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ENERGY BRIDGE BUILDER
Finland – Namibia Cooperation in Energy Business

Master's Thesis in
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CONVERSIONS AND ABBREVIATIONS

BOOT	Built-Own-Operate-Transfer
DSM	Demand Side Management
EE	Energy Efficiency
ECB	Electricity Control Board
DNI	Direct Normal Irradiance
ESI	Electricity Supply Industry
FDI	Foreign Direct Investment
GW	Gigawatt, unit of electrical generation capacity; equal to 1,000 MWh, unit of energy
GHI	Global Horizontal Irradiance
GRN	Government of the Republic of Namibia
KW	Kilowatt; as unit of electrical generation capacity
LPU	Large Power User i.e. a mine taking direct supplies from NamPower
MW	megawatt; unit of electrical generation capacity
MME	Ministry of Mines and Energy
MSBM	Modified Single Buyer model
NamPower	Namibia Power Corporation (Pty) Ltd
NamREP	Namibia Renewable Energy Programme
IPP	Independent Power Producer
PVP	Solar Photovoltaic Water Pumping System
PWh	Petawatt hour; equal to 1,000 TWh, unit of energy
NSA	Namibia Statistics Agency
RED	Regional Electricity Distribution Company
RE	Renewable energy
REFIT	Renewable Energy Feed-In Tariff
SHS	Solar Home System
PV	Solar photovoltaic, technology that converts sunlight to electricity
SRF	Solar Revolving Fund
SWH	Solar Water Heater
SACU	Southern Africa Customs Union
SADC	Southern African Development Cooperation
TW	Terawatt; unit of electrical generation capacity; equal to 1,000 GW
TCO	Total cost of ownership
UNFCCC	United Nations Framework Convention on Climate Change (UNFCCC)

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ABSTRACT:

This study is a result of a project initiated by the author in response to a looming electric power crisis in Namibia. Namibia has traditionally imported over half (at times up to 60%) of the electricity consumed in the country from neighbouring countries through Southern African Power Pool agreements. However, the exporting countries are facing power shortages as local demand continues to grow. It is against this backdrop that Namibia has embarked on a mission to become self-sufficient in power production.

The objective of the study is to promote business collaboration between energy companies and public sector in Finland and energy companies and public sector in Namibia. The objective is achieved by assessing the availability of renewable energy resources in Namibia, identifying major actors, investor networks, energy needs, and barriers to entry into the Namibian energy industry. The primary aim of the research is to build a networking platform for energy stakeholders from the two countries and ultimately create business relationships. As a result, the study proposes entry modes into Namibia for Finnish companies. The secondary aim is to promote education and research cooperation between the University of Vaasa and the Namibia University of Science and Technology.

The empirical data was collected through a survey distributed to Namibian energy stakeholders. The study revealed that the country is rich in renewable energy resources and has an established government-supported energy market. The study concluded that there are numerous business opportunities for Finnish energy companies in Namibia, and the best entry strategy into this young market is through strategic partnerships with local companies. Moreover, Namibian companies and the public sector are willing and able to contribute financially and strategically to partnerships with Finnish companies.

KEYWORDS: energy business, Finland-Namibia cooperation, strategic partnerships, renewable energy, electricity

1. INTRODUCTION AND STATEMENT OF PROBLEM

1.1. Background

In 2007 the United Nations Intergovernmental Panel on Climate Change (IPCC) warned that warming of the planet was certain and that “most of the observed increase in global average temperatures since the mid-20th century is *very likely* due to the observed increase in anthropogenic GHG concentrations” (IPCC 2007: 5). That said, energy is essential for life on earth and it is a primary driver of any modern economy. The availability, affordability and security of energy supplies are pre-requisites for the existence and development of the human population. As such, energy is a basic need for survival and security, it is needed for building and maintaining material environments, it provides comfort in utilising the material environment, and it is at the core of modern day human social interaction such as communication. It is the steady supply of energy that makes the lives of affluent people easy or comfortable, compared to that of billions still living in poverty. (Armaroli & Balzani 2011a: xv.)

Population and economic growth in the last few decades has caused global demand for energy to rise significantly. The rise in global energy demand is expected to continue while consumption is expected to roughly double by mid-century (VTT Technical Research Centre of Finland 2009: 11). Table 1 shows that the world population is expected to reach 9.7 billion people by 2050, from a population of 6 billion in 2000. Namibia’s population is expected to reach 3 million people by 2030. At continental level, the population of Africa with a growth rate of 2.3% per year during 2010-2015 is expected to reach 2 billion by 2044, as shown in the table below. (UN, 2011 : UN, 2015.)

Table 1. Population of the world and major areas, 2015-2100 (UN, 2015), According to the medium variant projection

Major area	*Population (millions)* 2015	2030	2050	2100
World	7 349	8 501	9 725	11 213
Africa	1 186	1 679	2 478	4 387
Asia	4 393	4 923	5 267	4 889
Europe	738	734	707	646
Latin America and the Caribbean	634	721	784	721
Northern America	358	396	433	500
Oceania	39	47	57	71

Source: United Nations, Department of Economic and Social Affairs, Population Division (2015). *World Population Prospects: The 2015 Revision*. New York: United Nations.

This trend in energy demand driven by population and economic growth is especially prominent in developing countries, particularly those in Asia and parts of Africa (Rämä, Pursiheimo, Lindroos, & Koponen 2013). Namibia, like all other Southern African countries, is facing an energy crisis. More specifically, Namibia has a severe shortage in power supply. NamPower, the national power utility company, is expected to continue introducing electricity tariff increases until Namibia reduces its reliance on other Southern African countries for electricity (2014 NamPower Annual Report 2015). According to the same annual report the constraints in power supply are expected to persist until Kudu Gas Power, a new base load gas power station of about 800 Megawatt (MW) is commissioned in 2019/2020 (2014 NamPower Annual Report, 2015). While these challenges persist, for an optimist, they present opportunities for growth and development.

About half of Namibia's electricity is generated locally, with the other half being imported from neighbouring countries (Emcon Consulting Group, 2008). According to the Energy Policy White Paper (White Paper), the Namibian energy policy document of 1998, Namibia will strive to be self-sufficient in energy in the near future. Although the document is outdated in some part, it sets a number of initiatives leading towards the development of Namibia's energy sector, and numerous research has been carried out aimed at fulfilling the policy framework (Rämä, et al. 2013). The White Paper sets out five goals to serve as framework for energy policy, as follows:

a) Effective governance
b) Security of supply
c) Social upliftment
d) Investment and growth

e) Economic competitiveness and efficiency

The White Paper's objectives are clear, to develop Namibia's energy industry sustainably and ensure security of supply. However, data showing the development of Namibia's energy industry indicates that no significant improvements have been made since the adoption of the White Paper. As the figure below shows, supply has been increasing steadily since 1998 with a sharp peak in 2001; however, oil imports have continued to rise which may indicate little or no signs of sustainable development in the industry.

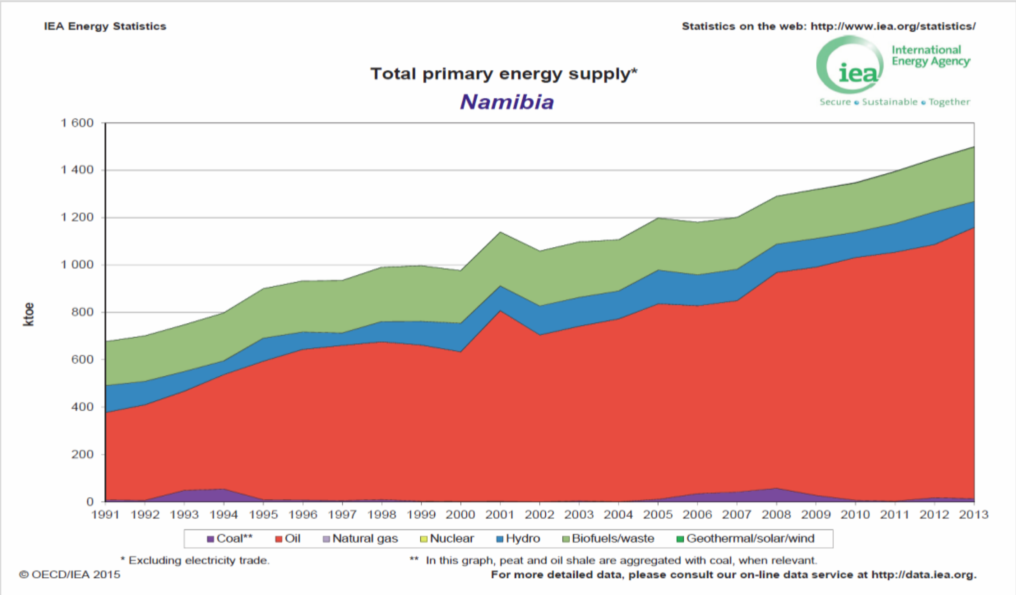

Figure 1. Namibia total primary energy supply, 1991-2013 **(IEA, 2015a)**

According to (IEA 2015a) statistics, Namibia was still reliant on imported energy in 2013, with oil taking the lion's share of the total primary energy supply in Namibia, as shown in the figure below. This trend still continues today. A matter of concern in the figure is that Namibia has no proven and commercially viable oil reserves; therefore, 100% of oil consumed in Namibia is imported (IEA 2015a). This indicates little or no progress towards attaining the objectives of the now 15 years old White Paper. The figure below summarises the share of total energy supply per energy source.

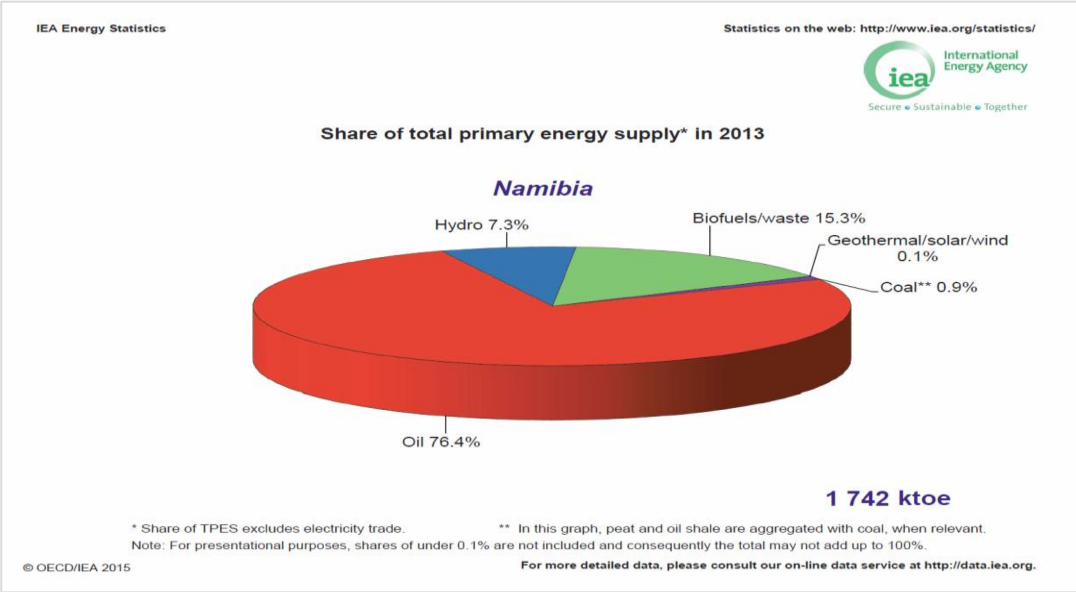

Figure 2. Share of total primary energy supply, 2013 (IEA 2015)

The figure above illustrates that Namibia imports well over two thirds of its primary energy supply. Such a reliance on imported energy is not desirable for any sovereign state. Nevertheless, the matter of energy security is not being left unaddressed any longer. The Government of the Republic of Namibia (GRN) through the Development Bank of Namibia (DBN) together with other stakeholders has come up with initiatives to make Namibia self-sufficient in energy production. These entities have identified opportunities to be harnessed with direct strategic intervention. The intervention is planned to be carried out through development of new infrastructure, rehabilitation of existing infrastructure and Demand Side Management (DSM). DBN is mobilising financing for these projects from state coffers, international sources, and local commercial sources of finance.

This thesis is a result of a project initiated by the author in response to the looming energy crisis in Namibia. In the initial stage of the project, the author called for a meeting between the Ambassador of Namibia in Finland and officials of the University of Vaasa together with a local energy institute, local energy Small and Medium Enterprises (SMEs) and other stakeholders. The meeting was aimed at bringing together organisations and individuals needed for the project's success. The meeting was attended by officials from the University of Vaasa and the energy institute, the Master's thesis supervisor of the author, representatives from a design company in the Vaasa Region, and a Finnish technology company offering expertise in development of business activities and operational preconditions of Vaasa enterprises. Also in attendance was a representative of an energy technology company, and of course the Ambassador of Namibia in Finland. All organizations presented their activities and how they could be adapted to the Namibia's needs, from business perspectives to research and education. The decision was taken at the meeting to begin preparations of partnership frameworks between Vaasa and Namibia. And, this thesis was born.

1.2. Problem, Objectives and Questions

On 5 March 2015, a peak demand of 524 MW was recorded in Namibia against a peak supply of 300 MW from locally generated power. The peak demand excludes demand of one of the largest single consumer of electricity, the Skorpion Zinc mine. The country's peak hours are from 06h00 to 09h00 in the morning and 18h00 to 21h00 in the evenings. The shortfall between demand and supply was addressed through existing power supply agreements with utilities in the Southern African Development Community (SADC) region. The power shortage is being experienced in the whole SADC region and has forced utilities in some countries to implement measures such as load-shedding to reduce the strain on generation systems. However, these measures are not without consequences as they have a negative impact on the economy. NamPower has avoided load-shedding by introducing some more effective DSM methods. However, these DSM measures are only short-term. (Shilamba 2015.)

Namibia faces an electricity supply shortage in the medium and long term. The supply of electricity in Namibia relies heavily on imports from neighbouring countries, mainly South Africa. Up to 65% of Namibia's electricity supply in 2011 was imported (Rämä, et al. 2013). The growing demand for electricity and the uncertainty of supply continually expands the gap between demand and supply. It is this gap that has forced government and other stakeholders to think of alternative methods of making Namibia self-sufficient in electricity supply.

Namibia's power challenges are unique. First, it is the only Southern African country that imports more power than it generates. Secondly, although access to electricity in urban areas was above 75% in 2011, only 25% of the population in rural areas had access to electricity. Thirdly, even though there are sufficient renewable resources; solar, wind, and biomass from invader bush, Namibia has not invested much in utilising these resources to satisfy its energy needs (REEEP, 2014). The country does not have an official renewable energy policy and government offers very limited support to the renewable energy industry. Lastly, even in the face of with a looming energy crisis, Namibia has not done enough in its efforts to establish an electricity market that would allow participation of the private sector on a large scale.

Therefore, as CORE International, Inc. (2009) reported, the challenges facing Namibia include a) the reduction in surplus electricity supply from South Africa; b) rising prices for liquid and gas fuels; c) rising demand for electricity in the mining sector due to increasing demand for mining products; d) the long lead times attached to building new power plants; and e) the willingness to develop a secure power supply without the involvement of South Africa (CORE International, Inc., 2009).

The objective of the study is to formulate a cooperation framework for energy companies and the education sector in Finland and energy companies, education and the public sector in Namibia. The objective is achieved by assessing the availability of renewable energy resources in Namibia, identify major actors in the industry, investor networks, and energy needs of Namibia, as well as barriers to entry into the energy industry. The primary goal of the research is to introduce Finnish energy companies to Namibia and ultimately create business relationships between Finnish and Namibian firms and encourage actual business activities. The secondary goal is to secure cooperation between the University of Vaasa and the Namibia University of Science and Technology (NUST). The study focuses on Namibia's electricity sector, particularly the renewable electricity sector. The study assesses the availability of renewable energy resources and energy efficiency technologies in Namibia and the role they play in the country's sustainable development targets. This assessment addresses the objective of the research. The main aim of the study is to contribute to Namibia's quest for self-sustenance in electricity by identifying opportunities in the renewable energy industry and introducing energy companies and researchers from Finland to Namibia.

To realise the objective of the research, the following questions are asked:

1. Why is Namibia facing an electricity crisis when the country has an abundance of renewable energy resources?
2. What business opportunities are presented by this crisis and how can Finnish companies capitalise on them?
3. Are Namibians companies able and willing to contribute financially and strategically to partnerships with foreign companies?

1.3. Scope and Delimitation

This research shall conduct a thorough examination of the Namibian energy sector. Current and future possible energy systems will be examined and the main players will be identified. The examination will determine the opportunities that Finnish energy companies may exploit. Importantly, possible forms of business partnership between the private and education sector between these two countries will be identified and recommendations made. The focus of this evaluation will be on renewable energy (RE); however, other sources of energy will be touched upon in brief. As a result, possible entry modes into Namibia will be presented and recommendations made.

This research is not a business plan. It merely serves to create a framework of understanding between Namibia and Finland and pave way for economic cooperation of mutual benefit between the two countries. It is an information source for future exploration of the Namibian energy industry and a stepping stone for a focused market research for Finnish as well as Namibian energy firms and researchers. The research will identify possible sites for operation in Namibia. However, it will not take to legally secure such sites unless officially instructed to do so by prospective firms. Just as the research will not be a business plan, it will not oblige participating firms to implement the findings of this work. Although discussions of the Southern African Power Pool (SAPP) will be included, this research will not be exploring or promoting business opportunities in other member states of SAPP unless such opportunities are directly related to Namibia. Due to the limited scope, this research will not include a study of the Finnish energy industry; however, a brief literature on the topic will be presented. Finnish energy technology and its applicability to Namibia deserves a dedicated study of its own. This limitation is a direction to another focussed study.

1.4. Methodological Framework

After reviewing several research design methods, the author came to the conclusion that the design phase of this research is to be done using the research onion. The research onion is a metaphor created by Mark Saunders and partners, used for describing the research process. The onion layers represent the different stages of the research process from philosophy to data collection and analysis (Saunders & Lewis 2012: 103). The research onion was chosen because of its holistic view of the research process.

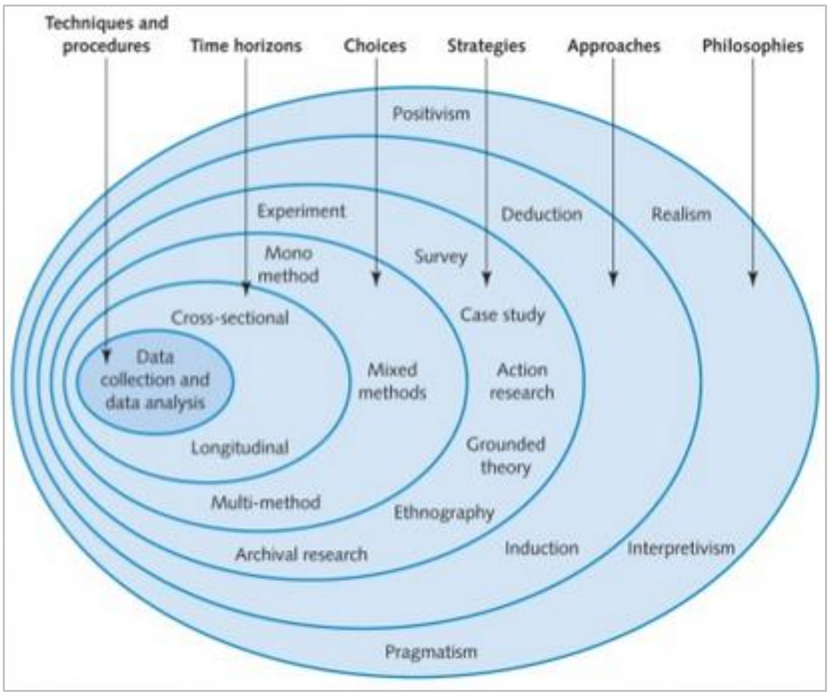

Figure 3. The Research Onion (Saunders & Lewis 2012)

The research philosophy employed in this work is the pragmatic research philosophy. The practical nature of this work makes this philosophy suitable. The pragmatic philosophy suggests that the most important factors that determine the research philosophy are the research questions and objectives (Saunders & Lewis 2012: 107). Pragmatic thinking satisfies the need for a mix of methods, which is a requirement for this research given its questions and objectives. Positivism and interpretivism are fine epistemological approaches; however, positivism on one hand makes the researcher too detached from the examination while interpretivism on the other hand leads to unacceptable levels of subjectivity in this kind of research. A pragmatic paradigm does not support any one philosophical standpoint, instead it takes into account the physical and social world and asks the questions 'what' and 'how' (Wilson 2014: 10).

The research approach employed in this work is inductive in nature; a bottom up approach that builds theory from observations (Saunders & Lewis 2012: 109). Hyde (2008: 83) as quoted by Wilson (2014: 12) defined inductive as a process of building theory by observing specific subjects and creating generalisation about the subject being examined. This definition is illustrated in the figure below.

Figure 4. Research Approaches

The figure above demonstrates the difference between the two approaches in terms of theory. The figure is adapted from Wilson (2014: 13). Inductive was chosen over deductive because it allows the researchers to build theories of cooperation from the observation that there is an energy crisis and there are opportunities for business.

1.5. Structure of the Thesis

The organisation of this thesis follows the six-step research process suggested by Polonsky & Waller (2011). The 6 steps basic steps are presented in the figure below.

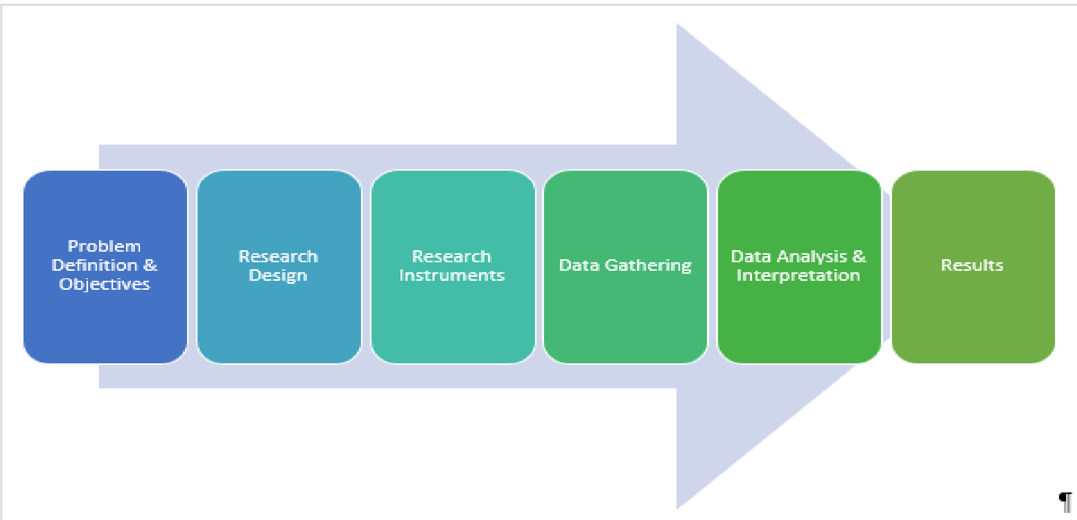

Figure 5. Research process. Adapted from (Polonsky & Waller 2011)

The rest of this thesis is structured as follows: Chapter 2 presents a review of the literature employed in this research. Chapter 3 discusses the theoretical framework upon which this study is based. This discussion addresses the diverse theory of energy production and consumption and its impact on Earth's biodiversity. Concepts such as energy economics, energy efficiency and sustainable development are addressed in this chapter. Chapter 4 gives an introduction to the case country: Namibia. The chapter gives an overview of Namibia as a country and offers a guide on how to conduct business operations in the country. Chapter 5 presents the Namibian energy industry and identifies the industry's main players. Chapter 6 focuses on the availability of renewable energy sources in Namibia and some statistics on the supply and demand of electrical energy in the country. This chapter gives a background understanding of the amount of known resources available in the country. Chapter 7 presents an analysis of the empirical data obtained from the case study conducted. Finally, the conclusion chapter discusses findings and offers recommendations for Finnish companies entering Namibia.

2. LITERATURE REVIEW

2.1. General Energy Trends, Climate Change, and Renewable Energy

Currently, a vast majority of the primary energy used by the world population, including energy used to produce electricity, comes from fossil fuels. However, today authorities and law makers have understood that these fuels are of finite nature and they have a negative impact on the climate just as they are a danger to the environment and human health. Therefore, there appears to be a move towards replacing energy technologies based on fossil fuels with renewable energy technologies. However, there is more to it than a simple move towards renewable energy technologies, the world seems to be headed towards an electricity-based economy (Armaroli & Balzani 2011). According to the authors, this is due to the fact that all the renewable energy technologies likely to replace fossil fuels are primarily for producing electricity. It would make sense that law makers are pushing for alternative energy sources now more than ever. Perhaps another reason for the move is the increasing affordability of renewable energy technologies.

2.2. Global Energy Trends

Hoffmann (2014) made an analysis of the current economic competitiveness of renewable energy technologies and argues for a 100% renewable energy coverage. His work shows that it is more feasible than previously understood that the world can achieve a 100% coverage by renewable energy. The book discusses various renewable energy technologies including solar photovoltaic (PV) and thermal, wind, hydro and tidal, bio energy and geothermal, among others. The work also emphasises energy efficiency as a critical means of reducing energy demand without compromising on living standards. The book makes a case for why and shows how renewable energy technologies will be more economical than fossil fuels in the near future. The book also demonstrates that renewable energy technologies' cost competitiveness will be driven by market demand instead of push factors.

In the same context of energy economics, Develi & Kaynak (2012) assert that energy is a very highly significant part of human existence and that its economic and political importance is demonstrated daily in countries' domestic and foreign policies. The authors continue that the European Union's energy consumption is on an upward streak. Striving to reduce the EU's dependence on Russia for energy has seen an increased focus on renewable energy. Develi & Kaynak also argue that the EU has also been active in adopting the use of natural gas as an alternative energy source.

Diesendorf (2014a) takes it a step further with a broader approach at sustainable development by offering a guide combining science, necessary technologies and policies required for sustainable development. The book does not only promote renewable energy but demystifies the myths surrounding it. It presents scenarios of renewable energy and energy efficiency transition, argues why nuclear energy is not the solution and offers advice on how individuals could contribute to the transition to efficient energy use.

Andrews and Jelly (2013) take an interdisciplinary approach similar to Diesendorf with a combined discussion of energy science, including the fundamentals, technologies and impacts of anthropogenic energy use. The book answers questions such as, are renewables actually capable of taking the dominant place of fossil fuels in the energy mix and whether or not current technologies are sufficient to fight global warming. The authors cover all energy sources, renewable and fossil, and measure just how much energy can attained from them all.

2.3. Namibian Energy Industry

On the Namibian energy frontier, there is a relatively significant body of literature on energy, particularly electricity supply and demand. The White Paper on Energy (1998) lays the foundation for all of Namibia's energy industry undertakings and developments. The policy sets 6 goals: effective governance, security of supply, social upliftment, investment and growth, economic competitiveness and efficiency (White Paper, 1998).

The amount of literature on electricity may be attributed to the studies conducted through the Namibian government's efforts to ensure security of supply through, among other means, making rural electrification a priority, introduction of energy efficiency programmes as well as electricity market liberalisation and promotion of Independent Power Producers (IPPs). The government has also been pushing a move towards renewable energy. The need for off-grid rural energy supply has received attention in the last several years. This is perhaps due to government's efforts to ease the impact of rural-urban inequalities and deter people from moving to already overburdened cities. Moreover, the sparseness of Namibia's population makes it infeasible to have the whole country connected to the grid. Since the inception of the Namibia Renewable Energy Programme (NamREP), several studies have been conducted on the country's energy future. Some of the notable studies include the Namibia IPP and Investment Market Framework Technical Assistance study of 2006, the Off-Grid Energisation Master Plan of 2007, and the Electricity Supply and Demand Management Options study of 2008.

Ample literature on the regulation of Namibia's energy industry can also be found. To demonstrate the importance of electricity to economic development and the need to regulate the industry, the Namibian government was swift in establishing the Electricity Control Board (ECB), a state institution that regulates the electricity sector of Namibia. According to the Electricity Act (2007), the ECB's mandate is to ensure the effective functioning of the Namibian electricity sector. It undertakes its mandate through various activities including electricity price setting and licensing of operations in the industry.

Although Namibia has been active in promoting the use of renewable energy, there was no separate renewable energy policy document at the time of writing this thesis. According to information from a survey conducted by the author of this work, there is currently work on an official renewable energy policy framework, even though this information was unknown to the majority of the respondents of the survey.

2.4. A brief on Finnish Electricity Sector Outlook

According to Energiateollisuus (2016) statistics, Finland's gross electricity consumption increased from 80 000 GWh in the year 2000 to 88 000 GWh in 2010. However, consumption dropped from its 2010 figure to 83 000 GWh in 2014. This could be attributed to low economic growth on one hand, or to increased efficiency on the other. As Nordic Energy Research reported in 205, Finland aims to reduce CO2 emissions by at least 80% in 2050 from their 1990 level. This ambitious target could be contributing to the reduction in energy consumption. These advancements in technology make Finland a world leader in energy technology and puts it in a position to develop Namibia's energy industry sustainably.

3. THEORETICAL FRAMEWORK

This chapter addresses energy theory, the basis of this study. Energy theory draws attention to the ecological, economic and social impacts of anthropogenic heating of the Earth's atmosphere. The chapter introduces some of the most widely debated concepts in energy production and consumption and development, namely renewable energy and energy efficiency, both of which are perceived as the current means to sustainable development. The chapter discusses the term sustainability in broad terms and in specific context of energy management. Energy management ensures that consumers have permanent access to energy while also ensuring resource conservation, climate protection, and cost efficiency. Energy management in this study is diffused in the discussions of energy security and energy efficiency. The relationship between energy, environment, and GDP is also discussed in this chapter.

3.1. Global Energy Trends

The world faces an energy dilemma, to secure reliable, affordable and equal energy supplies; and to secure it in an environmentally-friendly manner (Bradshaw 2014). For millions of years the use of energy on Earth was in balance with nature. Animals and plants coexisted in a natural cycle. This natural cycle was changed when primitive human beings discovered fire. Since then, the uses of heat energy have evolved as humans have developed and changed their lifestyles. Since the discovery of electricity—the most versatile and convenient form of energy—humankind has achieved tremendous advancement in lifestyle and position in the natural system. Electricity has enabled the development of human societies and has given humans the power to transform civilisations into what quality lifestyle is today. (Andrews & Jelly 2013: 1.) As these transformations have taken place, human consumption of energy has grown tremendously and fossil fuels have taken a great role in energy supply (Diesendorf, 2014a). However, as the impacts of greenhouse gas emissions on the climate and environment are clearer today than ever before, development of low emission or emission-free energy sources has become a priority.

According to the IEA (2015c), energy demand is expected to rise by nearly one-third by 2040 from current demand. One positive aspect to this growth is that it comes from non-OECD countries with China and India leading the, while the OECD will see demand fall by 3% IEA. (2015c.) However, approximately 1, 2 billion (17% of the world population) have no access to electricity while an estimated 2.7 billion people, mostly from Sub-Saharan Africa still use traditional biomass as the primary energy sources for heating, putting their lives at risk IEA (2015d). This unequal distribution of energy use undermines the basic concept of sustainable development, discussed below.

The world is currently witnessing tremendous growth in economic and social status of people. A great part of Earth has been lifted out of poverty and famine. Energy has been at the centre of these economic and social developments. However, these successes have not come without repercussions. The use of fossil fuels has seen the most powerful and technologically advanced society in human history destroy the natural world and set the human population on a trajectory likely to heat the planet up to 4 degrees Celsius (ºC) or more above the pre-industrial average by 2100 (Diesendorf, 2014a). Water vapour and carbon dioxide are the two main gases responsible for raising the temperature on Earth (Andrews & Jelly 2013: 370). The consequences of which have begun manifesting in changes in precipitation patterns resulting in severe droughts, heat waves, melting ice and rising sea level.

Emissions of greenhouse gases have damaged the system humankind is dependent on, the biosphere, that makes all of life on Earth. In recognition of the damage, attention has been brought to how the human population can remedy the harm caused to the planet. Hence, concepts such as global warming and carbon emissions, sustainability and sustainable development, renewable energy and energy efficiency, GDP and energy decoupling as well as energy economics, among others. These concepts are perceived as some of the measures taken to reduce the effects of greenhouse gases on the atmosphere. According to Diesendorf, there are three fundamental drivers behind human induced deterioration of the planet: population growth, consumption per capita, and inefficient technologies. All three need to be addressed to mitigate the problems associated with the use of fossil fuels. Andrews & Jelly (2013: 374) cement the relationship between Diesendorf's drivers by outlining the relation of carbon emissions to population, GDP, and energy consumption through the Kaya identity:

$$CO_2\ Emissions = Population \times (GDP/Population) \times (Energy/GDP) \times (CO_2/Energy)$$

The Kaya identity is a formula for a calculation that relates the quantity of annual carbon emissions to *population*, *consumption per capita*, and *energy intensity*, relative to annual

GDP and *carbon efficiency*, measured in gigatonnes of carbon emitted per terawatt of energy used.

The human population is bound on a continuous quest for abundant energy. Kruger (2006: 1) identifies three historic constraints of recorded history. The first historic constant is the never-ending search for useful energy by the human population. The second is the desire by a common population to live together in a clean and safe environment. The last constant is the permanent path of innovating better ways to generate energy in order to make living conditions better. The consistent discoveries throughout recorded human history has been motivated by the desire to do better over doing without. (Kruger 2006: 1.)

The drive for a better life, often perceived as safe and comfortable life style, has been at the forefront of human innovation. Kruger (2006:2) expresses this quest for abundant energy in three axioms that describe the drive for better living. The axioms are directly quoted as follows:

a. At any given growth rate of the population, total energy consumption will grow at a greater rate

b. Fundamental human goals include both the desire for abundant energy on demand and a clean and safe environment.

c. The future of humanity will continue to follow a one-way and irreversible path.

These axioms roughly translate in the modern human societies' desire for security in energy supply and their willingness to be *energy secure* at any cost. As will be presented below, the quest for energy security may be responsible for the dependence on fossil fuels and the various conflicts taking place in the world.

3.2. Diversity and Energy Security

Energy security may ultimately prove to be the most important component of the security of human habitation. The influence of energy resources on economic growth and development is not new (Galarraga, Gonzalez-Eguino & Markandya 2011: 9). The phenomenon of energy being a security issue dates back to the 1970s when the OPEC (Organization of the Petroleum Exporting Countries) countries cut oil supplies in 1973, and the crisis that followed exposed vulnerabilities of the energy system (Dyer & Trombetta 2013: 3). Therefore, energy security can be defined as “the uninterrupted availability of energy sources at an affordable price” (IEA 2016b). This definition of energy security contains in it three pillars: uninterrupted, reliable and affordable supply, as depicted in the figure below.

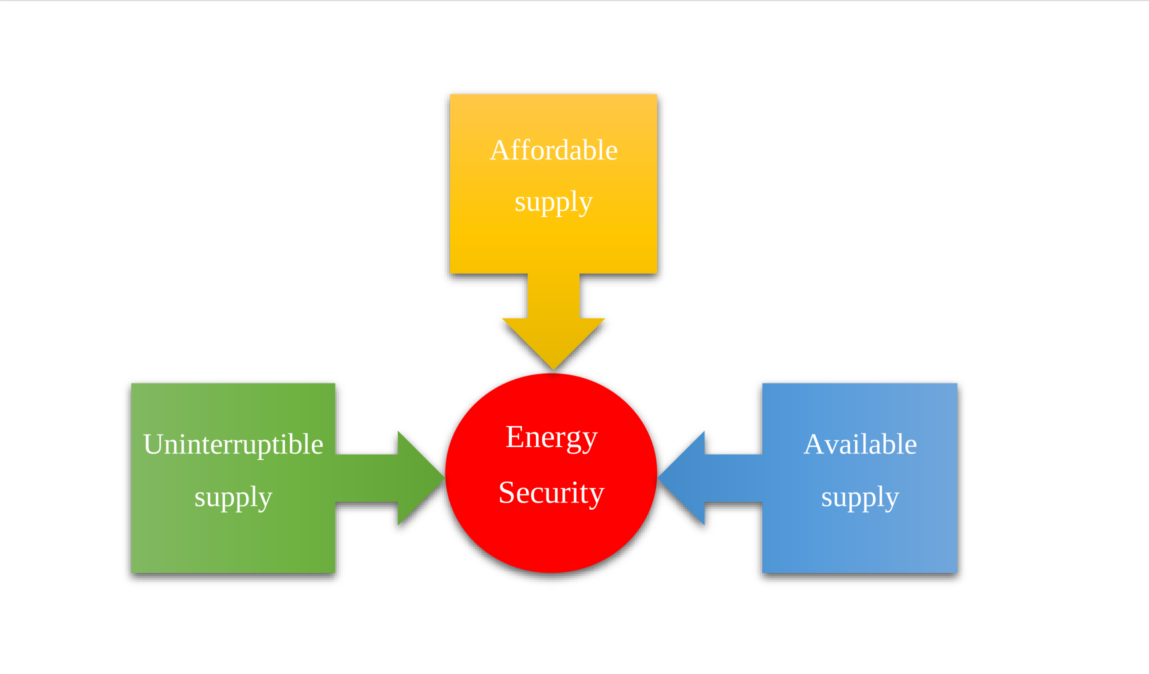

Figure 6. Defining energy security (adapted from IEA 2016b)

There are many definitions of energy security, most of them are centred on its continuous physical availability and economic affordability. Energy is critical for economic growth, and most of the recent global recessions may be associated with the energy price shocks. Therefore, ensuring energy security requires a multi-dimensional approach, which includes: preventive and crisis response mechanisms, foreign policy, infrastructure development; and energy efficiency. However, it is realistic to say that energy sources—renewable and fossil—are unevenly distributed (Filho & Voudouris 2013). It is a reality that some countries lack energy security because of this uneven distribution. Reliance on energy sources from other countries renders a country vulnerable to external factors, including politics, natural factors, and global market disruptions. Countries better endowed in resources have a hold over countries that are not, as was the case in recent disputes between Russia and various Eastern European countries (Dyer & Trombetta 2013: 3). This view is also supported by Develi & Kaynak (2012: 189) who state that countries that own energy resources can influence others by simply manipulating the market.

Energy security can be approached in one of two ways; as an economic concept or as a subset of national security. The economic approach is concerned with price and supply mechanisms of energy security, whilst the national security view allows for an analysis of the vulnerability of the physical system conveying energy from one place to another. The importance of vulnerability analysis being that energy security as a subset of national security integrates energy considerations in national and foreign policies of countries. Relations with countries are important in a situation where energy is produced in one country and transited through another before it reaches its final destination. The physical infrastructure transporting energy—pipe lines or electricity cables—are crucial to energy security of a country and ultimately national security. However, the notion of energy security does not only apply at national level but also at regional, community or household level and even individual level. As other researchers would argue, being energy secure at a local level can mean resilience and escaping from persisting carbon lock-in—the notion that industrial economies have been *locked* into carbon-emitting energy systems through the co-evolution of technology and institutions driven by unsustainable economic models. Yet, for a parent somewhere deep in rural areas, energy security means having electricity for themselves and their children to study at night. (Filho & Voudouris 2013; Unruh 2008; Brown, Rewey & Gagliano 2013.)

Energy security, whether as a subset of national or otherwise, has numerous dimensions: long-term and short-term energy security. Long-term security addresses the alignment of energy policy with economic and sustainable developments. Short-term security is concerned with the energy system's ability to respond to fluctuations in supply and demand. The risk of physical unavailability is no major concern in international oil markets that change according to changes in demand in demand and supply. However, it is a major concern in the electricity sector where transmission lines are subject to capacity constraints and lack of market response to price fluctuations. (IEA 2016b.)

Turning back to national level energy security, it is argued that few themes have been more constantly prominent in the evolution of energy policy considerations in many countries as energy diversity (Galarraga, Gonzalez-Eguino & Markandya 2011: 213). The definition of energy diversity, like energy security, is defined in various ways around "the pursuit of an evenly balanced reliance on a variety of mutually disparate options" (Galarraga, Gonzalez-Eguino & Markandya 2011: 213). Some developing countries, such as Namibia, have tremendous renewable energy potential, especially solar, wind biomass (NEI, 2015). One would think that it is only logical that people take advantage of these resources as there are enormous benefits to be gained. Renewables broaden a country's energy generation portfolio by diversifying energy supply, in the process boosting energy security. Countries with broader energy generation portfolios are better-off than those which heavily depend on centralized large-scale hydro or conventional fossil fuel-based energy generation (Galarraga et al. 2011: 214). Moreover, diversification has traditionally meant an inclusion of sustainable energy sources, the result of which is sustainable development. Perhaps, diversity is the partial solution to the global energy dilemma presented above.

3.3. Sustainable Energy and Development

The term sustainable development was popularised in a report published by the World Commission on Environment and Development in 1987, Our Common Future, commonly referred to as The Brundtland Report. The report defined sustainable development as *"development which meets the needs of the present without compromising the ability of future generations to meet their own needs"* (World Commission on Environment and Development, 1987). The International Institute for Sustainable Development (ISSD) says the term gained political salience with the acceptance of the report by the United Nations General Assembly.

The Brundtland Report continues that the definition of the term sustainable development contains within it two key concepts*: "*The concept of needs, in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs." Drexhage & Murphy (2010) simplify the definition of sustainable development as environmental, social, and economic well-being of today and tomorrow. ISSD maintains that all the various definitions of sustainable development require that people look at the world as a system of interconnectivity—a system that connects space; and time. It is only by understanding the world as a system that people can understand that the harm done in one part of the world, country or continent, harms people in another part (Drexhage & Murphy 2010).

The UN's Department of Economic and Social Affairs (DESA) identifies three dimensions of sustainable development namely, economic, social and environmental (UN, 2013). DESA continues that more than 1 billion people were still living in extreme poverty in 2013 and income inequality continued to widen in many countries. It is not possible to achieve sustainable development in the developing world without raising the living standards of its people (Burayidi, 1994). To reiterate that sustainable development entails systems thinking not a quick single fixes, a targeted approach towards a combination of various sectors of the economy—agriculture, fisheries, mining, buildings, transport, waste, water and energy—make up a sustainable development agenda (UN, 2013). This combination touches most aspects of human development.

Energy production has far reaching implications for the future of mankind. Costs of energy production and consumption are not only environmental but also social and economic. The correlation between economic growth and energy consumption, for example, should be studied closely when considering assessing sustainable economic development. This study of the correlation is even more important in developing countries, which are often most affected by fluctuation in energy prices. Giraud and Kahraman (2014) confirmed that there is some level of dependence between economic growth and primary energy and that primary energy is a key factor behind fluctuations in growth. This confirmation makes it possible to say the quest for economic growth by the human population has consequences, in absence of measures controlling this growth. As the figure below indicates, fluctuations in energy prices, particularly oil, have had some salient influence on GDP per capita growth.

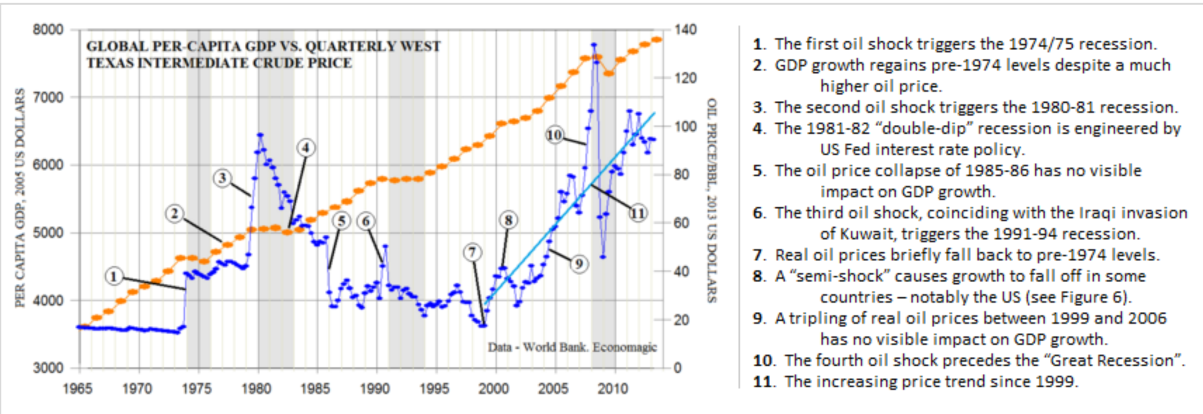

Figure 7. Salient economic events (From lecture notes by Prof. Andrius Kazukauskas 2015, Umea University visiting Vaasa University).

The figure above suggests that most of the recent economic recessions were associated with energy price shocks. It can be argued that there is a two way causality between real energy consumption and real GDP per-capita growth. An increase in real energy consumption may cause an increase in real GDP per-capita growth and an increase in GPD per-capita may cause a similar reaction in energy consumption. However, it should be noted that fluctuations in energy prices, although impacting per-capita GDP, are caused by various factors related to supply and demand.

Some researchers and conservatives agree that had the issue of sustainable development been taken seriously in the 20th century, much of the harm caused to the environment today would have been abated. With the developing world now accelerating their efforts in achieving economic growth, it is imperative that this growth is achieved sustainably, Namibia has a lesson to be learnt. One way of growing sustainably is to decouple GDP growth and energy consumption to limit their influence on one another. GDP and energy decoupling occurred in countries of the Organization for Economic Co-operation and Development (OECD) after the oil shocks of the 1970's (Mielnika & Goldemberg 2002). Mielnika & Goldemberg studied 20 developing countries and concluded that decoupling took place in those countries as an effect of foreign direct investment (FDI). As data shows in the figures below, there was a trend of GDP and primary energy consumption developing separately from one another.

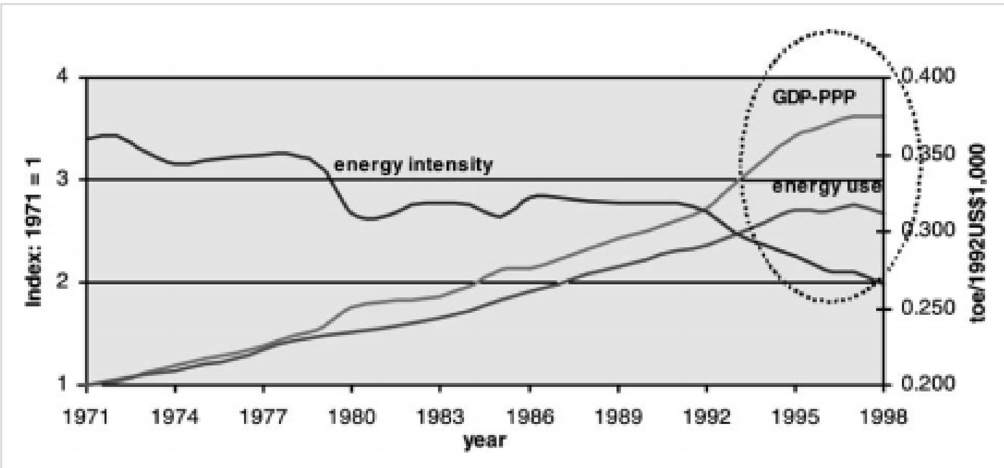

Figure 8. Changes in energy use and GDP-PPP in 20 developing countries (Mielnika & Goldemberg, 2002)

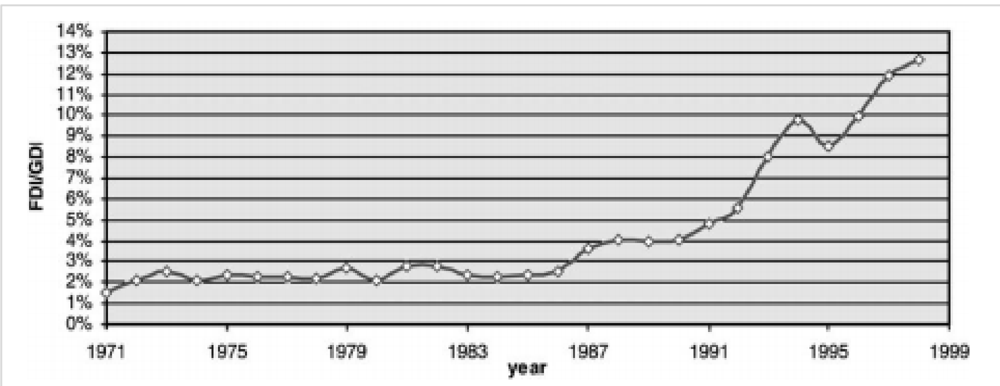

Figure 9. Total FDI/GDI in 20 developing countries (Mielnika & Goldemberg, 2002)

Namibia is no exception to the matter of GDP and energy decoupling. Although Mielnika and Goldemberg's study emphasised FDI as a driving force behind the decoupling, several other ways could be explored in the Namibian context. An alternative approach to growing sustainably, as a case for Namibia, is the adoption of efficient technologies already proven successful in other parts of the world. Perhaps one of the most important step towards sustainable growth is the advancement of renewable energy systems. The importance of policy should be emphasised too because to be sustainable it will require additional critical steps by policy makers that go beyond what have already been committed to (BP, 2014). Decoupling, energy efficiency, and climate policies will not work without proper policy implementation. However, policy aimed at ensuring energy security without a strategy for a broader energy mix is unlikely to succeed.

3.4. Development Cooperation in Technology Transfer

Due to intervention by the developed world and the United Nations, many developing countries today understand the importance of growing sustainably. Most countries, especially in Africa, have a common understanding that the transition to green growth as a means to achieving sustainable development offers various economic and social benefits, including employment creation, economic growth and poverty eradication (UN, 2016). However, a lack of technical capacity and experience in these countries calls for cooperation with the more developed counterparts. Central to cooperation in sustainable development are renewable energy technologies RETs. RETs offer the benefit of economic growth and access to clean energy in rural areas while minimising the impacts of energy generation on the environment (Kruckenberg, 2014).

Gone are the days when the more affluent countries sent development aid to developing countries. In the 21st century, development cooperation is a necessity. Development cooperation entails developed and developing countries working together with the objective of developing sustainably. It is through this new development partnership that there has been a significant increase in development programmes in recent decades. Although this is a step in the right direction, the success of these programmes have been measured according to project objectives as conceived by the donor. On the contrary, some researchers argue that for a RET development cooperation project to be really successful it should bring together different stakeholders and empower local organisations and communities. By focusing on meeting the preconceived success factors of a project as per international donor expectations, projects overlook the need to develop a sustainable renewable energy market for local end users. Such an overlook can cause a RET partnerships to fail to create the kind of transformative relationships required for successful technology diffusion in the local market. Thus, relationship building is critical in knowledge transfer in RET programmes. (Kruckenberg 2014; Glasbergen and Groenenberg 2001; Brass, Galaskiewicz, Greve, Tsai 2004.)

Kruckenberg (2014) uses empirical evidence from seven South American cases to trace the role of renewable energy partnerships in development cooperation. Kruckenberg takes a relational approach to the analysis of development assistance. The analysis shows that a focus on the key actors and their relationships rather than the success factors of an RET partnership gives a better understanding of the impact of development cooperation through knowledge transfer. A lack of an understanding of the relations that exist within a community leads donor organisations to think that they know the needs of a communities and come up with conditions for the donations. Often donor organisations disrupt existing systems in communities by the introduction of donation-tied operating systems. Rather, developing long and short-term relationships with local organisations ensures successful knowledge transfer. While single long term relationships ensure inter-organisational learning and knowledge transfer, they may leave the local partner dependent on the donor partner. Therefore, a combination with short term relationships, which enable the local partner learns from other actors, compliments learning in the long term partnership. (Kruckenberg 2014; Uzzi 1997.)

One of the latest concepts in the field of development and climate change is climate compatible development (CCD), a bridging concept between climate change adaptation, mitigation and community-based development (Stringer, Dougill, Dyer, Vincent, Fritzsche, Leventon, Falca˜o, Manyakaidze, Syampungani, Powell & Kalaba (2014). CCD is defined as ‘development that minimises the harm caused by climate impacts while maximising the many human development opportunities presented by a low emissions, more resilient future’ (Mitchell & Maxwell 2010). Supporting the systems thinking view, in Stringer et al (2014) state that progress towards CCD requires multi-stakeholder, multi-sector partnerships focused on community engagement. Therefore, CCD fuses sustainable development strategies including development strategies, mitigation strategies, and adaptation strategies, that have traditionally worked separately. The figure below illustrates that fusion.

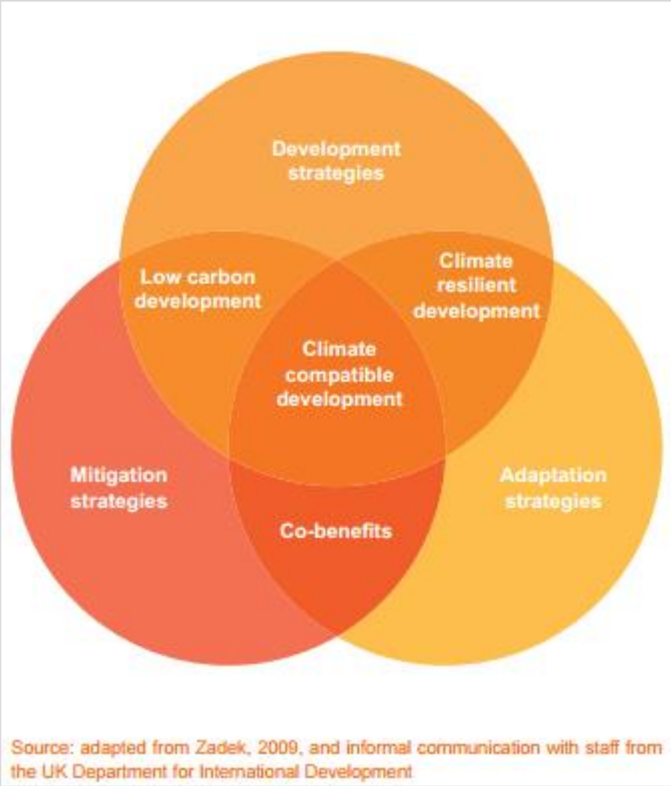

Figure 10. Climate Compatible Development (Mitchell & Maxwell 2010)

The CCD concept presents a new development landscape and it's the kind that recognises climate change as not only presenting threats but also opportunities. CCD aims to minimise these threats and maximise the opportunities. Policy makers are encouraged to promote economic and social development but align it with policies for climate change mitigation. CCD concludes that should policy makers miss to integrate the three strategies—mitigation, adaptation and development strategies—they will not see the multiple benefits of efficiency and may end up solving one problem but worsen others.

3.5. Role of Renewable Energy and Energy Efficiency in 21st Century

Reductions in the reserves of fossil fuels—oil, coal, and natural gas—and the environmental problems associated with the depletion of these fossils has prompted a need for alternative energy sources (Develi & Kaynak, 2012). Renewable energy has become the focal point of discussions on energy policy, environment, and global population growth. The term renewable energy refers to energy from sources that will always be available as long as the planetary system remains in the current state. For example, solar is referred to as renewable energy because it will be available for the next 4 to 5 billion years that the sun will continue to shine (Ghassemi 2011: 3).

In 2015, governments of more than 190 countries gathered in Paris for the Climate Change Conference (COP21). The United Nations Framework Convention on Climate Change (UNFCCC) gathered world leaders to discuss ways to meet climate change challenges. This may be a sign that the world is aware that fossil fuels are not sustainable and alternatives have to be found. The positive outcome of COP21 has raised hopes and expectations of collaborative global efforts to address climate change (United Nations Framework Convention on Climate Change 2015).

3.5.1. Economic Competitiveness of Renewable Energy Technologies

The main renewable energies are solar, wind, bioenergy, geothermal, hydro, tides and waves (Ghassemi 2011: 3). Some pessimists and those benefiting from the fossil industry make assumptions that renewable energy technology is not economic, too complex, or cannot satisfy global energy demand. However, Hoffmann (2014: 33), offers a simple calculation that suggests this assumption is false. The calculates states that *"only one quarter of today's global population - about 1.5 billion in OECD countries - is using three quarters of today's primary energy – which is about 105PWh."* Turn that around and it translates that today three quarters of the global population shares the remaining one quarter of primary energy.

The situation presented above is undesirable. Therefore, to be able to afford the whole global population a fair share of energy, Hoffmann (2014: 33) presents another calculation that maintains that continuing today's standard of life, 70 PWh (Petawatt hour) of primary energy is needed per one billion people. Given data showing that the world population will rise to ten billion by mid-century, this would translate into a global energy demand of 700PWh. Renewable energy antagonists would like to argue that renewables cannot deliver 700PWh. This argument is unfounded for three reasons: firstly, renewable energy resources are unlimited and there are no energy losses in the conversion of primary to secondary renewable energy. Secondly, the argument neglects the use of energy efficiency measures in new technologies, and lastly, that 700PWh can theoretically be delivered by solar energy alone. Hassen-Nanotech support Hoffmann's counter arguments with the representation of the magnitude of the potential of renewables in comparison to energy needs and available fossil fuel potential.

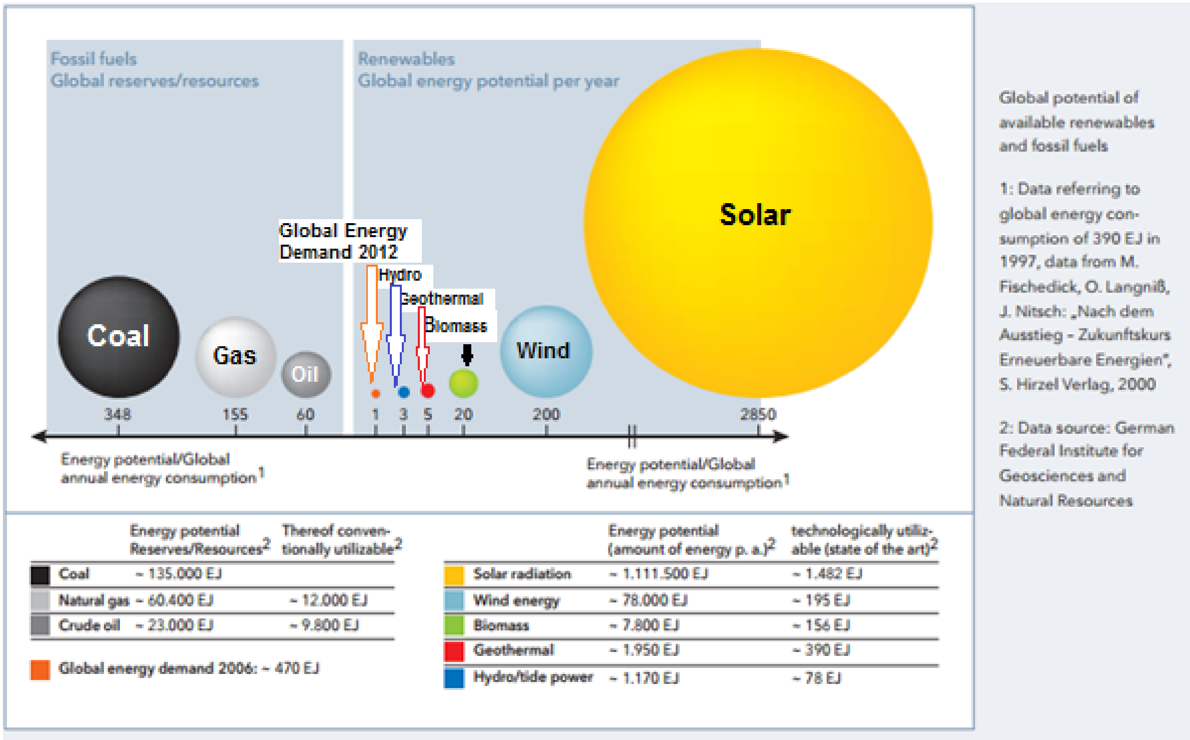

Figure 10. Global potential of available renewables and fossils fuels. (Adapted from Hessen-Nanotech, 2008)

Looking at the figure above there is no doubt that, with the right technologies, renewable energies could satisfy global energy demand many times over. In 2008, Hessen-Nanotech argued that the technically and economically usable part of renewable energy was negligible, mainly due to the low density and economically usable locations, especially in Europe. However, as will be presented below, the situation had changed significantly by 2012.

Although antagonists stress the cost of renewables, according to IRENA (2012), renewable power generation technologies are becoming more cost-competitive against their fossil counterparts and are now the most economic option for off-grid systems in many regions. Owing partly to the cost-competitiveness, renewable power generation technologies in 2012 accounted for around half of all new power generation capacity additions globally. In 2011 alone, there were generation additions of 41 Gigawatt (GW) of new wind power capacity, 28 GW of PV, 25 GW of hydropower, 6 GW of biomass, 0.5 GW of CSP and 0.1 GW of geothermal power. The future looks bright particularly for wind and solar as their costs continue to slide. This trend is expected to continue because for every doubling of the installed capacity of solar PV, module costs will decrease by 22%. As a result crystalline silicon PV module costs fell by more than 60% to below USD1.0/watt between 2010 and 2012. (IRENA 2012.) In a further positive move, renewable energy accounted for an astounding 90% of new electricity generation in 2015, with wind accounting for more than half (IEA 2016a). This positive shift kept CO2 emissions at bay while the global economy grew. This news is a sign that renewable energy is becoming economically competitive.

The renewable energy generation capacity map below shows that 2015 set a record in the adoption of renewable energy globally. An updated map available on IRENA's website.

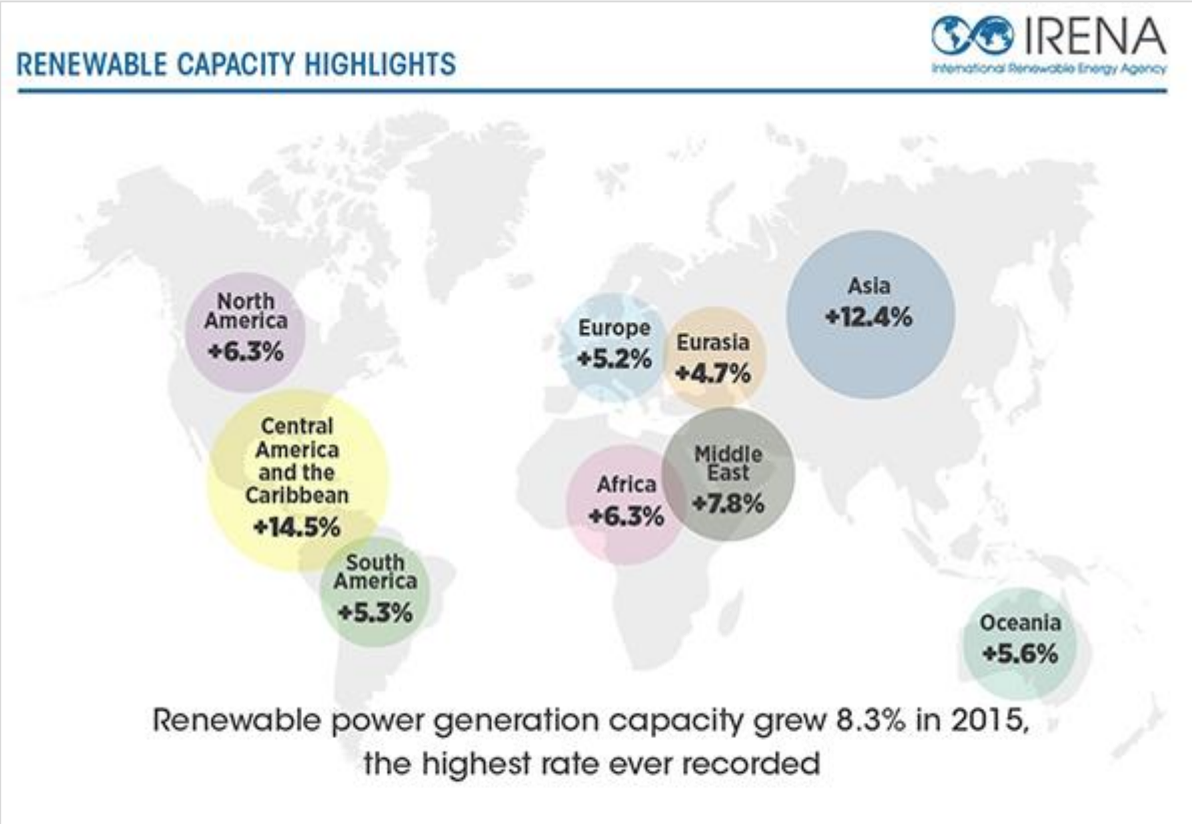

Figure 11. Global 2015 renewable energy generation capacity (IRENA 2016)

As of 2015, about 95% of wind capacity is now located in China, India, Europe and North America; and 90% of new capacity was installed in those regions in 2015, totalling 57.1 GW. On the solar front, Europe accounted for 43% of global solar capacity by end of 2015, with another 40% divided by China and Japan in Asia and 13% in North America. However, the most significant development on the solar front in 2015 was the 48 % increase in capacity in Asia, owing largely to the 15 GW of new installed capacity in China and another 10 GW in Japan. North America had an increase of 8% in new installations, surpassing Europe (7.6 GW) for the first time. There were also some significant capacity installations in Oceania and Africa; 1 GW and 0.9 GW respectively. Brazil, China, India and Turkey represented three-quarter (26G W) of new hydro capacity installed in 2015. Europe, North America and Iran in the Middle East installed more than 1 GW of new hydro capacity, while Africa increased capacity by 550 MW. (IRENA 2016: Nyquist 2015.)

Regardless of the achievements, antagonists are continuously attacking renewable, creating unfounded myths about RE technology. Like Hassen-Nanotech (2008), Diesendorf (2014a: 117) further complements Hoffman's attack on the negative assumptions of RE technology with a list of some of the most common of myths about RE:

a. RE is too diffuse: there is not enough to run an industrial society on RE
b. RE technology is not mature enough to replace fossil fuels
c. RE is too expensive
d. RE is responsible for the big increases in electricity prices in recent years
e. Base-load power stations, running of fossil fuels are necessary, and RE cannot provide them
f. RE is too intermittent to make a notable contribution to grid electricity supply
g. Wind turbines make people sick

These attacks are mostly because RE threatens utility business models, government revenue and big fossil fuel industry profits (Diesendorf, 2014b). It is a basic characteristic of renewable energy that most electricity generation activities must be located near the source of the renewable resource being captured and converted into electricity (National Academy of Science, 2010: 45). Therefore, unlike fossil fossils, renewable energy are local or regional by nature. Any renewable energy bases that cannot contribute significantly to national electricity supply can be used to satisfy local or regional demand for electricity in an area the resource if sound (National Academy of Science, 2010: 45).

3.5.2. Energy Efficiency and Management

As was the case for energy security, interest in energy efficiency began as a result of the 1970s oil crisis (Sioshansi 2013: 3). The energy sector faces two over-riding challenges when it comes to sustainable development: security of energy supply and reducing the effects of energy use on climate change. In 2013, the level of carbon dioxide was 390 ppm, compared to 280ppm before the industrial era (Andrews & Jelly 2013: 370). While technological advancement is needed in renewable energy development, most of the gains in the reduction of carbon emissions will come from efficiency and adoption of existing low-carbon systems. As stated previously, green growth will not be achieved if it interferes with economic growth. In light of this, policy makers have an agreement on goals and measures targeted at the decoupling of energy-related emissions and GDP. This was reiterated at the recent COP21 agreements in Paris. Because of these efforts, decoupling is currently taking place. In March

2016, the IEA confirmed that global CO2 emissions stayed flat at 32 billion tonnes for the second year in a row in 2015 while global GDP grew by 3% (IEA 2016a).

When talking about energy efficiency (EE), it is important to consider one's word choice. According to Hoffmann (2014: 34), many people consider 'energy saving' as meaning less energy and a compromise on their quality of life. A better way of explaining it may be to say, with energy efficient technologies, people will have the same standard of living or better but using less energy. Which is a preferred state economically and ecologically. The only challenge with this state is that initial costs in adopting such energy efficient technologies may be higher, even though over the longer period, overall cost (or levelized cost: investment + running cost + end of life cost) may be much lower than for fossil fuel technologies (Hoffmann, 2014: 34).

To demonstrate the power of EE, Hoffmann (2014: 35) gives an example of energy saving and improved service in lighting. It should be noted that lighting accounts for about 14% or about 2 PWh of global electricity demand. And, this figure does not include the different non-electricity-based fuels used for lighting by over 2 billion people in developing countries. Moreover, lighting consumes about 6 PWh of primary energy required in electricity production on average. Therefore, one wonders whether people would reconsider their use inefficient traditional incandescent light bulbs if they had the right information. These bulbs only convert 10% of electricity consumed into light while 90% is lost as heat. At 30% efficiency, fluorescent lights are much more efficient than traditional bulbs. However, at 50% efficiency, it is the Light Emitting Diodes (LEDs) and Organic LEDs (OLEDs) that are the future. It is only right that truth be told about how inefficient traditional light bulbs are and what alternatives are available. (Hoffmann, 2014: 35.)

Presenting EE in numbers, (Hoffmann, 2014: 36) presents two important lessons in energy efficiency in lighting. Firstly, it is an understanding that LED/OLED require five times less energy to create the same illumination in lumen than incandescent bulbs. Turn that around, the energy needed to light up an LED/OLED bulb with the same quality of illumination as a traditional bulb is five times less. Secondly, it is an understanding of the 'total cost of ownership (TCO)' of electric bulbs. As an example, a 50 W light bulb costs about one Euro and makes about 600 lumen (light intensity) over a life time of 1 000 hours. At an electricity price of 0,20€/kWh TCO of the light bulb use is 1€+50W * 1 000 hours * 0,20€/kWh = 10€ (plus the cost of replacing the lamp every 1 000 hours). Now, an LED lamp costs 30€ for the same 600 lumens, has a much longer lifetime of 25 000 hours, and requires only 12 W = TCO = 90€. That may seem much more expensive; however, for the same 25 000 hours, the traditonal light bulb would cost 250€. Therefore, TCO should be an important consideration in the economics of EE.

EE offers numerous benefits that are not limited to the economics. According to (IEA, 2014), experts across the globe are acknowledging the role of EE in the struggle to improve wealth and welfare without compromising the future of the next geneartion. As shown in the figure below, there is a broad range of benefits of EE that society should take into account.

Figure 11. The multiple benefits of EE improvements (IEA, 2014)

The figure above proves that there are multiple benefits of EE. IEA (2014) maintains that stakeholders and experts alike have not systematically assessed these broader impacts of EE. This can be attributed in part to inadequate data and lack of mature methodologies to measure their scope and scale. As a result, there is no understanding of the real potential of EE to enhance economic and social development. Therefore, consideration of energy efficiency in national policy decision-making processes is only qualitative in nature.

Similarly to EE, energy management implies a stable provision of energy while taking into consideration the impacts that production and consumption of energy have on the environment and living organisms. As Diesendorf 2014: xvi states, the energy problem is a linked problem between energy, environment, and the economy. Therefore, although necessary, technological advancements alone are not a solution to the problem as inefficient technology is only one of the three fundamental driving forces, energy, environment, and the economy. Anthropogenic climate heating and related environmental problems are as a result of these three drivers put together; thus, should be tackled simultaneously.

Today, utilities are also investing in EE and many have witnessed growth and a reduction in sales volumes (Sioshansi 2013: 51). There are numerous motivating reasons for utilities to invest in large scale EE. Sioshansi (2013: 55) summarised some of the main reasons for utility investment in EE as follows:

a. Energy efficiency is generally the lowest cost energy resource, less expensive than new power plants.
b. Energy efficiency is generally accepted by customers as it offers less energy use and cost savings.
c. It is relatively easy to get approval for energy efficiency programmes than it is for, say, a power plant.
d. Many authorities are supportive of energy efficiency and are generally willing to improve business cases for utility energy efficiency.
e. Energy efficiency programmes can be implemented in a much shorter time compared to power plants.
f. Utilities are using energy efficiency to balance demand and supply as they wait out the uncertainties regarding future environmental regulations before they invest in new power plants.
g. Utilities are energy efficiency as part of an emissions compliance plan as energy efficiency has zero or low emissions.
h. Energy efficiency has been proved to work. As its utility adoption increases, utilities that were previously sceptical are becoming more confident to join the movement.

Policy makers have also shown interest in EE investments as they offer both macro and microeconomic benefits. At a microeconomic level, EE measures have economic, social and ecological impacts in that they increase household incomes, reduce the impact of energy price changes on households and raise environmental awareness. On the macroeconomic level, benefits include improved competitiveness in energy trade and a reduced impact on energy price changes. (Sioshansi 2013: 89). Due to its zero or low emission reputation, EE is becoming widely accepted as an important instrument in keeping the rise in global mean temperatures below 2 degrees Celsius compared to that of the pre-industrial era. The figure below (McKinsey 2009) shows the significant potential offered by various measures under consideration by policy makers in energy efficiency.

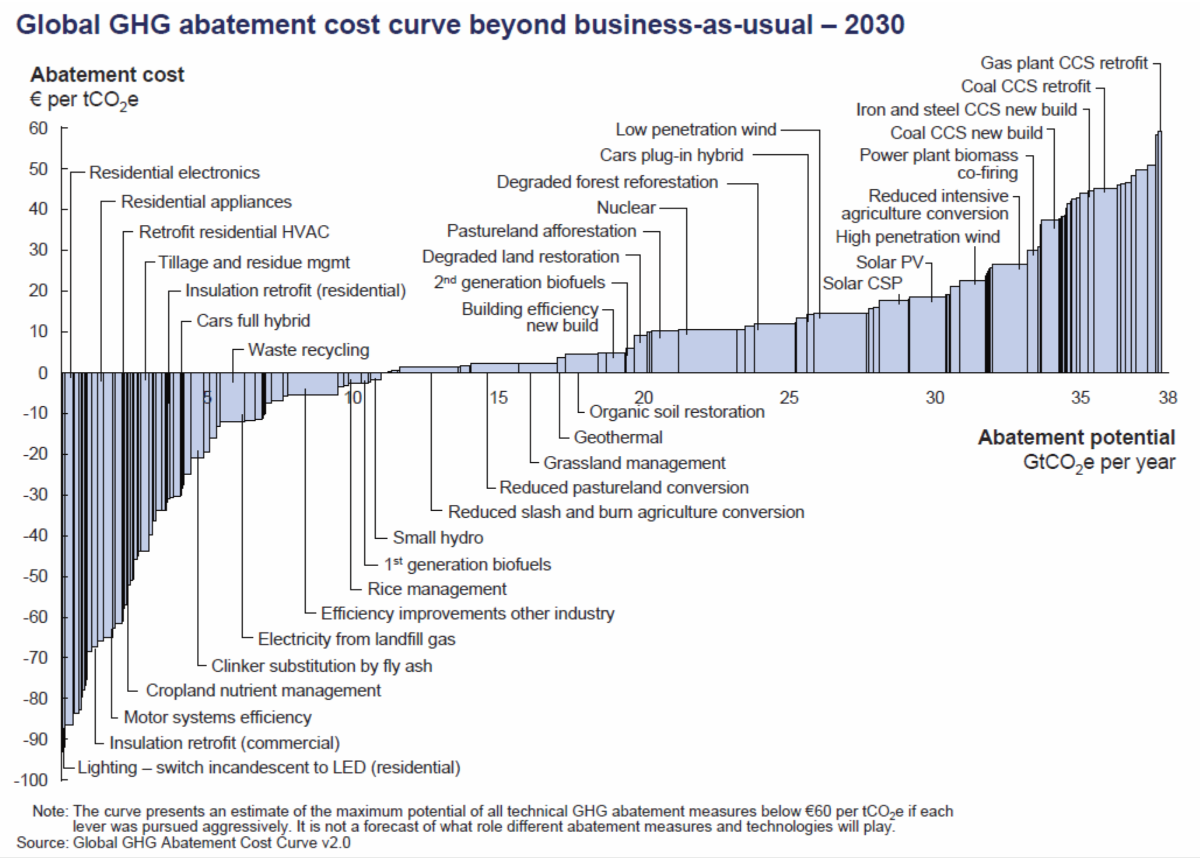

Figure 12. McKinsey Abatement cost curve of different technologies. Source: McKinsey (2009)

The abatement curve offers a quantitative discussion starting point on what measures would be most effective in reducing greenhouse gas emissions and how much they would cost. As the McKinsey shows, many measures actually have negative abatement costs. However, the study shows that there is potential by 2030 to reduce emissions by 35% compared with 1990 levels, or by 70% compared with the 2030 estimated levels if every country did their part in emission reduction.

3.6. Energy Business in Namibia: Policy and Regulation

As is the case in many countries, doing business in the energy industry requires adherence to laws and regulation governing the market. The energy industry of Namibia is overseen by the

Ministry of Mines and Energy (MME). MME is the line ministry responsible for the initiation and implementation of energy policies. Operating in the Namibian electricity sector requires authorisation in the form of a licence. The Minister of Mines and Energy retains the authority to approve or deny licences to generate, transmit, or distribute power. The Minister has the authority to grant, transfer, or renew electricity licences.

The electricity sector of Namibia is regulated by various stakeholders with different levels of power in government and private sector. The main stakeholders are discussed later in this thesis. Some of the main legislation, regulation, and institutional setup running the Namibian electricity sector are as follows:

a. *White Paper on Energy Policy of 1998*: developed by the Energy Policy Committee of the MME. Through its six objectives, the White Paper mandates MME to, among others, ensure effective governance of the industry, promote investment and growth, and maintain sustainability of the industry (MME, 1998).
b. *Electricity Act 2007*: The Electricity Act, Act No. 4, 2007 was passed by parliament and signed by the president on 26 September 2007. The Act's purposes were to establish the Electricity Control Board (ECB) and specify its authority and functions; to set conditions for obtaining licences for the provision of electricity and determine the powers and obligations of licensees; as well as to specify ways of solving disputes in the industry (GRN, 2007). At the time of writing, this Act was under revision to allow for the creation of the new Energy Regulatory Authority Bill through which ECB would be transformed into the Energy Regulatory Authority.
c. Independent Power Producer Investment Framework 2006: the framework was developed to encourage IPPs to participate in the industry.
d. Codes of Practice for Namibian Solar Energy Technologies (2006): code of practices for Solar Home Systems (SHS), Solar Photovoltaic Water Pumping Systems (PVP), and Solar Water Heaters (SWH). The practices are meant to uphold minimum quality levels and ensure reliability of solar technologies adapted in various government programmes, including the Solar Revolving Fund (SRF), a programme for providing loan facilities for SHS, PVP and SWHs activities.
e. *Electricity Control Board;* a state-owned enterprise responsible for the regulation of the electricity sector of Namibia. During the time of writing, ECB was being transformed into the Energy Regulatory Authority which would regulate not only electricity, but downstream gas and petroleum.

f. *Namibia Energy Institute;* the national energy research institute hosted by the Namibia University of Science and Technology (NUST). This government institute's mandate is to undertake research, development and capacity building in the field of energy.

4. CASE COUNTRY: NAMIBIA

This chapter introduces the reader to the Namibian business environment. The chapter highlights Namibian business law and regulation. The content captures the basic public law regulating foreign operations in Namibia, competition, and protection of national resources, natural or otherwise.

4.1. Country overview

Namibia (22º S, 17º E) is an upper middle income country located on the South-Western coast of Africa. The country is bordered by the Atlantic Ocean to the West and has land borders with South Africa to the South, Angola to the North and Botswana, Zimbabwe, and Zambia to the East and North-East. Namibia's capital city and largest city is Windhoek. Windhoek's population is 425 000 (2016 projections) from 325 000 in 2011 (NSA, 2013). With a population of 2.4 million people (2014) occupying an area 825,418 square-kilo meters, Namibia is one of the least populated countries in the world.

The World Bank (2015) reports that the country has enjoyed steady economic growth since independence in 1990 resulting from sound economic management, good governance, basic civic freedom, and respect for human rights. However, Namibia has one of highest income inequalities in the world, with a Gini coefficient of 0.63 (Humavindu & Stage, 2013).

Population	2.403 million	2014
GDP	$13.00 billion	2014
GDP growth	6.4%	2014
Inflation	5.4%	2014

Figure 13. Fast facts Namibia **(World Bank, 2015)**.

At more than two times the area of Finland, Namibia is a geographically large country with a very small population. Active in nature conservation, 44% of Namibia's total land was under conservation by 2012 (World Bank 2015). The country is administered by 14 regions spread around the country. The country is characterised by lengthy dry conditions with little rainfall in some parts of the country. Namibia is home to the Namib Desert, the oldest desert in the world. The map below shows main cities and towns in Namibia where international business is likely to take place.

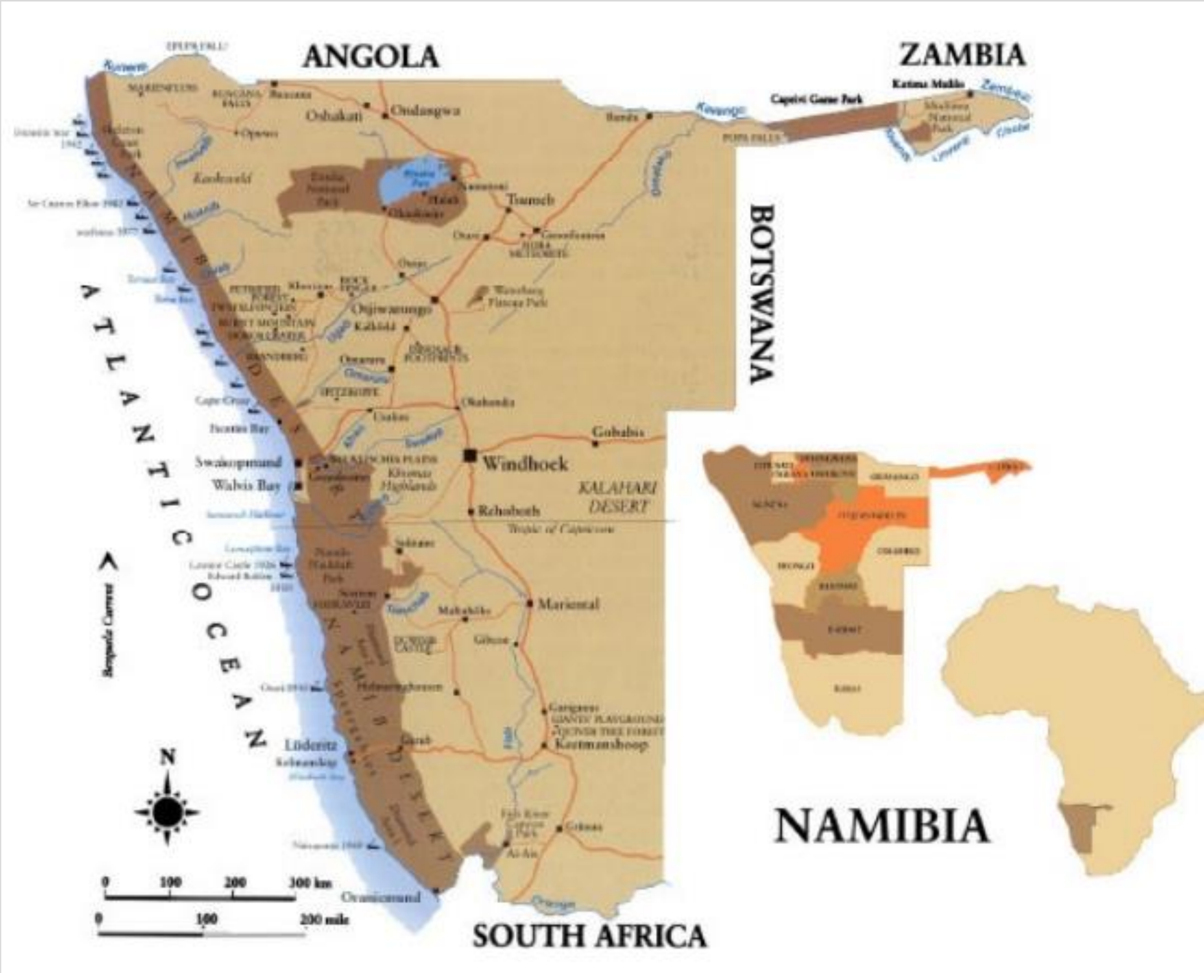

Figure 14. The shape of Namibia **(PWC, 2016)**

The Khomas region where the capital city Windhoek is located is the business hub of the country. The two coastal cities Walvis Bay and Swakopmund are popular business and tourist cities. 43% of Namibians live in urban areas, while the remaining rural population is concentrated in the Central-North and along the two main rivers, Okavango and Zambezi River. According to (NSA, 2013), more and more people are moving to urban areas while at the same time, more rural areas are being urbanised. The figure below shows population and urban growth statistics from pre-independent Namibia to 2011.

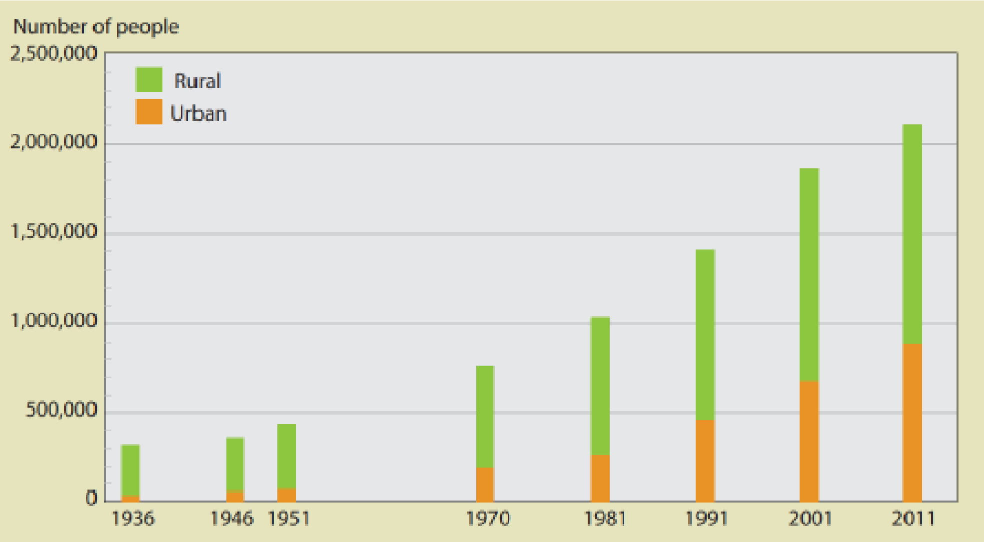

Figure 15. Namibia population and urban growth, 1936 – 2011 (NSA 2013)

Population dynamics in rural and urban areas of Namibia points to a growth in both urban and rural areas, but more so in urban areas where growth rates have been approximately 4% annually (NSA, 2013). Growth in both rural and urban areas and constant school enrolment rates translates into an increase in energy needs but also a trainable work force. According to the World Bank (2015) world development indicators, Namibia looks to be rather competitive compared to averages of other Sub-Saharan countries, although it falls short in certain aspects on the global upper middle income averages. Nonetheless, it is a young country and its economy has seen continuous growth since independence, in turn keeping a steady rise in GDP per capita.

4.2. Doing Business in Namibia

The Namibian government is receptive of foreign investors. Foreign investments in Namibia are regulated through the Foreign Investment Act (MTI, 2013). This ensures that foreign investments are legally shielded from certain factors, i.e. government action. Foreign investors in Namibia can leverage the many incentives offered by the Namibia Investment Centre *(See Appendix 6: Incentives)*. This research analyses the Namibia business environment with the use of the PESTEL framework, on a high abstract level. The acronym PESTEL stands for political, economic, social, technological change, and legal framework, and it is a framework for macro-environmental factors used in assessing a business environment (Gupta, 2013). PESTL is helpful in strategic decision making as it allows a business to react to changes in its external surroundings. The analysis is undertaken with the assumption that if an organisation is able to understand its target market, it will have a competitive advantage over its competitors in terms of preparedness and response to change.

By studying all market characteristics, including politics, social, and legislation, this work aims to give a descriptive guide for any company wishing to enter Namibia. Doing business in Namibia requires its due diligence. The following subsections will give an overview of Namibia's business environment in consideration of political, economic, social, and technological factors. The environmental factors analysis is integrated in the Namibia energy resources chapter, while the legal factors are integrated in the discussion about energy regulation in a later chapter.

4.3. Political Factors

Politics plays an important role in business, in both the developed and developing world. This is because there requires to be a balance between systems of control and free markets. In a global economy where global economics has become more important than domestic economies, businesses intending to enter new markets in new regions must consider different opportunities and threats before entering those markets.

4.3.1. Government

Namibia is a constitutional multiparty democracy where free and fair elections are held on a regular basis. The country is led by a democratically elected president who is the head of state and government. Since independence in 1990, Namibia has had three presidents, the third being incumbent. The president is elected every 5 years in presidential elections involving several other parties. All three presidents have been members of the SWAPO (South West Africa People's Organization) party, making it the ruling party since independence. The SWAPO party has been winning landslide majority in all elections, weakening all opposition over time. Namibia has been active in gender equality. In 2014, women made up 41% of the members of the National Assembly and in the same year Namibia got its first ever female prime minister.

After attaining independence on 21 March 1990 Namibia was established as a sovereign, secular, democratic and unitary state (GRN 2016). The Namibian government is divided into three organs:

- The Executive
- The Legislative
- The Judiciary

Source: *GRN 2016*

The three organs have different but related functions in government. GRN (2016) outlines that the legislative branch is responsible for making laws which are implemented by the executive and interpreted by the judiciary branch. Parliament, which consists of two chambers, the National Assembly and National Council, is the main law-making body. The constitution of Namibia provides that the country be divided into regional and local units. Through this provision, Namibia has been divided into 14 administrative regions and several local authority units. These regions and local authorities are governed by the Regional Councils Act and Local Authorities Acts of 1992.

4.3.2. Corruption

Corruption is a big concern in Namibia. Political and corporate corruption come in the form of illegal issuing of licenses (for conducting business operations), bribery, kickbacks, investment schemes, financing of an elite lifestyles such as procurement of luxury cars and apartments for politicians and well-connected individuals (Transparency International, 2015). Transparency International ranks Namibia at 45/168 least corrupt countries in the world and it is the 4th least corrupt in Africa.

Rank	Country/territory	2015 Score	2014 Score	2013 Score	2012 Score
45	Namibia	53	49	48	48

Figure 16. Except from Corruption Perceptions Index 2015 (Transparency International, 2016).

The Namibian government created an anti-corruption agency, which has made some progress in fighting corruption, at least on the individual level; however, it remains to be seen whether it will prosecute politically connected individuals. Government corruption continues to drain average Namibian citizens of their economic rights. In 2010, a control of corruption list by the Transparency International gave Namibia a score of 0.26 or a percentile ranking of 64%. Control of corruption indicates the extent to which public office bearers exercise public power for private gain. The indicator includes both trivial and substantial forms of corruption, in addition to total control of the state by elites and private interests (World Bank 2015; Transparency International 2016).

4.3.3. Private/ Public Partnership

GRN is committed to the provision of infrastructure and public services to its citizens. The Government acknowledges that a well-established economic and industrial infrastructure is a fundamental prerequisite for economic growth and development. It is because of this understanding that the GRN is keen on improving infrastructure such as roads, power, telecommunications, ports, airports, water, sanitation, sewerage, health, education, industrial research and testing facilities, as well as industrial parks.

In 2010, the Ministry of Trade and Industry (MTI) commissioned a study to review the legal and institutional framework in Namibia with the aim of establishing a conducive policy and institutional framework for Private/ Public Partnerships (PPPs). The PPP policy was created and it is used by Government as an instrument for achieving its social commitments, i.e. empowerment of the historically disadvantaged Namibians, encouraging entrepreneurship by Namibians, promoting small and medium enterprises, and achieving economic equality through the so-called 'Transformation Economic and Social Empowerment Framework'). As MTI puts it, PPP may be a means "to deliver improved services and better value for money through appropriate risk transfer, innovation, asset utilisation and integrated project-life management, underpinned by private financing" (MTI 2010).

As evidence for its commitment to PPPs, the GRN offers support to PPPs. In its broadest form (and as presented in MTI 2010), the principle behind the support is as follows:

a. Financial support: based on the output based aid (OBA) approach and includes financial assistance to delivery of specified services, outputs, and targets. The assistance include capital grants/subsidies during construction; operational subsidies; viability gap funding; unitary/annuity payments.
b. Asset based support (ABS): includes provision of land based resources to PPP projects for a tenure as may be determined at the feasibility stage.
c. Non-asset based support: includes administrative support for obtaining clearances and statutory approvals; Guarantees; and benefits in the kind of waiver of sales tax on construction material and stamp duty and registration charges.

4.3.4. Corporate taxation

In Namibia, income tax is levied on taxable income from sources deemed to originate from/ within Namibia, i.e. corporations and individuals subject to this levy (PWC, 2016). The country has several types of taxes levied on corporations, presented in the table below. Namibia has entered into tax treaties and signed double tax agreements with Botswana, France, Germany, India, Malaysia, Mauritius, Romania, Russia, South Africa, Sweden and the United Kingdom. These agreements may reduce withholding taxes. Following are tables of Namibia's 2015/2016 tax rates and other mandatory payments applicable to corporations. (Source: PWC & MoF Namibia)

Table 2. Companies tax rates for 2015/2016 (Price Waterhouse Coopers, 2016: Ministry of Finance, 2016: Deloitte, 2015)

Tax	**Rate (%)**
Corporate Tax	32
Branch Income tax	32
Diamond Mining Companies	55
Mining Companies (other than diamond mining companies)	37.5
Petroleum Companies (exploration -, development - or production operations)	35
Value added Tax	15*

**Direct exports of goods and services are zero-rated. There is a number of other zero-ratings and exemptions. A company, individual, trust, or partnership carrying on a taxable activity with a turnover for the past or future 12 month period in excess of N$500,000, must register for VAT.* (Source: Price Waterhouse Coopers, 2016)

Table 3. Payments to non-residents (withholding tax) rates for 2015/2016 (Price Waterhouse Coopers, 2016: Ministry of Finance, 2016)

Withholding Tax	**Rate (%)**
Dividends paid to non-residents (NRST) < 25% shareholding	20*
Dividends paid to non-residents (NRST) > 25% shareholding	10*
Interest paid to non-residents	10
Royalties paid to non-residents	10
Management, technical, admin, consulting, entertainment and directors' fees	10

**Dividends received are exempt in the hands of corporates, individuals and trusts. Dividends declared to foreign shareholders are however subject to NRST.* (Source: Price Waterhouse Coopers, 2016)

Tax law of Namibia is governed by the following acts: Income Tax Act, Value Added Tax Act, Stamp Duty Act, Petroleum Taxation Act, Transfer Duty Act, and Social Security Act. The Ministry of Finance's Inland Revenue, Receiver of Revenue arm is the taxation authority of the country. Namibia is a member of SADC, The Southern African Customs Union (SACU), and Common Monetary Area (for South Africa, Lesotho, Swaziland, and Namibia).

4.4. Economic Factors

Namibia, like other African countries, is in transition; building and growing and well on its way to becoming a knowledge-based country. The country has a Gross Domestic Product (GDP) per capita (PPP) of around US$6 000. Since Independence in 1990, the government has established development objectives & targets for the country through 5-year term plans officially known as National Development Plans (NDP). Namibia’s Vision 2030 program provides the long-term development framework to becoming a prosperous industrialized nation, developed by its human resources (GRN, 2004). While striving for the attainment of Vision 2030, the country has made progress given its net importer status. The graph below shows Namibia’s GDP growth trend from 2008 to 2014.

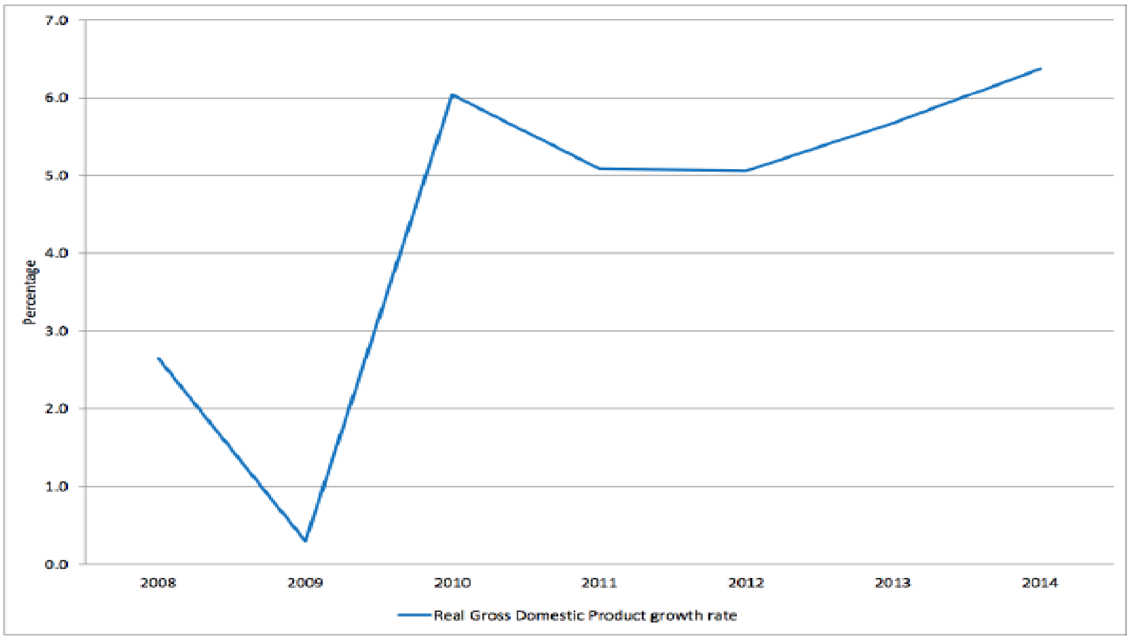

Figure 17. Namibia GDP growth 2008-2014 (NSA 2014)

The Namibian economy registered GDP growth of 6, 4% in 2014, much better than 5, 7% in the preceding year. The Namibia Statistics Agency (NSA) attributes this GDP growth to the secondary and tertiary industries that grew 9, 4% and 7, 4%, respectively. The primary sector, Namibia’s key sector, recorded a decline of 2, 2% in real value in 2014. However, the decline in the primary sector is perceived as a positive because it showed recovery from 3, 2% loss in 2013.

In the same vein, Namibia’s Gross National Income (GNI) and Gross National Disposable Income (GNDI) have continued to grow, with GNDI recording significant improvements in 2014 compared to the preceding year. Starting from 2007 to 2014, GNDI was higher than the GNI, attributed to net inflows in current transfers that have been influenced mainly by high Southern Africa Customs Union (SACU) receipts. The graph below summarises these trends.

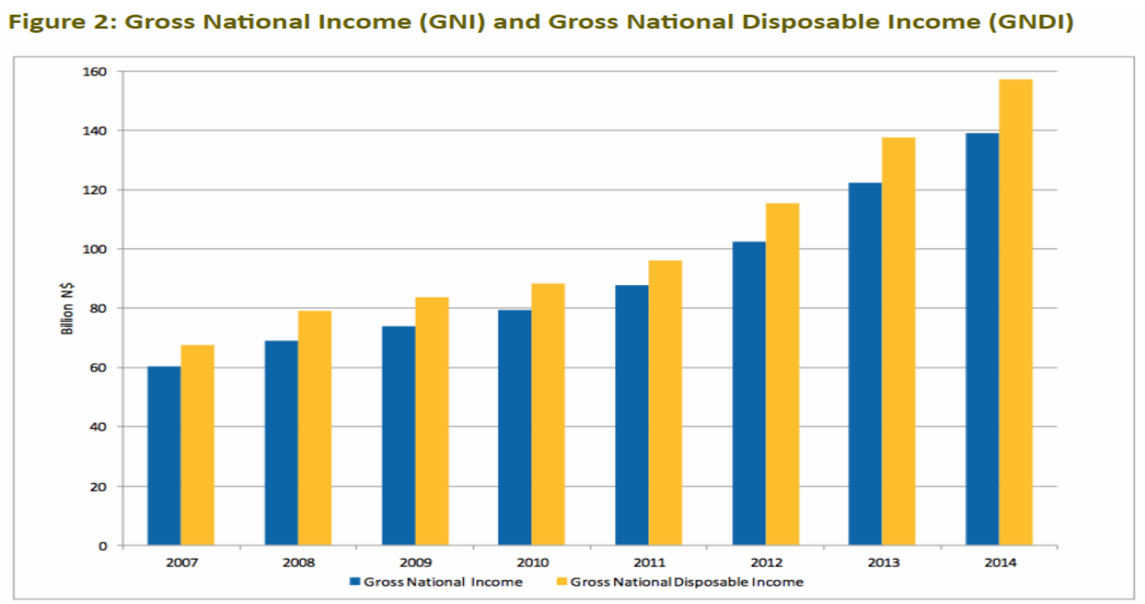

Figure 18. GNI and GNDI (NSA 2015)

The graph shows a positive trend in the economy i.e. GNI recorded more than US$9 billion in 2014 compared to less than US$8 billion recorded in 2013. GNDI on the other hand expanded to more than US$10 billion in 2014 from just below US$9 billion of the preceding year.

4.5. Social Factors

In a PEST analysis, social factors taken into consideration are such as social change, including effects of demographic change, tastes and habits, education levels, influence of religion and considerations for the environment and sustainable development (Gupta, 2013).

4.5.1. Social Structure and Religion

The diversity of the people of Namibia—black and white—can be experienced in the variety of languages spoken in the country. English is the official language of Namibia. It replaced Afrikaans and German soon after independence in 1990. Namibia’s first government adapted

English as the official language as a move to unite the people and leave the colonial association of Afrikaans and German in the past (McIntyre 2015: 29). English is taught throughout the education system which begins from early childhood to tertiary education. However, Afrikaans is still the lingua franca among the older generation. Almost all black Namibians speak one or more indigenous languages, attributed to their tribal lifestyle and natural linguistics abilities (McIntyre 2015: 29). Among the indigenous languages, Ovambo and Herero are the most widely spoken, the Ovambo people make up more than half of Namibia's population.

Namibia is an overwhelmingly Christian country with Christianity making up 85 – 90% of the religious spectrum, of which up to 50% is Lutheran. The most common congregations include Lutheran, Roman Catholic, Methodist, and Dutch Reformed. The Lutheran Church grew out of the work of the Finnish Evangelical Lutheran Mission back in the 1880s. However, some tribal Namibians still practice one or more traditional African beliefs such as ancestral worship.

4.6. Technological Factors

Technological factors include the effects of technological change on processes, products, and even distribution channels. Technology affects business in the sense that they can lower barriers to entry, raise efficient productivity levels, and influence outsourcing decisions. Moreover, they influence Research and Development (R&D) activity and automation in some industries.

There are two main mobile telecommunications operators in Namibia offering national voice services, which are both either partially or wholly-state owned (CRAN, 2014). These are MTC Namibia, managed by Portugal Telecom, and Telecom Namibia. Telecom Namibia is also the only fixed-line operator in the country. At the time of writing, a third operator, Paratus Telecom was just beginning operation. MTC Namibia boasts a 95% mobile network coverage of the country of 2G to 4G networks (MTC, 2013).

The GRN recognized the importance of research, science and technology as an engine for economic growth and development back in 2004 with the enactment of the Research Science and Technology Act, 2004 (Act no 23 of 2004). Some of the objectives of the Act are as follows:

a. To ensure the co-ordination, monitoring and supervision of research, science and technology in Namibia;
b. To promote and develop research, science and technology in Namibia;
c. To promote common ground in research, scientific and technological thinking across all disciplines;
d. To encourage and promote innovative and independent thinking and the optimum development of intellectual capacity of people in research, science and technology;
e. To ensure dedicated, prioritised and systematic funding for research, science and technology application and development in Namibia;
f. To promote linkages between Namibia and international institutions and bodies on the development of research, science and technology

Source: *(NCRST, 2016).*

Namibia has invested in the science and technology sector through the National Commission on Research, Science, and Technology (NCRST), which spearheads the country's efforts in science and technology (NCRST, 2016). The Division Innovation and Industrial Research is responsible for creating and managing platforms that promote and develop innovation, spin-offs, and value addition research and technology transfer. The division is currently in the process of establishing what it calls an Innovation Hub with the aim of providing entrepreneurs and innovators a suitable environment for interaction and knowledge transfer. The hub will offer, among others:

a. ICT infrastructure, including telephones, Internet and email access and data storage facilities,
b. Business mentoring services, venture capitalist platforms and legal assistance,
c. Networking platforms with established companies and like-minded innovators through regular events organised by The Innovation Hub to which clients are invited,
d. Facilitated access to sources of funds through existing relationships with other appropriate funds and schemes nationally and internationally,
e. Close proximity to the institutions of higher learning.

Source *(NCRST, 2016).*

4.7. Sectorial Outlook

Namibia's key sectors are mining, agriculture, and fisheries, in that order. The mining sector is Namibia's most crucial industry accounting for more than half of the country's foreign earnings. Namibia produces 1/3 of the world's diamonds, which bring in most of the export earnings from the industry. Namibia also produces uranium, zinc, copper, lead, gold, silver, tin, marble and granite. It is the fourth largest producer of uranium in the world. The second most important industry is agriculture, which makes a great number of jobs. The third is fishing, a highly regulated industry that exports mostly processed fish. Tourism is another important sector, with growth expected to reach 7% annually. (NSA 2014.)

According to Humavindu & Stage (2013) government services is another crucial sector. Moreover, manufacturing and services played an important role especially in output effects. According to NSA (2013), in 2011, an estimated 224 000 people were employed by nearly 62 000 registered businesses in Namibia. The biggest chunk of these businesses are in the retail and wholesale trading industry and the hospitality industry. The following table shows the number of business establishments in Namibia and their contribution to the labour market.

Table 4. Business sectors in Namibia (NSA 2013)

	Number of establishments	Number of employees
Wholesale and retail trade, and vehicle repair	31,382	78,911
Accommodation and food service activities	15,788	32,662
Manufacturing	5,153	26,129
Other service activities	2,814	11,044
Agriculture, forestry and fishing	1,249	7,584
Financial and insurance activities	774	7,623
Education	741	5,634
Administrative and support services	671	15,183
Health and social work activities	665	4,989
Construction	547	9,600
Other	1,898	24,394
Total	61,682	223,753

Clearly the retail and vehicle repair out-performed other businesses by far. Different sectors of the economy have contributed differently to the GDP of the country. Between 2008 and 2012, the tertiary sector accounted for over half of all the industry contributions to GDP, followed by the secondary sector which out-performed the primary industry by a small margin. This trend continued through to 2014. The chart below presents the contributions to GDP by different sectors.

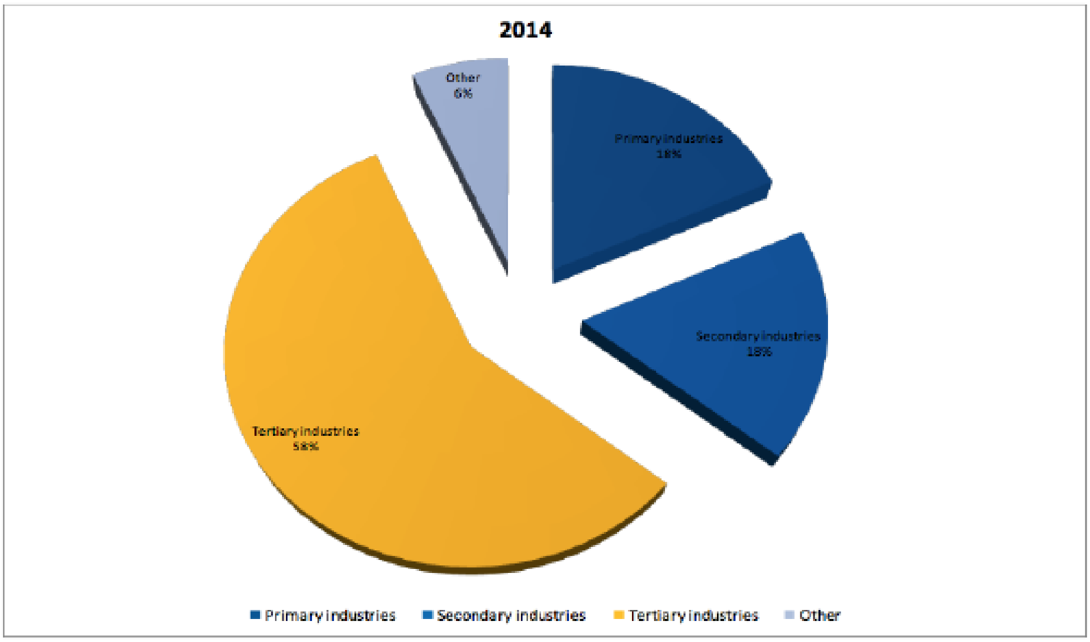

Figure 19. Contribution to GDP by sector, 2014 (NSA 2015)

The tertiary sector is credited for the 6.4% growth in GDP contribution in 2014 from 5.7% in 2013. As the figure below shows, the primary sector recorded negative results, which may be due to the uranium and other mining and quarrying that registered negative growths in real value added of 9.9% and 39.7%, respectively.

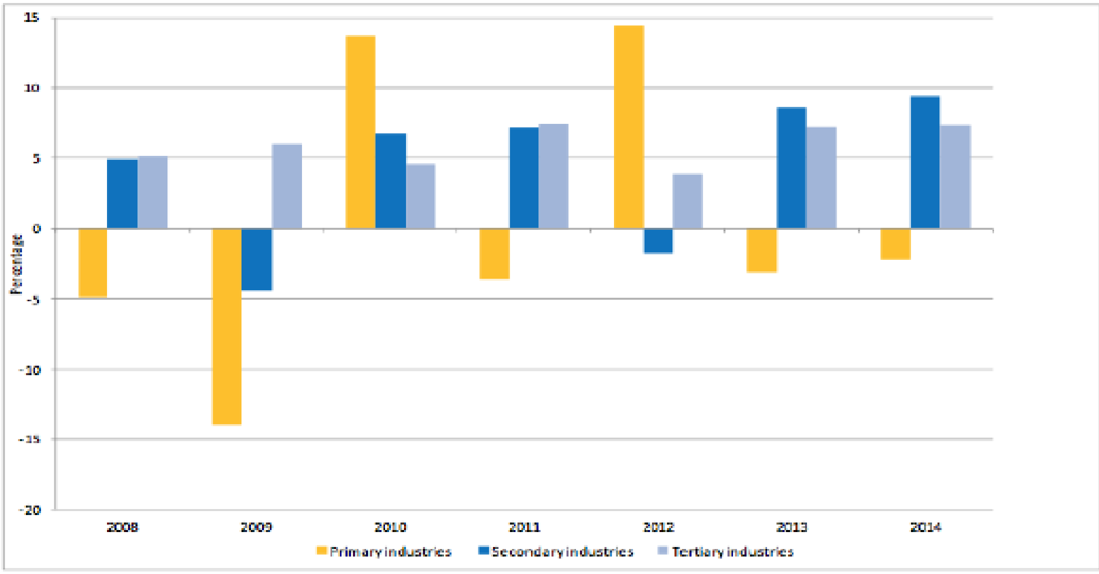

Figure 20. Growth rate of Industries (NSA 2015)

5. NAMIBIAN ENERGY INDUSTRY

This chapter gives an overview of the whole energy industry and identifies the major players in the Namibian electricity sector, namely, NamPower, Regional Electricity Distributors (REDs), and Independent Power Producers (IPPs).

5.1. Structure of Namibian Energy Industry

The Ministry of Mines and Energy (MME) of Namibia is responsible for energy-policy formulation and direction. MME, which has 6 directorates, includes the Directorate of Energy. The directorate is divided into 3 divisions namely, Electricity Division, Renewable Energy Division (RED), and National Energy Fund (NEF) Division. The Electricity Division which emphasises rural electrification and local power generation is responsible for the coordination, planning, managing project financing, and implementing national electricity programmes. RED is responsible for the implementation of renewable energy and energy efficiency. NEF receives and manages the electricity levy funds collected by NamPower, among other duties. (MME 2015.)

5.2. Structure of the Electricity Supply Industry

Namibia’s electricity supply industry (ESI) is built on four main functions that can be categorised according to the activity and responsible entity. The diagram below provides an overview of the four main functions, i.e. generation, transmission, distribution, and supply.

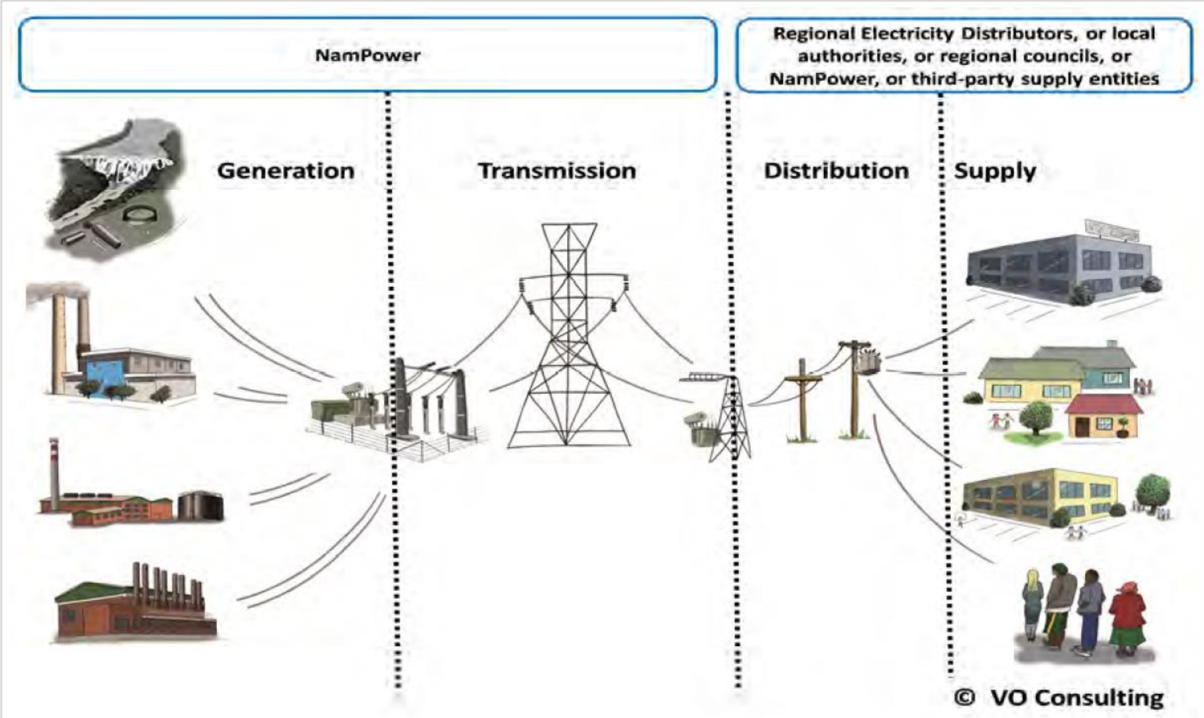

Figure 21. Four main functions of Namibia's electricity industry **(Konrad Adenaure Stiftung, 2012)**

The key players in the ESI are MME as the line ministry, the ECB as the regulator, NamPower, doubling as system operator and power producer, and other operators, i.e. the Regional Electricity Distributors (REDs), local authorities, and IPPs (ECB, 2016). All operations in the ESI are overseen by the ECB, which governs the industry according to the Electricity Act 4 of 2007. The Namibian electricity sector is dominated by a state-owned vertically integrated power utility, NamPower, see figure below. The utility is a monopoly in both generation and transmission sectors. The distribution sector, however, is fragmented with various REDs and local authorities. REDs purchase electricity from NamPower and are responsible for distributing this electricity to their respective regions. IPPs, who are new in the picture, have started to make significant contributions to Namibia’s electricity supply (MME 2015). The graph below illustrates the hierarchy of Namibia’s electricity sector, consisting of the main players and their linkages.

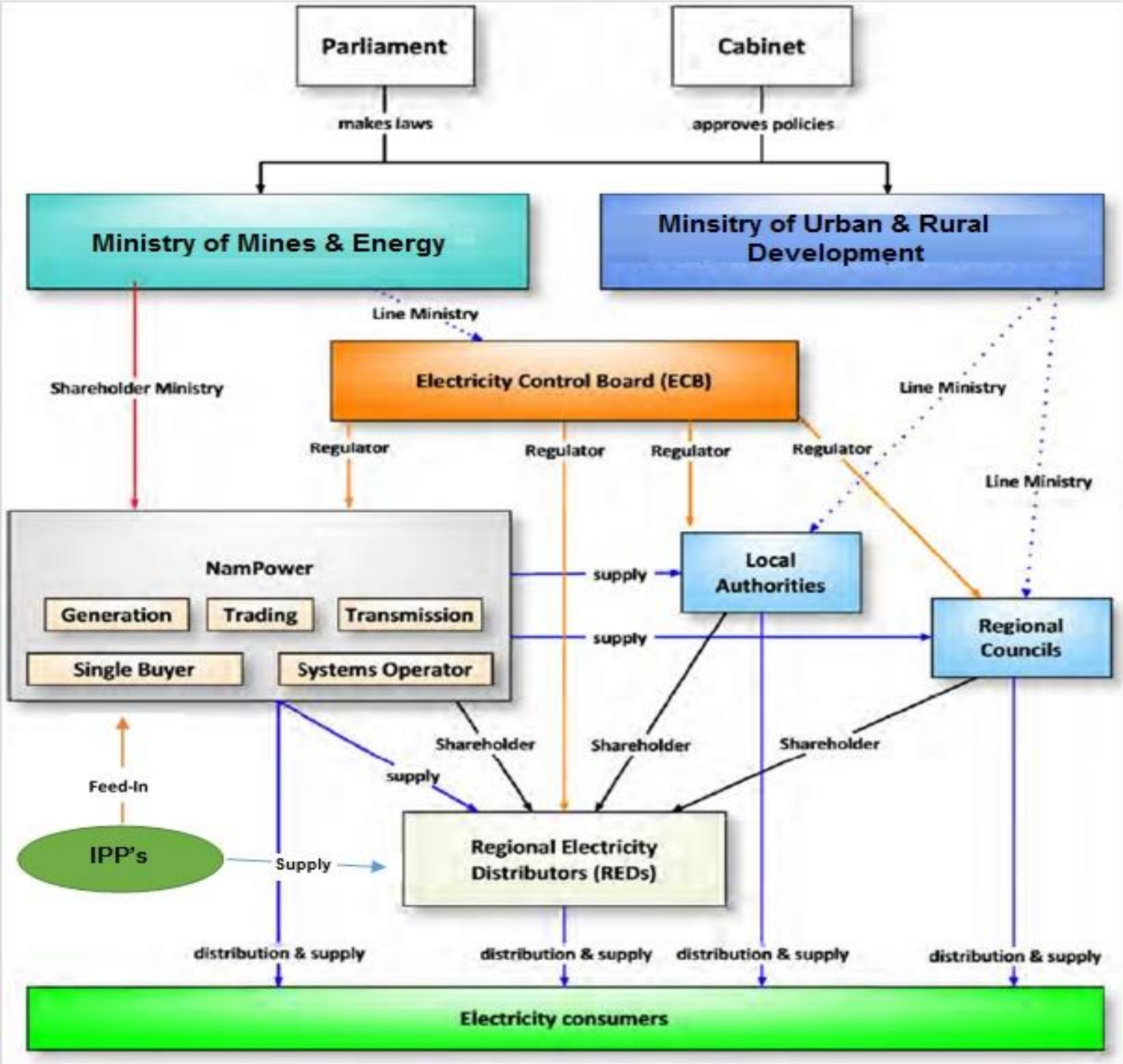

Figure 22. Namibia Electricity Industry Structure with main players and their responsibilities (Adapted from Konrad Adenaure Stiftung 2012)

It can be seen in the figure above that Namibia's electricity sector is highly regulated—laws governing the sector are decided in parliament. The functions of the industry can be described as follows:

- *Cabinet* is responsible for approving the White Paper on Energy Policy of 1998.
- *Parliament* is responsible for formalising relevant policies with appropriate legislation, i.e. the Electricity Act of 2007.
- *The Ministry of Mines and Energy* is the line ministry of the electricity sector. It is the main energy policy initiator and implementer. The line Minister's authorities include, upon recommendation by ECB, granting, transfer and renewal of electricity licences.
- *The Ministry of Urban and Rural Development* oversees the country's local authorities and regional councils. The ministry is tasked with ensuring the sustainable

development of local and regional authorities; therefore, it contributes to the electricity supply decisions of these entities.

- *Electricity consumers* are the end-users of electricity, i.e. public institutions, commercial and industrial users, and domestic users of electricity.

MME oversees the entire industry through ECB. NamPower, as the system operator and Single Buyer, is in the business of generation, transmission, distribution and energy trading. It should be noted that at the time of writing this thesis Namibia was in an advanced stage of revising the Single Buyer model to develop a Modified Single Buyer model (MSBM). Although distribution is conducted by REDs, NamPower still plays a significant role in distribution activities. This is because NamPower has a stake in most REDs and it distributes to communities that do not have REDs. REDs and municipalities receive their power directly from NamPower and IPPs and pass it through to their local residents and industries. The rest of this chapter discusses the players in the supply industry, ECB, NamPower, REDs, and IPP's, in detail.

5.2.1. Electricity Control Board

The ECB is a State-Owned Enterprise (SOE) responsible for the regulation of electricity in Namibia. The ECB was established in 2000 under the Electricity Act (Act 2 of 2000), which was later repealed with the Electricity Act 4 of 2007. ECB has a board as its highest decision making body. Members of the board are appointed by the line minister for a fixed term of four years. ECB has the core mandate of exercising control over the electricity supply industry of Namibia. The ECB's main responsibility is to regulate electricity generation, transmission, distribution, supply, import and export in Namibia. (ECB 2016.) As the highest regulatory body of ESI, ECB's mandate includes regulating national electricity supply and consumption; ensuring efficiency and security of electricity supply; ensuring that the industry functions efficiently and develops sustainably; regulating competition in the Namibian electricity market; and promoting private sector investment in the industry.

The ECB's regulatory areas include economic and technical regulation, licensing, answering to customer and licensee/ service provider complaints as well as develop a fair and competitive industry for all participants i.e. utilities, IPPs, and investors. Through its economic regulatory arm, the ECB is responsible for setting electricity tariffs and ensures that industry operators are profitable by assessing the economic impact of its tariffs. In addition, it ensures the affordability of electricity by consumers. Its technical arm is responsible for setting standards for the electricity industry and enforcing compliance by service providers. The licensing arm issues licenses, and amend, transfer and even cancel licenses. The licenses issued by the ECB include electricity generation, transmission, distribution, supply, import and export, and trading. The license application procedure is transparent in that after the applications have been made they are first advertised in newspapers, and are open to public scrutiny for a period of 30 days. During the period the public may object to the application, and the applicant is given a chance to respond to the objection. (ECB 2016.)

5.2.2. Namibia Power Corporation

The Namibia Power Corporation (NamPower) is Namibia's national power utility, founded in 1964. It is a utility that operates within SAPP and is in the business of electricity generation, transmission, and energy trading. NamPower is registered as a company, therefore; it operates according to the Namibia Companies Act. The utility supplies bulk electricity to REDs, as well as mines, farms, and local authorities that do not have REDs (NamPower 2015). As the national utility, NamPower operates the country's main sources of power generation; 332 MW hydro-electric Ruacana power station at Ruacana, 120 MW coal-fired Van Eck power station in Windhoek, 24 MW and 22.5 MW diesel-powered Paratus and Anixas power stations in Walvis Bay.

NamPower is Namibia's system operator and owns and operates a transmission system and network of 132 kV to 400kV of overhead power lines stretching to more than 25 000 kilometres. NamPower's grid is one of the longest of its kind in the world and it is designed and, for the most part, built by Namibians. (NamPower 2015.)

5.2.3. Regional Electricity Distributors

REDs dominate the distribution sector of the Namibian ESI. REDs, which purchase bulk electricity from NamPower and IPPs distribute it to their respective customers, are private enterprises co-owned by regional authorities, municipalities and NamPower. At the time of writing, there were three main REDs and several local authorities and municipalities operating in Namibia with the most prominent being, CENORED, ERONGO RED, and NORED, including the Municipality of Windhoek and Municipality of Oshakati through Oshakati Premier Electricity (OPE), and NamPower distribution arm, Nampower Dx (ECB, 2015). There are approximately 47 (See Appendix 2) distributors of electricity licensed in Namibia currently.

REDs have varying customer bases. Central Namibia has the highest number of customers, followed by NORED.

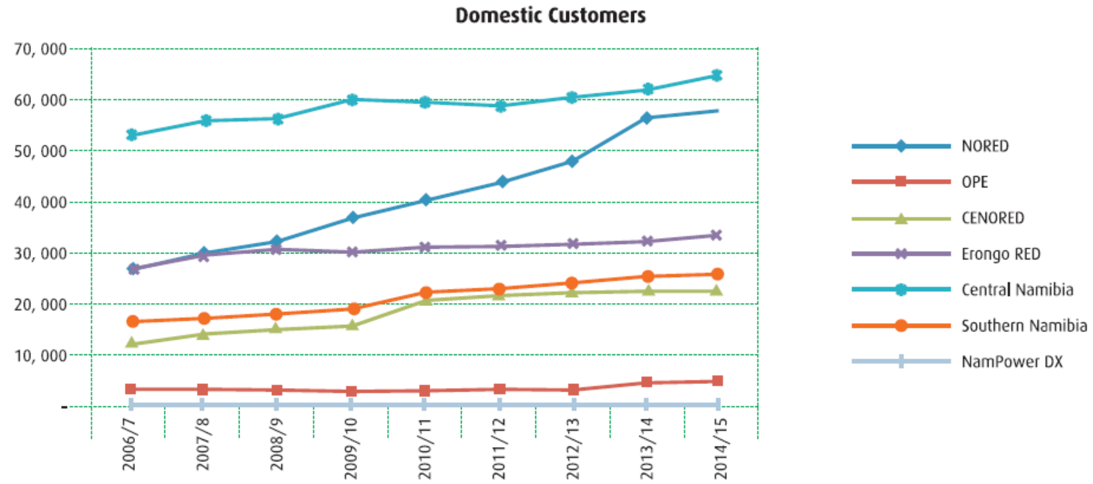

Figure 23. REDs domestic customers, 2006-2015 (ECB 2015)

All distribution in the Erongo Region is conducted by Erongo RED. Most of the distribution in the Central North and Northern Regions are done by CENORED and NORED respectively. NORED has had the largest increase in customer number by far, from 30 000 in 2007/8 to 57 000 customers. Over the past eight years, Khomas and Omaheke regions, City of Windhoek, Okahandja and Gobabis have had highest numbers of domestic customers. Most of the domestic customers in Central Namibia reside in Windhoek and it is very interesting to note an upward trend of this category of customers over the last three years, indicating that electricity demand in these areas continues to grow. OPE, a 100% owned Oshakati Town Council distributor, has a seen stagnant numbers of customers for years. OPE and several privately-owned entities in the central and Southern parts of the country cater to the central North and Northern regions. To varying degrees, NamPower holds shares in all the REDs. The Windhoek Municipality and other local authorities in the central, eastern and southern part of Namibia are individually licensed for distribution of electricity to their residents. (WSP Group, 2012.) *See Appendix 2 for list of distribution companies.*

5.2.4. Independent Power Producers and REFIT

The government of Namibia established a policy of encouraging investment in the Namibian power sector as early as 1998, as evidenced by the White Paper. The government aims to stimulate the involvement of IPPs in the Namibian electricity market to help overcome the deficit in short to mid-term supply forecast. However, as stated above, Namibia's electricity market operates on a Single Buyer model, with NamPower having monopoly over power generation, transmission, trading, and in certain circumstances, distribution. At the time of writing, NamPower owns all of the transmission system in the country and will be the sole off taker from prospective IPPs. Nonetheless, as ESI restructuring proposals indicate, there is a move towards an investor oriented market as a MSBM where IPPs will be able to bypass Nampower and sell directly to REDs, local authorities or mines, and only sell to NamPower by choice. An example of this new model is the agreement between the new Omburu solar plant to sell electricity directly to a RED. Development of this new market model is on-going and in its final stage. As of 2016, there were 37 licensed IPP's in Namibia. Of those, there were 27 renewable energy licenses (ECB Annual Report, 2016).

Namibia is currently in the final phases of developing its Renewable Energy Feed-In Tariff (REFIT) programme. The programme, meant to bolster IPP participation in energy generation, sends out one key message: if a company generates power, GRN, through Nampower, will be obligated to buy it at a pre-determined price. Qualification for the REFIT programme is limited to plants with capacity of no more than 5MW but not less 500kW. The interim REFIT programme has a ceiling of 70MW. At the time of writing, an interim programme was operational and some 14 IPPs had been shortlisted to fill the 70MW ceiling (2015 ECB Annual Report, 2016). *See Appendix 4 for list of 14 shortlisted IPPs under REFIT*.

Regardless of the capacity limit attached to the REFIT programme, generators are free to construct plants bigger than 5MW, in consideration of base source ceilings, and enter into PPAs with NamPower or a contestable customer. However, all RE base sources have a limit of use. Power projects deemed to be large—10MW or more—will be procured through a competitive public bidding system (ECB Annual Report, 2016). Before undertaking any activities every potential IPP requires a suitable licence issued by ECB. All licenses—generation, transmission, distribution, supply, import & export, and trading of electricity—in Namibia are issued by the ECB (GRN, 2007). Application for a licence must be done in the prescribed manner, as shown in the chart below.

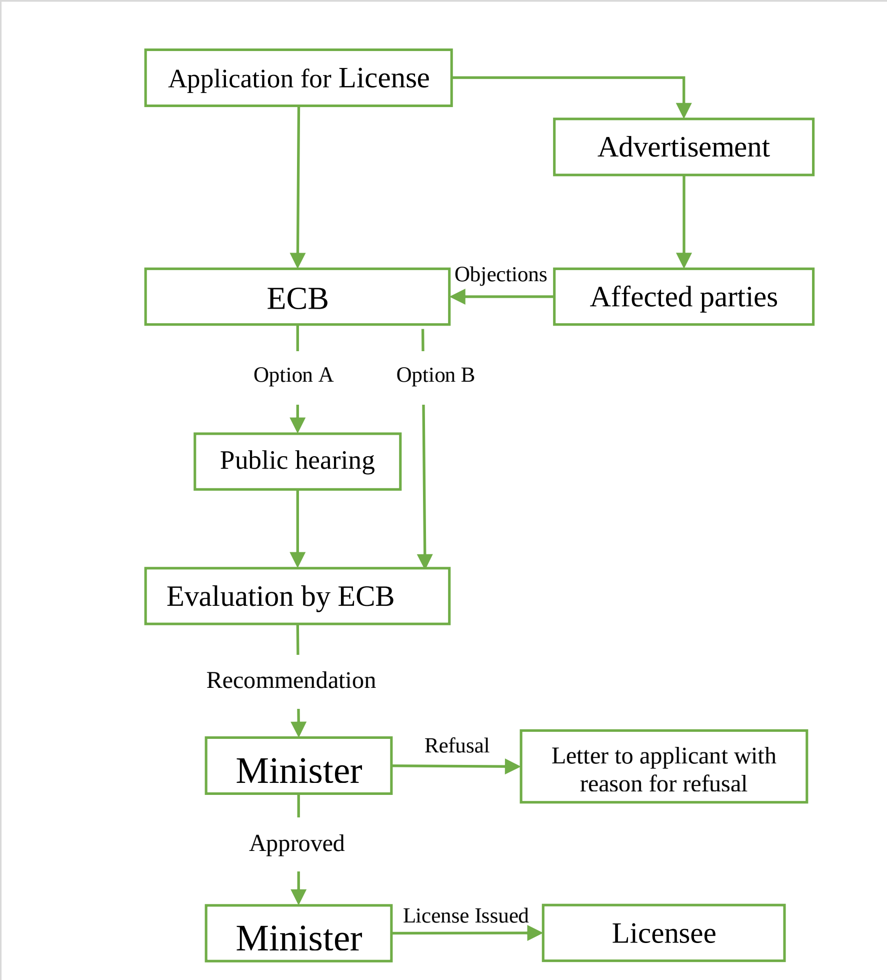

Figure 24. ECB's Licence Application Procedure. Adapted from (WSP Group, 2012)

Licence applications are advertised in the newspaper for public inspection for a period of 30 days following publication. During the 30 days, opposing parties may submit their objections to the ECB, after which applicants are afforded a specified period of time to respond to the objections. The ECB will take into consideration the application, any objections, and applicant's responses to the objections, and make a recommendation to the line minister whether or not to grant a licence. The ECB will issue the licence upon approval of the line Minister. (ECB 2016; Government of Namibia 2007; WSP Group 2012.)

ECB may not recommend, or issue thereof, a licence before all prerequisites of the applications have been met. However, in some special circumstances, ECB may issue a conditional license based on condition that the PPA protects the customer from excessive electricity price adjustments on one hand and ensures profitability of the IPP on the other hand. The PPA specifies a tariff for the electricity to be produced. It is not enough that the IPP and NamPower agree on the tariffs, the PPA and the agreed tariffs require ECB's approval (WSP Group, 2012).

6. NAMIBIA RENEWABLE ENERGY RESOURCE BASE AND ELECTRICITY STATISTICS

Currently, over 80% of the energy used in both the developed and developing world comes from fossil fuels. The availability of coal, oil and gas is accountable for the dramatic increase in energy demand. Through history, powering nations with these energy resources has been convenient; however, modern populations have become aware that there are consequences, most notably climate change. (Armaroli & Balzani 2011: 5.) Namibia is certainly not one of the most polluting countries in the world, but it is one of the countries most affected by climate change caused by human-made pollution of the atmosphere (Konrad Adenaure Stiftung, 2012). The ever increasing prices of energy, supply security concerns, and the dependence on foreign energy imports pause a risk, not only to Namibia's economic and social welfare, but to the sovereignty of the country.

There are several obstacles or barriers to the more widespread application of solar energy technologies in Namibia. Some barriers—technical, capacity, awareness, financial and institutional development—have been identified. In order to lower these barriers and to realise the considerable solar potential, the United Nations Development Programme and Global Environment Facility (UNDP –GEF) launched a US$ 14 million technical assistance project—Namibia Renewable Energy Programme (NAMREP)—in collaboration with Namibia's Ministry of Mines and Energy with co-financing from MME and the Government of Denmark. The project was implemented in two phases, a Phase I or NamREP I (2004-2006) with US$ 2.6 million and a Phase II or NamREP II (2006 – 2008) with US$ 2.7 million from GEF conditional on the result of NamREP I. NAMREP I focused on providing technical assistance to government, NGOs, finance and other sectors. NAMREP II focused on promoting the delivery of commercially, institutionally and technically sustainable solar energy services to rural and off-grid communities. (Van den Akker & Heita 2006; MME 2015; Deenapanray 2011.)

The rest of this chapter presents an overview of the availability of renewable energy sources, i.e. solar, wind, and bioenergy. This discussion focuses on the unexplored or under-explored sources; therefore, hydro energy is not included because at present, most of Namibia's locally generated electric energy is from hydro sources. In a way, Namibia's electricity is almost 100% renewable.

6.1. Solar Energy

The most popular solar technologies in Namibia are solar home systems (SHS), solar water heaters (SWH) and photovoltaic pumps (PVP). PVPs are more common in the agricultural sector. SWHs are often deployed in both urban areas and in rural areas mostly in public institutions; government buildings, clinics and schools but also in commercial farms. SHSs, mostly roof-top panels, provide basic electricity services for off-grid communities and, have traditionally been used to lighting and powering media electronics (radio and television) and even refrigeration. (Van den Akker & Heita 2006; NEI 2015.)

Among all energy resources, solar energy is by far the most abundant resource on the planet. The average irradiation hitting Earth's surface in one hour is equivalent to that of the energy consumed by the world population in the whole year (GEA, 2012). With an average of 300 days of sunshine annually, Namibia is one of the sunniest countries in the world (Chiguvare & Ileka, 2016). The map below shows Namibia's solar energy potential per square-meter in terms of Global Horizontal Irradiation (GHI) and Direct Normal Irradiation (DNI).

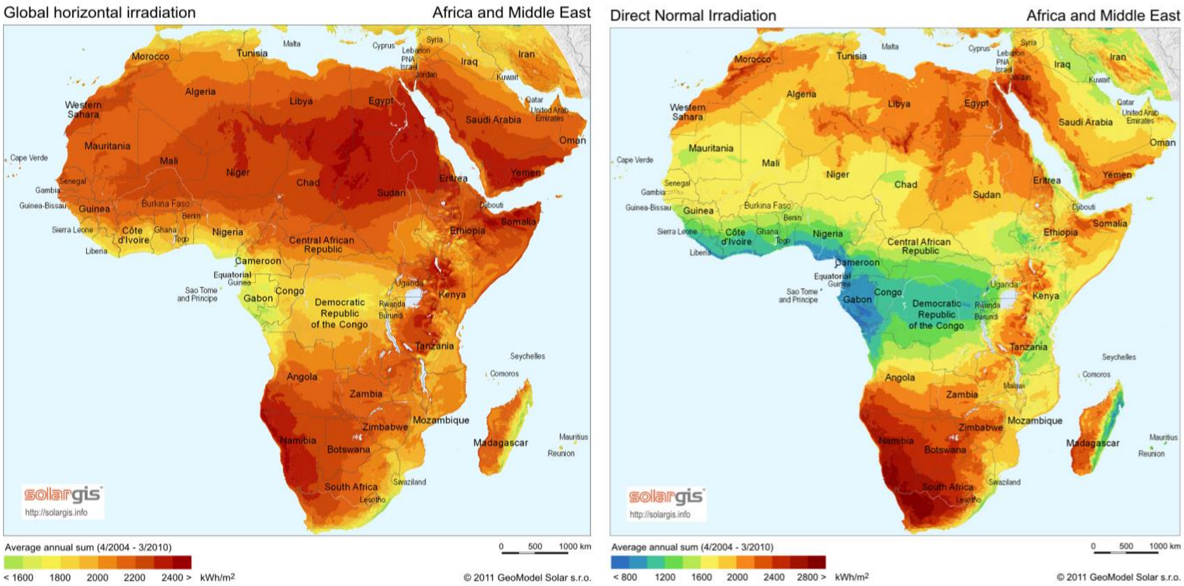

Figure 25. Africa's GHI and DNI (SolarGIS , 2016)

GHI is the sum of Direct Horizontal Irradiation (DHI) and Diffuse Horizontal Irradiation (DIF). DHI comprises the irradiation component that reaches a horizontal Earth surface without any atmospheric interaction that causes losses through scattering or absorption. DIF is the irradiation component that reaches a horizontal Earth surface after being exposed to atmospheric interaction and scattered by air molecules, cloud and other particles (SolarGIS , 2016). The measure of level of insolation, i.e. the amount of DNI and GHI per square meter is one of the most important measurements for suitability of solar technologies (Chiguvare &

Ileka, 2016). With over 2200kWh/m² (SolarGIS , 2016), Namibia receives the most solar irradiation per surface area in the whole Southern Africa and also one of the most endowed in the whole of Africa. With the right technology and implementation, Namibia could benefit immensely from this resource.

6.2. Wind

With a shoreline stretching over 1600 kilometres (kms), Namibia has a sufficient wind resource waiting to be exploited. According to REEEP (2014), Namibia has one of the best wind resource potential in Africa due to its location in the extreme latitudes. Assessments carried out in the coastal regions of Namibia (Luderitz and Walvis Bay) showed that the region has potential for wind power with wind speed of around 7 m/s. Measurements at 85.7 meters high estimated an average annual wind speed of up to 10 m/s with a stable wind direction. Additional potential sites with good wind regime are likely to exist in other parts of the country too. SAPP has estimated the Namibian wind potential to be at 27.201 MW and 36 TWh per annum with a relative land use of 824,268 square kilometres (km²). (REEEP, 2014.) Below is a map of the selected wind sites in the country.

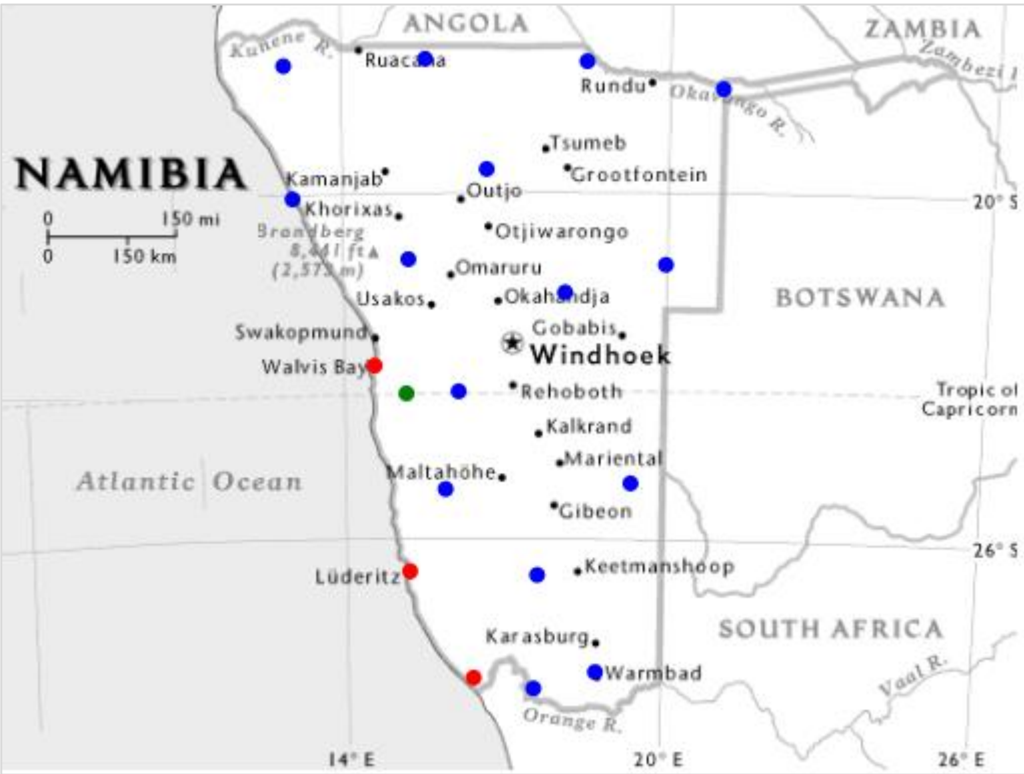

Figure 26. Selected wind sites in Namibia (NEI 2016)

At the time of writing, there was only one wind turbine installed in Namibia. It is mainly for research purposes and it feeds the distribution grid in the Erongo Region. Also, NamPower was in negotiations of a PPA and a Transmission Connection Agreement with Diaz Power, a potential wind power plant of 44 MW in Luderitz.

6.3. Bioenergy

The Namibian bush landscape faces an environmental disturbance due to bush encroachment. Unwanted bush, referred to as invader bush in Namibia, covers vast amounts of land interfering with local biodiversity, water absorption into the soil and pastoral natural lifecycle which impacts livestock. However, the bush has been identified as a potential source of fuel for biogas fired power plants. A completed assessment of the invader bush potential as a fuel sources showed that it is technically feasible to build 10-20MW plants utilising invader bush as the fuel source (NamPower, 2013). NamPower and other private investors continue to investigate this resource with a view of developing a hybrid plant of biomass and solar.

6.4. Electricity Statistics

Namibia fulfils half of its electricity demand with imported electricity. The bulk of the imported power is supplied by Eskom in South Africa and the rest comes from Zambia and Zimbabwe (Emcon Consulting Group, 2008). The imported power is supplied through the interconnector with a capacity of 900 megawatts (MW), of which 600MW comes through a connection to the South African system and 300MW comes from the Zambian system through the Caprivi Link. The power crisis comes after other Southern African countries who have traditionally provided Namibia with electricity since independence began experiencing increasing demand for electricity in their local economies. (Rämä, et al., 2013.)
As shown in the figure below, Namibia continues to be a net-importer of electricity 24 years after independence.

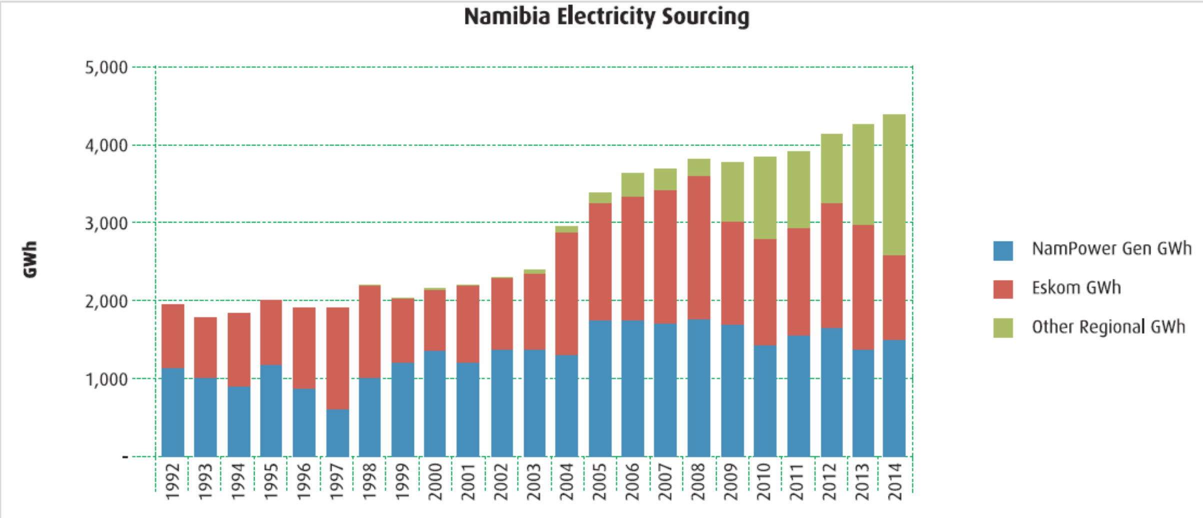

Figure 27. Namibia Electricity Sourcing (ECB 2014)

Local supply comes from the Ruacana hydro plant with a capacity of 347 MW, Paratus and Anixas (24 and 22 MW respectively), and the Van Eck coal plant with a capacity of 120MW with a base-load of only 90 MW, used largely for peak hours. At the time of writing, Omburu solar power plant in central Namibia was due to be commissioned, with Nampower as the off-taker. The power plant is Namibia's first IPP grid-connected plant expected to add 4.5 MW to local generation capacity. Lack of diversity in local generation has always been a concern for Namibia. As the figure below shows, diversity in local generation was almost non-existent in some years during the period under review.

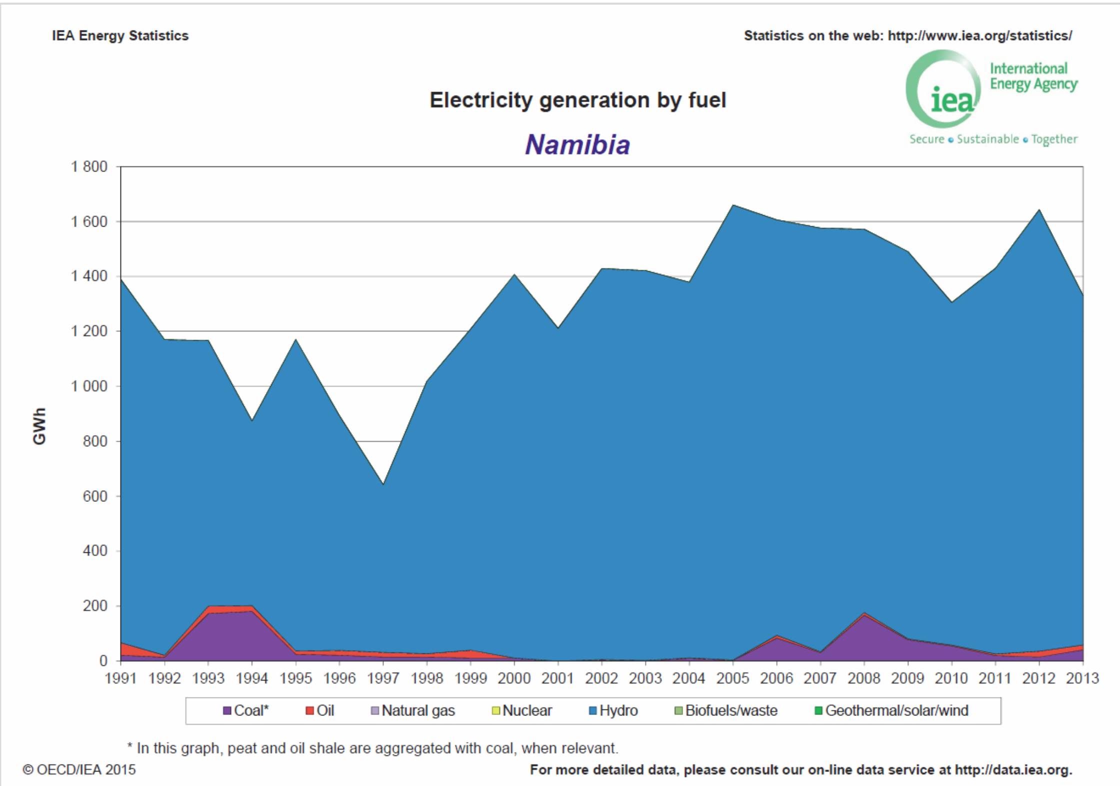

Figure 28. Namibia electricity generation by fuel (IEA, 2015b)

For someone familiar with Namibia's climate, it is clear that reliance on hydro power is not in the best interest of the country since the country receives the least rainfall in Sub-Saharan Africa. The rest of this chapter presents industry numbers in the form of graphs. All data is sourced from ECB Statistics Bulletin 2014/15 and ECB Annual Report 2016.

6.4.1. Electricity Supply and Demand Outlook

In Namibia, electricity customers are divided into three categories: domestic, commercial, and large power users (LPU) (ECB, 2015). Domestic/ household customers make up the largest portion of electricity customers in Namibia. The following graph shows total numbers of customers per category.

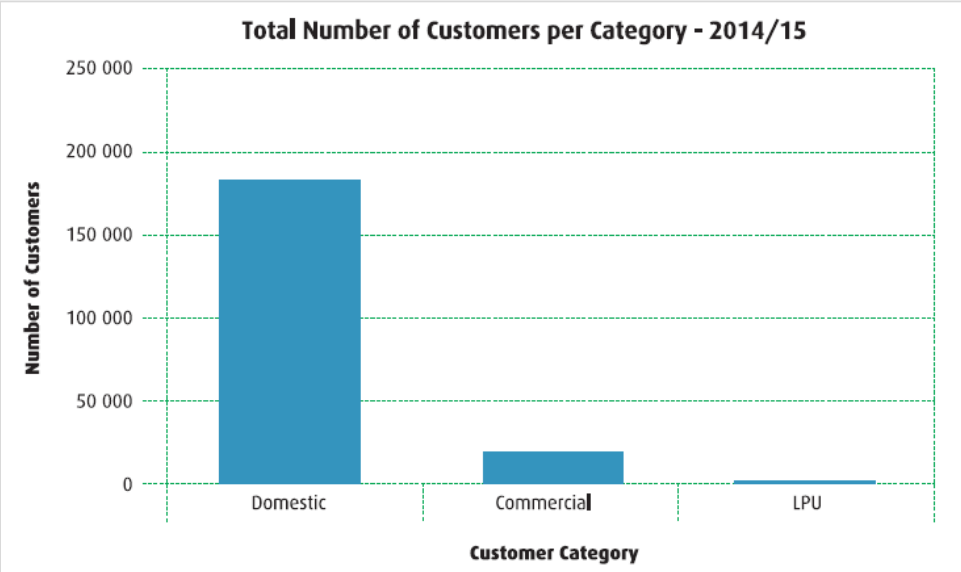

Figure 29. Total number of customers per category

Below is the historic summary of the number of electricity customers in all categories from 2006 to 2015. While the number of commercial and LPUs fluctuates somewhat, the number of domestic customers has been growing consistently.

Table 5. Number of Electricity Customers

Customer Number	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
Domestic	137,841	148,190	157,377	164,516	173,440	181,419	188,934	202,538	209,334
Commercial	13,871	14,791	15,115	15,298	18,234	19,865	20,330	19,147	20,795
Large Power User	1,861	1,930	1,688	1,620	1,997	2,000	2,000	2,036	2,202
Institutional	-	-	534	505	546	480	570	707	711
Institutional LPU	-	-	75	91	104	85	91	110	111
Distribution Total	153,573	164,912	174,790	182,031	194,321	203,850	211,924	224,539	233,153

6.4.2. Domestic Distribution and Consumption

Below is a historic overview of electricity consumption by the domestic customer category.

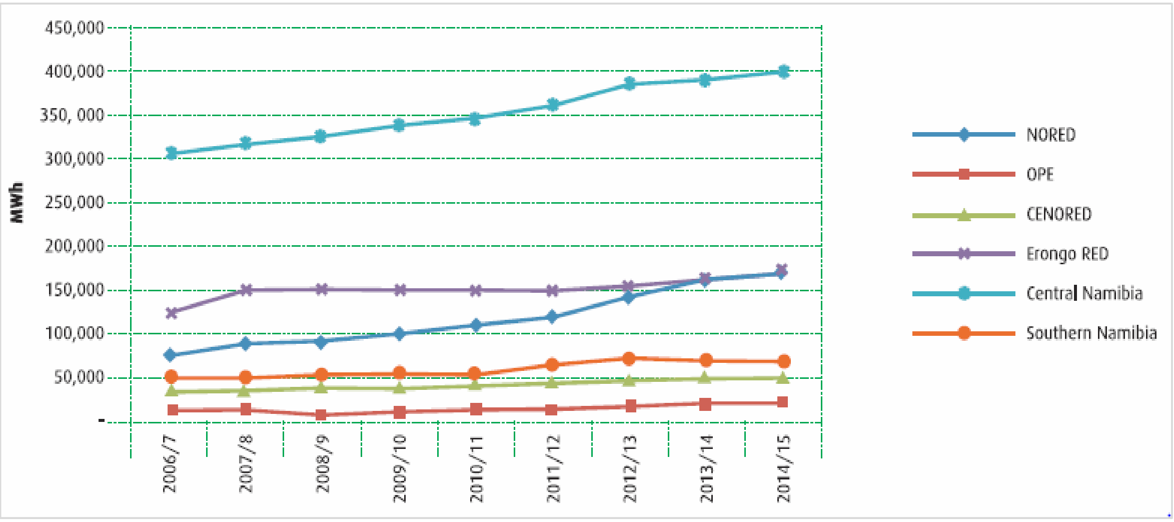

Figure 30. Domestic consumption (2006 -2015)

Domestic consumption per annum in Central Namibia is the highest and appears to be continuing in that trend. The region has had an average growth rate of 3% annually since 2006. Windhoek, the capital city, contributed a large portion of the total consumption in central Namibia. ECB is satisfied with the rise in consumption despite a slowly growing number of customers; however, this is not necessarily a good thing because it could mean inefficient use of electricity.

6.4.3. Commercial and LPU Distribution and Consumption

As in the previous category, Central Namibia continues to be the highest electricity consumer. However, the sharp spike in the data may be due to an error as validation was not done in the City of Windhoek for a period of time. Erongo RED saw the highest jump in consumption rate per annum, doubling in 2010/11. This can be attributed to an increased number of commercial customers in that reporting period. CENORED, Southern Namibia, NORED and Oshakati's OPE have remained stable, staying under 70 GWh for the period under review.

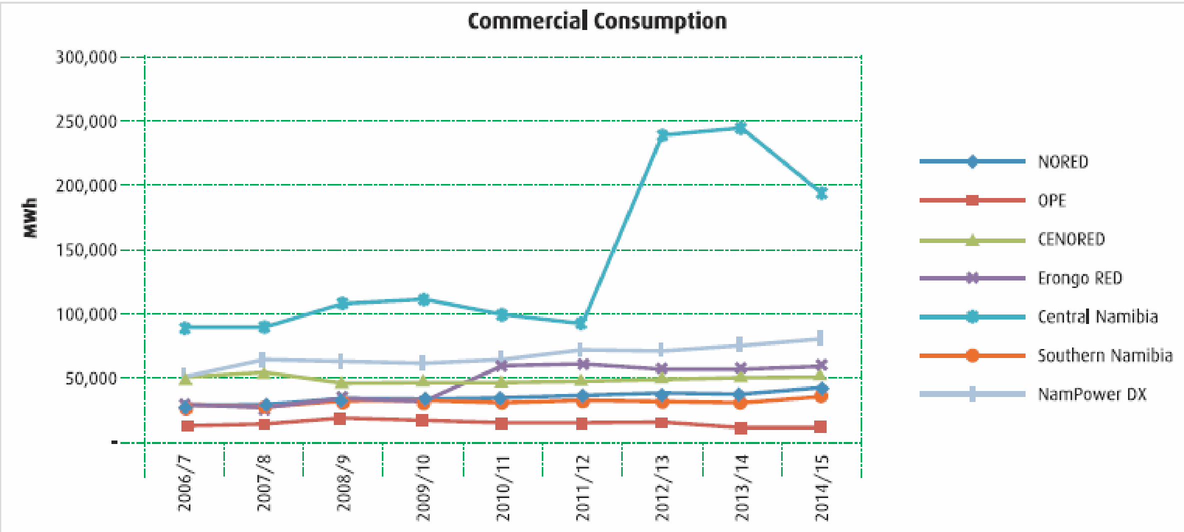

Figure 31. Commercial Consumption 2006 – 2015

As in the previous categories, Central Namibia is still the highest consuming region in terms of LPUs compared to other regions. It increased consistently. NORED, CENORED, OPE and Southern Namibia show consistent and fluctuating consumption since 2010/11.

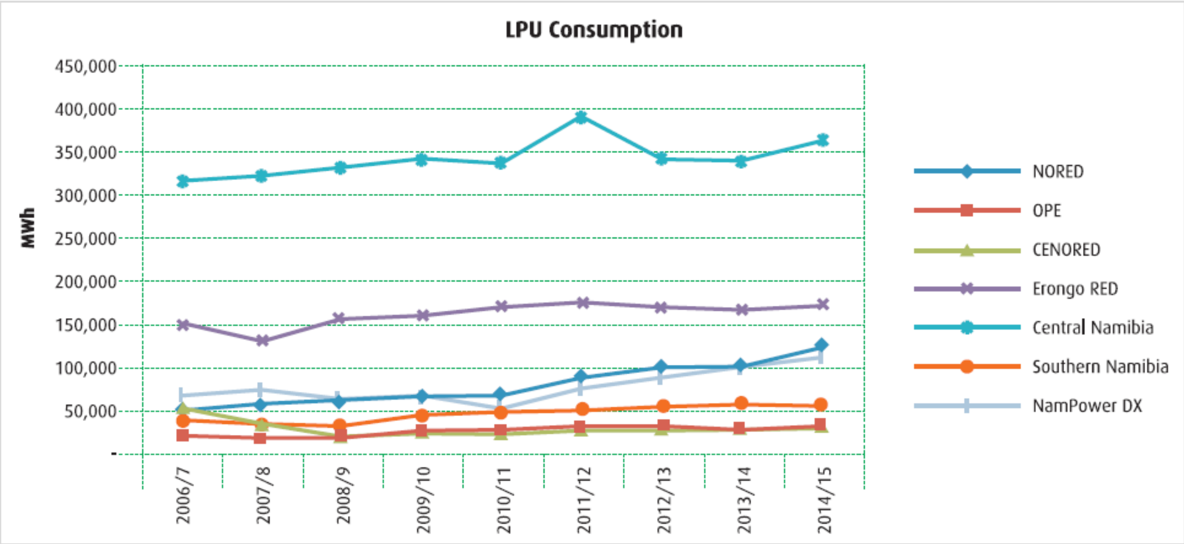

Figure 32. Industrial Consumption 2006-2015

7. EMPIRICAL STUDY:

This chapter presents the approach used to collect and analyse the empirical data that form the basis of this study. The chapter discusses possible entry modes available to Finnish companies entering Namibia. The entry modes and their recommendations were chosen based on the survey results conducted. The graph below presents an overview of the electricity system and areas where Namibia is looking for investments.

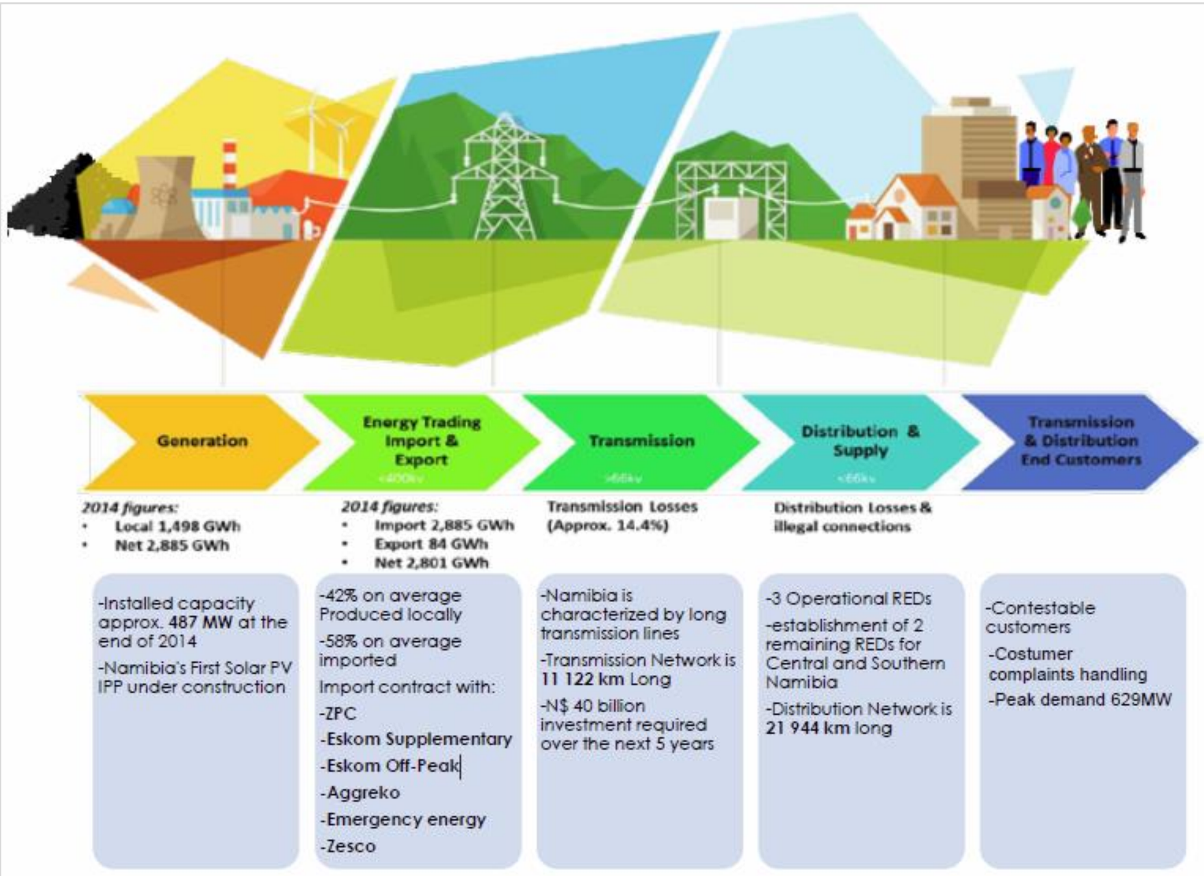

Figure 33. Value chain of the electricity supply sector (ECB Annual Report, 2016)

7.1. Data Collection and Analysis

The data used in this study was collected over a period of eleven months. The data is both primary and secondary data. Primary data is original data, i.e. data from an interview conducted by the researcher or questionnaires from a survey organised by the researcher, gathered specifically for the purpose of the research project (O'Gorman & MacIntosh, 2014: 81). The primary data was obtained by use of an online survey in the form of a questionnaire. The questionnaire was sent to select key players of the Namibian energy industry. The methods and techniques employed in sampling are discussed later in this chapter. Secondary data came from available literature on energy theory and previous research conducted by other researchers on Namibia and its energy industry. Secondary data is data that is readily available for a researcher to gather and analyse (O'Gorman & MacIntosh, 2014: 83). The secondary data used was all verified as reliable and valid.

While formulating the questionnaires, the researcher took into consideration the questions asked at the energy bridge builder workshop which took place at the University of Vaasa in May 2015. The workshop was organised by the University of Vaasa in cooperation with the local regional development company of the Vaasa region. The aim of the workshop was to link the international community in Vaasa with local energy companies to promote internationalisation of these companies. In addition, the researcher took into account the current energy status of Namibia. To ensure reliability and validity of the questions in the questionnaire, the researcher consulted various energy stakeholders in Vaasa. The goal of the questionnaire was not only to gather information about the status of the energy industry of Namibia but also the business environment that shapes the industry and opportunities that lie there. Therefore, the survey was divided into 4 sections as follows: 1) General industry information; 2) Foreign investment potential; 3) Renewable energy in Namibia; and 4) Knowledge about Finland.

Every stakeholder in the Namibian energy sector qualified to be a member of the population. That includes the Ministry of Mines and Energy, Ministry of urban and rural and rural development, ECB, Nampower, all REDs, all IPPs, regional and local authorities, and municipalities. A population is a complete set of members representing a group that a researcher is interested in making conclusions about (Saunders & Lewis, 2012: 132). A population is not limited to individuals or employees: it can be organisations, places, or a complete video library of a TV station. The researcher employed the non-probability sampling technique to select certain stakeholders that best represented the population. A sample is a subset of the population (Saunders & Lewis, 2012: 132). Researchers sample populations because it just not feasible to target the whole population as some some populations can be in thousands or even millions (Wilson, 2014: 210).

This study included a PESTEL analysis of the Namibian business environment. While the PESTEL analyses and presents the macro-environment, it does not analyse one element critical to the surivival of a business—profitability. Although not going into detials, this analysis is conducted with reference to the Porters’s Five Forces. Porters’s Five Forces gives a business an understanding of its competitors and how they impact its profitability (Porter, 2008). The researcher made use of the Five Forces to analyse the kind of competition that exists in Namibia in order to recommend the most suitable entry strategy in terms of profitability and survival in a new environment.

7.2. Sample Selection

A web-based survey was conducted from December 2015 to February 2016. 19 respondents consisting of 10 critical and 9 regular respondents were targeted to answer the web-based survey. 7 responses were received, giving a low response rate of 37%. Although this is a rather low response rate, it should be noted that it is a fair representation of the population because the 7 respondents were all from the critical 10 respondents. The low response rate was caused by several factors, the main cause being technical. Out of the 19 possible respondents 4 reported experiencing technical problems such as inability to access the survey form or the web form freezing half-way through filling in. The researcher tried repeatedly with the respondents to solve the problems but some just could not be solved. One possible reason for the technical failures may be weak Internet connectivity in some organisations. The following two paragraphs break down steps taken to reach the 19 sample size.

The Namibia electricity is made up of various players ranging from governance level to small and very small IPPs. These are two main ministries, the electricity regulator, and the energy institute. In the supply sector, there are up to 47 licenced organisations consisting of the utility, REDs, and regional and town councils. In the private generation sector, there are approximately 30 organisations made up of large to small companies. The private sector also includes engineering consultancy firms. Therefore, one may question why from a population of approximately 80, a sample of 20 was chosen. The reason is that although there are up to 30 IPPs, a vast majority of them (up to 65%) have generation licenses for between 500KW and 4,5MW, automatically disqualifying them from the sample.

The disqualification above is due to the assumption that most Finnish companies who the data in this research is intended for have reservations about venturing internationally for projects of less than 5MW capacity. Besides that, ECB (2015) confirmed that Namibian IPPs face the same challenge—lack of finance and capacity; therefore, generalisation would be suffice if required. This distribution sector is similar to the IPP sector in that it also has several entities who are automatically disqualified from the population. At the government level, all representatives were chosen. Logically, the Embassy of Finland in Namibia was also chosen as a respondent.

After the pre-emptive disqualifications, a sample of between 35 and 40 remained. Aiming for a confidence level of 95%, I subsequently ended up with a relevant sample of 19 but this meant an error margin of 16%. Conclusions made with a margin of error of 16% may be interpreted as invalid; however, in this case one has to consider the small size of the population and the fact that a significant part of the population are entities facing the same problem as per the ECB (2015) study. The rest of this chapter presents the analysis of the survey, while taking into account the research questions. The results are presented in the form of graphs depicted directly from the survey.

7.3. Namibia – Finland Partnership in Energy Business: The Case Study

The objective of this research is to formulate a partnership framework for Finnish energy companies and Namibian private and public energy companies. To fulfil this objective, three main questions are asked:

Why is Namibia facing an electricity crisis when the country has an abundance of renewable energy resources?

What business opportunities are presented by this crisis and how can Finnish companies capitalise on them?

Are Namibian companies able and willing to contribute financially and strategically to partnerships with foreign companies?

Based on these questions, a web-based survey was sent to select energy industry stakeholders in Namibia.

The tool used for the survey is Google Forms. This is a reliable online survey tool offered by Google Inc. Respondents were limited to one response each. It was agreed that no identities would be closed in the analysis; therefore, no identity/ personal information was captured during the survey. In some instances, respondents provided their contact information to have the final thesis mailed to them. All that information remains private. The survey tools offers data analysis features that were used to analyse the data in this survey. Following is the analysis of the responses, beginning with a summary of the type of organisations that responded to the survey.

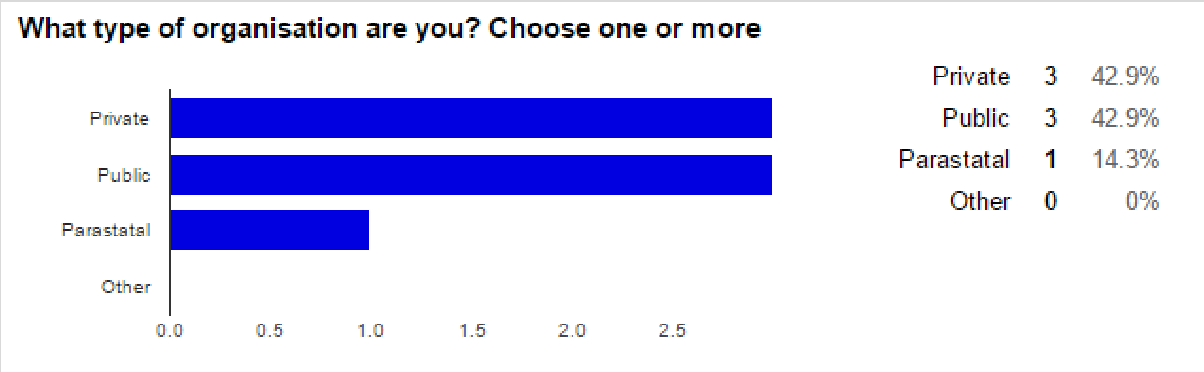

Figure 34. Organisations that responded to the survey

As can be seen in the figure above, there were respondents from the private sector and the public sector as well as the private-public sector. Having respondents from all the three sectors targeted gives a dependable conclusion of the industry and its needs. These organisations represented players in electricity generation, electricity distribution, energy consulting, government and other players such as foreign missions.

Electricity demand: after indicating the initial identification stage questions, respondents were asked to describe in their own words the status of Namibia's electricity demand. The question was formulated as follows:

"In your own words, how would you describe the current status and future of Namibia's electricity demand?"

What was apparent in the responses was that demand outweighed *local* supply, with some respondents saying the country imported and continues to import up to 60% of its electricity from its neighbouring countries, mostly South Africa, to meet local demand. Moreover, demand was expected to increase up to 4% per annum and in some cases sharp increases were anticipated owing to mining step loads. It continues that although Namibia acknowledges the inability of South Africa to supply power to the country, measures taken to make Namibia self-sufficient in power have not materialised. Nevertheless, some credited national power utility for effectively mitigating the impact of power shortages on the economy by implementing innovative short to mid-term supply strategies. It appears that the continuing reliance on South Africa for affordable electricity is the answer to the question why Namibia has not invested in local generation capacity.

Electricity Supply: respondents were also asked to describe the supply status in a question similar to the demand question above. There was a common positive feeling among respondents to this question as the majority were hopeful that Namibia has plans to become a net exporter of electricity by year 2020 sighting the Kudu Gas and Baynes Hydro projects. Also importantly, some respondents were hopeful that renewable energy will play a more important role in the supply industry in the near future. The positive feedback on the future of supply can also be noted in the response to the question: *is Namibia considering boosting local electricity generation capacity?* As shown below.

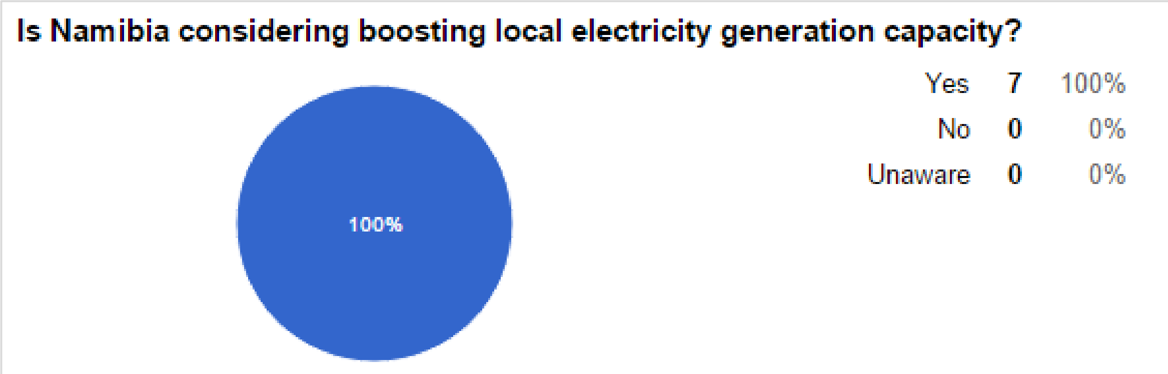

Figure 35. Response to: Is Namibia considering boosting local electricity generation capacity?

To support the response above, respondents indicated that there were plans to add up to 200MW into the local generation mix by year 2017 from IPPs, and 800MW from Kudu Gas by year 2020. Solar PV and embedded or hybrid generation systems are the focus of the industry. Section 2, foreign investment potential, is analysed in the next section as possible market opportunities for Finnish companies in the industry.

7.4. Market Opportunities

At the beginning of this study, the researcher concentrated on finding investment opportunities for Finnish companies in Namibia. However, after attending the Africa Energy Forum at the Vaasa Energy Week 2016, it became apparent that finding investment opportunities was not the most effective way of going about reaching the objectives of the research. This became apparent when the speaker from the Department for Africa and Middle East in the Finnish foreign ministry stated with emphasis that there is a conflict in Finnish-Africa cooperation because Africa is looking for long-term investors while Finnish companies are looking for short-term projects. After this revelation, it was imperative that the strategy be changed from looking for investors to looking for strategic partnership. In good faith, the researcher offers below a possible approach at addressing this conflict.

7.5. Strategic Partnerships

A strategic partnership involves a form of formal agreement between two or more organisations that have agreed to share finance, skills, information, and other resources in pursuit of common goals (PWC, 2009). The partnership can be a bilateral partnership between two parties or a network between two or more parties.

In Namibia, companies are regulated by the Companies Act, Act No. 28 of 2004 (Companies Act, 2004), which is based on UK company law. There are no local equity requirements found in the Companies Act. However, local equity participation may be a sound business strategy in some industrial sectors, i.e. in energy and exploitation of natural resources. Therefore, it is recommended that Finnish companies entering Namibia do so in one of the many partnership strategies presented in the Companies Act and the Foreign Investment Act.

When asked whether or not the Namibian energy industry needs foreign investment, all respondents answered yes. The main support areas for the answer included the type of investment in the form of FDI through IPPs and financing of turnkey power projects using the build-own-operate-transfer (BOOT) model. Also in demand are technical expertise and mechanisms for boosting local technical capacity to install, run, and maintain power systems.

From the partnerships recommended to consider when entering Namibia, a joint venture (JV) is most preferred by local companies. Two important takeaways from the descriptions of the said JVs are that the share of local content be increased on a sliding scale over time, towards full ownership, and that partnership should involve local engineering consultants and utilities. In good faith, the two takeaways may very well be an approach to addressing the cooperation conflict presented above. This approach has merit because on one hand it promises that Finnish companies will not get *stuck* in Africa and on the other hand African companies will gradually gain the knowledge and expertise they require.

When asked whether local companies are willing and able to contribute financially and strategically to such partnerships, all respondents answered yes. This can be seen as a positive answer to the third and last of the research questions. Some respondents stated that local utilities and experts have the technical skills required and knowledge of the local infrastructure since they developed it. A respondent stated that *"Namibian companies are looking for JV's and would like to have long-term involvement from Finnish partner[s] in the form of training and knowledge sharing"*. Yet another respondent stated that Namibian companies are willing to contribute to the partnership but they may not be able to make meaningful financial contributions to large projects. In the same vein, 57% of respondents indicated that they were additionally interested in energy research partnerships. And, two-thirds of the respondents indicated that the industry needs service/engineering providers or equipment/component provider or both. Thus, one can conclude that the joint ventures may be based on the foreign partner providing the components required in the engineering while sharing the financial burden.

7.6. Entry Barriers

Besides referring the question to the Namibia Investment Centre, respondents did have answers when asked to name some of the barriers to entry into the Namibian energy market. One such barrier listed is the long tender procedure. This applies not only to government projects but also to private business. Given the fact that any investor wishing to construct a power plant with a capacity of over 5 MW requires to do so through a bidding process, the concern of long tender procedures is valid.

Another barrier is the legal requirement that IPPs must have a generation licence before they can be allowed to do business in Namibia. This can deter foreign investment as one requirement for eligibility of a licence is proof of an environmental assessment of a potential site. Foreign investors with limited financial resources may have reservations towards conducting environmental surveys before they have a licence. On top of that, a new law will require 25% local/ Namibian shareholding for companies of foreign origin operating in a partnership in Namibia.

7.7. Relationship between Finland and Namibia

All respondents indicated that they were aware of the long standing relationship between Finland and Namibia, which is over 140 years old. When asked whether or not the history shared between two countries plays a role in easing Finnish companies' entry into Namibia, the majority responded positively, with some pointing out some cooperation that have already taken place. However, only 28% of the respondents were aware of the Vaasa energy cluster. This figure could even be lower considering that one of the respondents was a representative of the Finnish foreign mission in Namibia. Nonetheless, all respondents showed interest in receiving more information about Energy Vaasa.

Since this research seeks cooperation between Finland, particularly Vaasa, and Namibia, it was imperative that the Energy week be brought up. On the question whether the respondents knew about the Vaasa Energy Week 2016, 57% responded positively. Although 57% may contradict the fact that only 28% knew about the Vaasa energy cluster, it can be justified that some of the respondents filled in the survey after they had received an invitation to the Energy Week which was sent by Technology Centre Merinova Oy to the Minister of Mines and Energy in Namibia. Two of the respondents indicated that their organisations would be represented at the Energy Week 2016.

One of the goals of this research is to have an event in Namibia like the Vaasa Energy Week to which all stakeholders of the Namibian energy industry, the Southern African Power Pool and Finnish energy stakeholders would be invited. Hence, the question in the figure below.

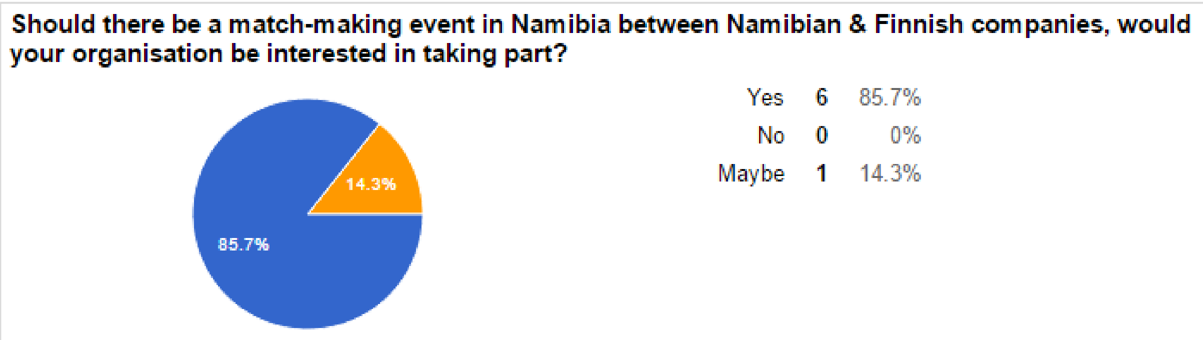

Figure 36. Response to: Should there be a match-making event in Namibia between Namibian & Finnish companies, would your organisation be interested in taking part?

A question was raised whether or not the respondents would be interested in taking part should there be an energy event in Namibia similar to the Vaasa Energy Week. All respondents showed interest in taking part. The result are shown in figure above.

8. CONCLUSION

It has become clear that the world demands more energy today and demand will continue to grow, doubling current demand in the next few decades. It has also become clear to policy makers and experts that fossil fuels are not only unsustainable but finite and depleting rapidly. With that in mind, it is now common knowledge that renewable energy and energy efficiency are the future. Not only are renewable energy sources sustainable, they are also infinite. Therefore, it is imperative that development efforts of these inexhaustible resources be given priority. However, it should be noted that switching to renewable energy alone is not the answer to current global and environmental problems caused by the exploitation of fossils fuels.

Therefore, experts maintain that the only way to ease global dependence on fossils and ease the damage caused to the ecosystem is by combing renewables and energy efficiency. Energy efficient technologies have the ability to reduce the amount of energy consumed without reducing the quality of life of people that comes with quality energy supply. There are multiple benefits of energy efficiency that, if properly measured, would prove that energy efficiency does not come in monetary terms only. It is up to policy makers to investigate these benefits and correctly measure them in order to pass them over to end users. Without energy efficiency, the world will continue to demand more energy than actually needed, with over two-thirds of the energy going to waste.

Namibia, like other Southern African countries, is facing a severe power crisis. However, Namibia’s case is special in that the country has ample renewable resources in terms of solar and biomass. In addition, coastal winds of the country are viable for scalable wind projects. However, the country’s dependence on imported power has held it back from utilising these resources. Namibia has had favourable long-term contracts with Eskom in the past, based on the excess capacity in South Africa. However, ESKOM is experiencing challenges meeting demand inside South Africa. Local reports indicate that the nominal cost of sourcing electricity has almost tripled in the last eight years.

Namibia, therefore, finds itself in a difficult position. Its security of supply is compromised and power shortage is likely to worsen in the coming years should there not be a boost in local generation capacity. Electricity prices will continue to rise and power cuts will increase. This is an unprecedented occurrence in a country that has enjoyed a reliable and stable power supply since independence. Power outages have been rare occurrences in the history of

Namibia. However, this will not remain the case unless proactive steps are taken to make Namibia self-sufficient in power supply. On a positive note, Namibian authorities acknowledge the power shortage and the impact it has on economic and social development. Therefore, government, together with the national utility and local and international financial sources are putting measures in place to mitigate the negative impact of the supply shortfall.

For Namibia to develop sustainably, it is recommended that the country firmly considers renewable energy and energy efficiency as the way to the future. It may not be Namibia’s interests to put further effort in unsustainable energy systems. It has been proven that Namibia’s lack of fossil fuel sources leaves the country at the mercy of the countries supplying it with these fuels. Current measures, including rehabilitation of old energy systems and construction of new systems to improve local generation, are welcome as a quick fix to the current energy strain. However, these measures should be implemented in such a way that makes the infrastructure renewable ready and energy efficient, in order to promote a subsequent transformation to a majority renewable energy portfolio.

In light of GRN’s commitment to providing power to its citizens and the lack of capacity in Namibia, opportunities are present for Finnish SMEs and large companies alike who possess the necessary capacity Namibians need. Capitalising on the short-term-term-critical initiatives may be a strategic decision. Taking part in these initiatives may include, but not limited to, providing products and services for the DSM programme and creating partnerships with local companies to take part in the generation initiatives. Barriers do exist in Namibia and so do risks; however, an opportunity not taken due to fear of the unknown is an opportunity missed entirely. Looking at Finland’s dwindling exports rate, the current economic downturn and the saturation of the local energy market, it is recommended that Finland considers exploring opportunities present in Namibia and Southern Africa as a whole.

A suggestion for further study is a detailed market research of Namibia and SAPP, which involves not only identifying opportunities but also adapting Finnish high-tech energy systems to the SAPP system. This study revealed that the Namibian energy infrastructure is outdated and efforts are underway to upgrade this infrastructure. This state of affairs holds true for the entire SAPP region. Therefore, an adaptation of Finnish technology to the technology state of SAPP would not only improve the status quo but help SAPP develop sustainably. In the process opening up solid business grounds and long-term friendship.

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APPENDICES

APPENDIX 1.List of distribution licences, as of January 2016

Licence No	Licensee	Location	Date of Issue	Period of issue (Years)	Due date for renewal	Status
Alf - 1/88	Erongo RED (Pty) Ltd	ERONGO RED	1-Aug-05	25	1-Aug-30	Effective/ In force
Alf - 1/76	CENORED (Pty) Ltd	CENORED	12-Jul-03	25	12-Jul-28	Effective/ In force
Alf - 1/71	NORED (Pty) Ltd	NORED	13-Mar-03	25	13-Mar-28	Effective/ In force
Alf - 1/73	Nampower	CENTRAL & SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/64	Omaheke Regional Council	CENTRAL & SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/20	Windhoek Municipality	CENTRAL RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/56	Witvlei Village Council	CENTRAL RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/111	Finkenstein Development Trust	CENTRAL RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/10	Gobabis Municipality	CENTRAL RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/62	Namibia Airports Company	CENTRAL RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/75	Aredareigas Homeowners Ass.	CENTRAL RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/40	Okahandja Municipality	CENTRAL RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/23	Ongopolo Mine (Otjihase Mine)	CENTRAL RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/03	Aranos Village Council	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/15	Aroab Electrical Group	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/52	Aroab Village Council	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/53	Berseba Village Council	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/67	Bethanie Village Council	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/85	Gibeon Village Council	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/83	Gochas Village Council	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/28	Hardap Regional Council	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/59	Kalahari Farming Two CC	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/93	Kalkrand Village Council	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/82	Kameelboom Power Supply (Pty) Ltd	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/02	Karas Regional Council	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/04	Karasburg Municipality	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/01	Keetmanshoop Municipality	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/90	Keinab Power Supply (Pty) Ltd	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/84	Khomas Power (Pty) Ltd	SOUTHERN RED	1-Jul-13	1	1-Jul-14	Cancelled
Alf - 1/94	Klein Karas	SOUTHERN	1-Jul-14	1	1-Jul-15	Renewed

	Power CC	RED				
Alf - 1/96	Kokerboom Power Supply (Pty) Ltd	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/60	Leonardville Village Council	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/43	Luderitz Town Council	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/87	Maltahohe Village Council	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/16	Mariental Municipality	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/29	Namdeb Diamond Corporation	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/92	Nature Investments (Pty) Ltd	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/91	Naukluft Electricity Investments (Pty) Ltd	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/09	Rehoboth Town Council	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed.
Alf - 1/66	Roshskor Township (Pty) Ltd	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/78	S & S Kragvoorsiening	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/72	Salt Block Power CC	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/79	Swartrand Power Supplies CC	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/89	Swartwater Power Supplies (Pty) Ltd	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/57	Tses Village Council	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf - 1/80	Vergelee Power Supply (Pty) Ltd	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed
Alf – 1/122	Hakiesdoorn Estate (Pty) Ltd	SOUTHERN RED	1-Jul-14	1	1-Jul-15	Renewed

APPENDIX 2. List of IPP licences, as of January 2016

Licence No	Licensee	Location	Capacity (MW)	Technology	Date of Issue	Duration	Status
Alf - 1/98	Diaz Wind Power (Pty) Ltd	Spergebiet National park	44	Wind	1-Apr-07	2 2	Effective/In force NP uptake
Alf-1/102	GreenNam Electricity	Keetmanshoop	10	Solar PV	1-Jun-11	25	Effective/In force NP uptake
Alf-1/113	GreenNam Electricity	Mariental	10	Solar PV	1-Jul-11	25	Effective/In force NP uptake
Alf-1/114	GreenNam Electricity	Rehoboth	10	Solar PV	1-Jul-11	25	Effective/In force NP uptake
Alf - 1/115	Arandis Power (Pty) Ltd	Arandis/Diesel	120	HFO	1-Nov-11	30	Effective/In force NP uptake
Alf - 1/134	Xaris Energy	Walvis Bay	200	Gas/OCGT	1-Apr-14	25	Effective/In force NP uptake
Alf-1/152	Hopsol	Grootfontein (Otjozondjupa)	5	Solar PV	1-Mar-15	25	Effective/In force Cenored uptake
Alf - 1/116	Namibia Solar World	Farm Quinta/Solar	5	Solar PV	1-May-12	25	REFIT
Alf - 1/117	NamEnergy Solar (Pty) Ltd	Arandis/Solar	5	Solar PV	1-May-12	25	REFIT
Alf - 1/119	Momentous Energy (Pty) Ltd	Keetmanshoop	5	Solar PV	1-May-12	25	REFIT
Alf – 1/121	Uprise Investment (Pty) Ltd	Keetmanshoop	5	Solar PV	1-May-12	25	REFIT
Alf – 1/123	Ark Industries Namibia (Pty) Ltd	Rehoboth	16	Biogas	1-Jan-13	30	REFIT
Alf – 1/125	OKA Investment	Ondangwa	20	Solar PV	1-Aug-13	25	REFIT
Alf – 1/126	Erongo Diagram Investment	Arandis	5	Solar PV	1-Aug-13	25	REFIT
Alf – 1/127	Africa Energy Corporation	Walvis Bay	5	Solar PV	1-Aug-13	25	REFIT
Alf-1/128	Camelthorn Business Venture no2	Outapi	4.9	Solar PV	1-Jul-14	25	REFIT
Alf – 1/129	Paramount Infrastructure Development	Khorixas	22	CSP	1-Sep-13	25	REFIT
Alf – 1/130	Osona Sun Energy (Pty) Ltd	Osona	4.5	Solar PV	1-Nov-13	25	REFIT
Alf – 1/131	Omburu Sun Energy (Pty) Ltd	Omburu	4.5	Solar PV	1-Nov-13	25	REFIT
Alf - 1/135	AFRES	Okakarara	0.680	Solar PV	1-Apr-14	25	REFIT
Alf-1/133	Phatsimo Solar Power	Otjiwarongo	5	Solar PV	1-Jan-15	25	REFIT
Alf - 1/132	Sertum Energy	Trekkopje	27	Solar PV	1-Apr-14	25	REFIT
Alf-1/138	Aloe Investment No 27	Rosh Pinah	4.9	Solar PV	1-Oct-14	25	REFIT
Alf-1/140	Alten Holdings Namibia	Tsumeb	4.98	Solar PV	1-Jan-15	25	REFIT
Alf-1/141	Alten Holdings Namibia	Gerus	4.98	Solar PV	1-Jan-15	25	REFIT
Alf-1/137	Sunchem Alpha Investment	Farm Cleveland (Otjiwarongo)	5	Solar PV	1-Mar-15	25	REFIT
Alf-1/148	Benzel and Partners Investment	Tsumeb	5	Solar PV	1-Mar-15	25	REFIT
Alf-1/153	Hopsol	Otjiwarongo	5	Solar PV	1-Mar-15	25	REFIT
Alf - 1/104	Namibia International Mining Company (Pty) Ltd	Walvis Bay	210	Oil CCGT	1-Jun-07	20	Licence lapsed
Alf - 1/99	Vizion Energy Resources (Pty) Ltd	Walvis Bay	300	Coal	1-Apr-08	25	Licence lapsed
Alf - 1/103	VTB Capital Namibia (Pty) Ltd	Aussenkehr	30	Hydro	15-Jul-07	20	Licence lapsed
Alf - 1/108	Eletrawind	Walvis Bay	50	Wind	1-Nov-09	20	Licence lapsed
Alf - 1/110	Innowind	Walvis Bay	60	Wind	1-Mar-10	20	Licence lapsed
Alf - 1/111	CBEND	Farm Pierre (Outjo)	0.250	Biomass	1-May-10	5	Licence lapsed
Alf - 1/118	EcoNam Energy (Pty) Ltd	Rehoboth	10	Solar PV	1-May-12	25	Licence lapsed
Alf - 1/120	Evofield Energy Holdings (Pty) Ltd	Farm Safier (Karibib)	10	Solar PV	1-Oct-12	25	Licence lapsed
Alf - 1/105	Atlantic Coast Energy Company (Pty) Ltd	Walvis Bay	700	Coal	1-Nov-07	25	Licence lapsed

APPENDIX 3. List of renewable energy licenses under REFIT, as of January 2016

INTERIM REFIT PROGRAMME (5MW) IPPS

	Licensee	Address	Location	Technology (Type)
1	Benzel and Partners Investment (Pty) Ltd	Mr. Benzel Zaaruka Chief Operational Director Benzel & Partners Investment (Pty) Ltd P. O. Box 678 Windhoek Tel: 061-263301 Fax: +264 88 617 748 Email: benzelpi@gmail.com	Gobabis	Solar PV
2	OKA Investment (Pty) Ltd	Mr. Werner Shilunga Director OKA Investment (Pty) Ltd P. O. Box 7536 Windhoek Tel/Fax: 061-305450 Email: kandilithawe@gmail.com	Gobabis	Solar PV
3	Camelthorn Business Venture No Two (Pty) Ltd	Mr. Luca Coltro Director P. O. Box 30 Klein Windhoek Tel: 382 800 Fax: 233555 Email: lmcoltro@gmail.com	Outapi	Solar PV
4	Momentous Solar One (Pty) Ltd	Mr. Piers L'Estrange Director P.O. Box 22501 Windhoek Tel +264 61 239 355 Fax +264 61 239 357 Email: piers@momentousenergy.com	Keetmanshoop	Solar PV
5	HOPSOL Power Generation (Pty) Ltd	Dr. R. Hopperdietzel P. O. Box 9150 Windhoek Tel: 061-255947 Fax: 061 255 948 Robert.hopperdietzel@hopsol.com	Grootfontein	Solar PV

6	Sertum Energy (Pty) Ltd	Mr. Elton Katangolo The Project Director Sertum Energy (Pty) Ltd P. O. Box 98170 Windhoek Email: Elton.k@sertumenergy.com	Trekkopje	Solar PV
7	Aloe Investment No. 27 (Pty) Ltd	Mr. Pandu Shaetonhodi Managing Director Aloe Investments Twenty Seven Namibia Email: pandus213@gmail.com>	Rosh Pinah	Solar PV
8	ALCON Consulting Services (Pty) Ltd	Mr. Tironenn Kauluma Chief Executive Officer ALCON (Pty) Ltd P.O Box 99202 Windhoek Fax: 061-221816 Email: tironen@yahoo.com	Aussenkehr	Solar PV
9	UNISUN Energy (Pty) Ltd	Mrs. Katrina Davids Executive Director Unisun Energy P. O. Box 3885 Windhoek Cell: 0811440044 Email: unisunenrgy@gmail.com	Okatope	Solar PV
10	Tandii Investment (Pty) Ltd	Mrs. Maria Nuukulu The Director Tandii Investment P. O. Box 819 Windhoek Tel: 0855510138 Contact person: Mrs. Nuukulu Email: nuukulum@yahoo.com	Okatope	Solar PV
11	NCF Energy (Pty) Ltd	Mrs. Maria Nuukulu The Director NCF Energy (Pty) Ltd P. O. Box 819 Windhoek Tel: 0855510138 Contact person: Mrs. Nuukulu Email: nuukulum@yahoo.com	Okatope	Solar PV

12	Ombepo Energy (Pty) Ltd	Mr. Gregoire Verhaeghe The Chief Executive Officer InnoSun Energy Holdings P.O. Box 86524 Windhoek NAMIBIA Email: ttorne@innosun.org	Luderitz	Wind
13	Osona Sun Energy (Pty) Ltd	P.O. Box 50520 Windhoek Tel +264 61 307 505 Fax +264 61 307 504 Cell: 0851277675 (Nam) Email: Usuta@innovent.fr Contact person: Usuta Imbili	Osona	Solar PV
14	Metdecci Energy Investment (Pty) Ltd	Mr. Barnabas Uugwanga The Managing Member Vigor Investments P O Box 20907 Windhoek Contact person: Mr. Uugwanga Email: barnabas@lithon.com	Karibib	Solar PV

APPENDIX 4. Special incentives for manufacturers, exporters and epz enterprises

NAMIBIA SPECIAL INCENTIVES FOR MANUFACTURERS, EXPORTERS AND EPZ ENTERPRISES

	Registered Manufacturers	Exporters of Manufactured Goods	Export Processing
Eligibility and Registration	Enterprises engaged in manufacturing.	Enterprises that export manufactured goods whether produced in Namibia or not.	Enterprises engaged in manufacturing, assembly, packaging or break-bulk and exporting mainly to outside of SACU markets.
	Application to the Ministry of Trade and Industry and approval by the Ministry of Finance.	Application and approval by the Ministry of Finance.	Application to the EPZ Committee through the ODC or EPZMC.
Corporate Tax	Set at a rate of 18% for a period of 10 years, where after it will revert to the general prevailing rate.	80% allowance on income derived from exporting manufactured goods.	Exempt
VAT	Exemption on purchase and import of manufacturing machinery and equipment.	Normal treatment	Exempt
Stamp and Transfer Duty	Normal Treatment	Normal treatment	Exempt
Establishment Tax Package	Negotiable rates and terms by special tax package.	Not eligible	Not eligible
Special Building Allowance	Factory buildings written off at 20% in first year and balance at 8% for 10 years	Not eligible	Not eligible
Transportation Allowance	Allowance for land-based transportation by road or rail of 25% deduction from total cost.	Not eligible	Not eligible
Export Promotion Allowance	Additional deduction from taxable income of 25%	Not eligible	Not eligible
Incentive for training	Additional deduction from taxable income of between 25% and 75%	Not eligible	Substantial, issued by Government on implementation of approved training programme.
Industrial Studies	Available at 50% of cost	Not eligible	Not eligible
Cash Grants	50% of direct cost of approved export promotion activities.	Not eligible	Not eligible