is committed to facilitating the entry of independent power producers in collaboration with government, the National Energy Regulator of South

“The New Generation Regulations require a feasibility study on the potential capacity identified in the IRP to provide input to the Ministerial determination between Eskom build and procurement from Independent Power Producers (IPPs). This feasibility study needs to be undertaken as soon as the IRP is promulgated to give impetus to the decisions.”

- 5) The introduction of the IPPs is useful to minimise the vertical growth of Eskom. Nevertheless, it seems that the role of the IPPs in the intended nuclear expansion programme will be limited because Eskom is plans to integrate the intended new nuclear power plants.
- 6) Underinvestment in the country’s power infrastructure poses an emerging risk to South Africa’s electricity industry.¹⁶⁶⁰ Investment in the electricity industry is a key objective of the Electricity Regulation Act.¹⁶⁶¹ The Government has recently taken a decision to invest in nuclear power generation including the development of a nuclear industrial base.¹⁶⁶² The policy principle for nuclear energy use in South Africa is the deployment of nuclear energy contributes to economic growth and technology development in South Africa through investment in infrastructure, creation of jobs and the further development of skilled workers.”¹⁶⁶³ Therefore, “the move towards sustainability of the electricity industry in South Africa and one that is attractive to investment requires an effective framework that evolves with the needs of the industry in a predictable and transparent manner.”¹⁶⁶⁴

Africa and project developers. Eskom has already signed agreements with independent power producers and will continue to do so within the framework of the integrated resource plan and the multi-year pricing determination.” *Ibid* at 175.

¹⁶⁵⁹ Energy Security Master Plan at 3.

¹⁶⁶⁰ *Eskom Holdings Limited Integrated Report 2011* at 21.

¹⁶⁶¹ Section 2(c) of the Electricity Regulation Act.

¹⁶⁶² Energy Security Master Plan at 41.

¹⁶⁶³ Para 7 of the Nuclear Energy Policy at 15.

¹⁶⁶⁴ *Eskom Holdings Limited Integrated Report 2011* at 32.

7) Energy efficiency is a legal requirement promoted by the National energy Act, the Electricity Regulation Act, and policy documents such as the 1998 White Paper. The Minister has the mandate to regulate the necessary steps required to promote energy efficiency. Section 19(1) reads as follows:

“the Minister may, after consultation with those Cabinet Ministers whose areas of responsibility will be affected by the proposed regulations, without derogating from his or her general regulatory powers, by notice in the *Gazette* make regulations regarding—

...

(h) steps and procedures necessary for the application of energy efficiency technologies and procedures.”

The IRP refers energy efficiency “to the effective use of energy to produce a given output (in a production environment) or service (from a consumer point of view), i.e. a more energy-efficient technology is one that produces the same service or output with less energy input.”¹⁶⁶⁵ The analysis of energy efficiency cannot be insulated from other factors such as environmental constraints, affordability, availability of energy resources, and diversification. “South Africa is one of the world’s least energy efficient nations” and “the 11th highest emitter of greenhouse gasses in the world.”¹⁶⁶⁶ The efficiency of coal-fired power stations in South Africa is very low and reaches approximately 34.8%. Moreover, they are high emitters. In this context “nuclear energy is attractive for a number of reasons” including:

- “Low carbon emissions based on full life cycle and significant role in achieving clean air by avoiding polluting emissions as compared to fossil fuels.
- The availability of safer more efficient new generation nuclear power technologies.
- Available energy resources for bulk electricity generation.”¹⁶⁶⁷

¹⁶⁶⁵ IRP at 5.

¹⁶⁶⁶ See, South African Government Information, “National Electricity Emergency Programme” <http://www.info.gov.za/issues/energy/index.html> (accessed 23 November 2012).

¹⁶⁶⁷ The 2008 Nuclear Energy Policy for the Republic of South Africa at 8.

- Unlike fossil fuels nuclear reactor requires small volume of nuclear fuel required to run a reactor which “make it easier to establish strategic inventories.”¹⁶⁶⁸
- South Africa has 279,100 tonnes of recoverable resources of uranium in 2011 amounting to 5% of the world uranium¹⁶⁶⁹ “which can be recovered economically”¹⁶⁷⁰

The introduction of nuclear energy inevitably enhances electricity security and contributes to greater diversification. The NDP which adopted the proposed 9.6 GW by the IRP regards “the new energy architecture and its relationship to the built environment will spur innovation, and potentially attain energy security and a cleaner and safer environment, while retaining greater biodiversity.”¹⁶⁷¹

6.4.6 The Clean and Environmentally Sustainable Principle

The regulatory framework governing the operation of “any generation, transmission or distribution facility” of electricity¹⁶⁷² requires the “compliance with health, safety and environmental standards.”¹⁶⁷³ These standards are set by the Minister who¹⁶⁷⁴ “may, after consultation with the Minister of Trade and Industry, the Minister of Labour and the Minister of Environmental Affairs and Tourism, adopt measures not contemplated in any other legislation, to minimise the negative safety, health and environmental impacts of energy carriers.”¹⁶⁷⁵ The safety, health and environmental suitability of energy or energy

¹⁶⁶⁸ IAEA Atoms for Peace International Status and Prospects for Nuclear Power 2012, Report by the Director General, GOV/INF/2012/12-GC(56)/INF/6 (15 August 2012), Board of Governors, General Conference para 59. http://www.iaea.org/About/Policy/GC/GC56/GC56InfDocuments/English/gc56inf-6_en.pdf (accessed 23 November 2012).

¹⁶⁶⁹ World Nuclear Association “Supply of Uranium” (updated August 2012) <http://www.unfoundation.org/what-we-do/issues/energy-and-climate/clean-energy-development.html> (accessed 23 November 2012)

¹⁶⁷⁰ International Status and Prospects for Nuclear Power 2012 at 58.

¹⁶⁷¹ NDP at 91.

¹⁶⁷² Section 8(1)(b) of the Electricity Act.

¹⁶⁷³ Section 15(1)(s) of the Electricity Act.

¹⁶⁷⁴ Section 47(4)(q) of the Electricity Act.

¹⁶⁷⁵ Section 4 of the National Energy Act.

services intended to achieve universal access for all the people of the Republic at affordable prices should be taken into account by the Minister.¹⁶⁷⁶ This shall be done taking into account the environmental factor¹⁶⁷⁷ by the Minister of Energy, during the annual development, review and publication of the IRP.¹⁶⁷⁸ The IRP “must... guide the selection of the appropriate technology to meet energy demand.”¹⁶⁷⁹ The technology utilised in electricity generation may function as a decisive factor in promoting certain energy resources. For example, “during the development of the master plan, a deliberate decision was taken to choose cleaner technologies in order to mitigate against climate change”¹⁶⁸⁰ Besides the energy efficiency, diversification, demand side management, clean coal technologies¹⁶⁸¹ etc., nuclear power has been proposed as a solution for the adverse environmental impact resulting from fossil fuels and their rapid depletion.

6.5 CONCLUSIONS

Access to clean and modern electricity became a UN’s universal call intended to promote the quality of the living standards of all humans. The examination of universal access to electricity in South Africa requires the examination of the electricity supply infrastructure in order to assess the availability of adequate electricity generating capacity. The IRP and other policy documents have identified the need to expand the electricity supply infrastructure. There is broad agreement in the literature that South Africa must address the environmental interests, the availability of resources, and the objectives of sustainable development in its policies and planning to develop and expand access to electricity.

This thesis examines the components of the South African electricity supply infrastructure in order to assess the electricity generating capacity and its envisaged expansion. All the data examined indicates nuclear energy as the best alternative source of energy for fossil fuels in so far as the satisfaction of base load generating capacity is concerned. Nuclear energy also

¹⁶⁷⁶ Section, 5(1) and 5(2)(a) of the National Energy Act.

¹⁶⁷⁷ Section 6(2)(g) of the National Energy Act.

¹⁶⁷⁸ Section 6(1) of the National Energy Act.

¹⁶⁷⁹ Section 6(6)(c) of the National Energy Act.

¹⁶⁸⁰ Para 6(iv) of the Energy Security Master Plan.

¹⁶⁸¹ Para 7.6.4.1 of the 1998 White Paper on Energy Policy.

remains the cleanest and safest energy option for South Africa, within the context of availability and affordability of sources of energy.¹⁶⁸²

The legal linkages between the universally acknowledged rights to development and therefore of access to electricity and the socio-economic rights system in the South African constitution remain to be fully explored and developed. Thus far the Constitutional Court has not confirmed access to electricity as an independent constitutional right, but rather as a right ancillary to the right to adequate housing, whilst it has found the guarantees of fair administrative action to apply to any denial of access to electricity. Legislation, on the other hand, has treated access to electricity as a right and numerous policy and policy planning documents consider access to electricity as a necessary condition for the achievement of South Africa's reconstruction and development goals. Indeed, further study and attention to the evolution of international human rights guarantees will provide the proper platform, in the context of Article 39 of the Constitution, for recognising access to electricity as an independent human right which merits constitutional protection.

Access to electricity is all-important for the realisation of most socio-economic rights and is integral to the fulfilment of the right to adequate housing. The choices and decisions of the State regarding the electricity supply infrastructure and its future expansion must therefore address actual requirements, and objectively and rationally balance available options, affordability and environmental concerns so as to optimise the preservation of each of the involved normative values to the utmost. The inadequacy of the current electricity supply infrastructure is reflected in the assessed need to double the current generating capacity up to a total in excess of 80 GW by the year 2030, i.e. in less than two decades, whilst substantially reducing South Africa's reliance on coal, due to severe environmental but also economic concerns. Any other alternative fossil fuels would have to be imported and can therefore not be relied upon to replace coal as the primary source of energy for the satisfaction of base load electricity demand.

In this context it is relevant that South Africa has readily available, affordable and vast uranium resources which are entirely suitable for generating electricity. The utilisation of

¹⁶⁸² The Strategic Plan 2011/12–2015/16 at 5.

these resources would contribute significantly to mitigating climate change. Added to that, both the South African national and the international nuclear legal regimes provide an adequate and safe regulatory framework and all the relevant guidelines for South Africa's nuclear energy expansion programme. For these reasons, it must be considered a rational and constitutionally required decision that the South African government has decided to pursue its declared nuclear power expansion programme that is projected to add 9.6 GW from nuclear energy by 2030.

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