



GOVERNMENT OF THE REPUBLIC OF BOTSWANA

NATIONAL ENERGY POLICY

**MINISTRY OF MINERAL RESOURCES, GREEN TECHNOLOGY AND
ENERGY SECURITY**

APRIL 2021

Foreword

This National Energy Policy (NEP) is intended to guide the management and development of Botswana's energy sector, especially the penetration of new and renewable energy sources into the country's energy mix in order to attain energy self-sufficiency and increased security of supply. The NEP is expected to create a conducive environment that will not only facilitate investment in the energy sector but also add value to export revenues, facilitate production in other sectors of the economy and create employment within the energy sector. It also sets a foundation that will steer the utilization of locally available energy resources optimally and efficiently to ensure that Botswana attains a sustainable and low carbon economic development.

Botswana has experienced some constraints in the energy sector in recent years, which to some extent have negatively impacted on the country's economic development prospects. A devastating power supply and demand mismatch was encountered between the years 2008 and 2014, and this breached the country's power supply security. This encounter, and other such misfortunes have motivated this Policy to outline the principles, prospects and choices that are required to optimise the role of energy in the economy and maximise Botswana's potential for the desired economic growth in line with the country's Vision 2036. The NEP contributes towards achievement of national prosperity and economic diversification. It envisages Botswana's transition from being a net energy importer to being self-sufficient and having surplus energy for export into the region.

Botswana has got strong relations with her neighbours in the SADC region and has been involved in a number of regional energy-related initiatives to promote regional integration. This Policy recognises the need for the country to continue seeking regional synergies, which will enable it to pursue sovereign development objectives. The Policy also advocates for the need to harmonise Botswana's key policies in order to promote competitiveness, increase access to regional and global markets and to enable socio-economic development for all Batswana.

Effective implementation of this Policy requires a legislation and/or regulations for robust development of the new and renewable energy subsector, a powerful communication strategy to manage public anxiety and expectations and a prominent institutional framework that will drive the sector development. Therefore, a strategic plan and a policy monitoring framework will be designed in this regard to aid continued work and consultations with key stakeholders throughout the policy implementation process.



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Table of Contents

Foreword	i
List of Tables	iii
List of Figures	iii
Abbreviations & Acronyms	iv
Glossary of Terms	vi
Executive Summary	viii
1.0 INTRODUCTION	1
2.0 POLICY FOUNDATION	1
2.1 The Rationale	1
2.2 The Formulation Process	2
3.0 AN OVERVIEW OF THE ENERGY SECTOR	3
3.1 Organisational Setup and Regulatory Framework	3
3.2 Electricity Subsector	4
3.3 The Petroleum Subsector	6
3.4 Key Local Energy Resources	7
3.4.1 Coal and coal bed methane	7
3.4.2 Solar and wind energy potential	7
3.4.3 Biomass and waste energy potential	8
3.5 Energy Conservation and Demand Side Management	9
3.6 The Global Context	10
3.6.1 Energy and environment	10
3.6.2 Energy and gender	10
4.0 THE FRAMEWORK OF THE NATIONAL ENERGY POLICY	11
4.1 Policy Guiding Principles	12
4.1.1 Economic development	12
4.1.2 Equity	12
4.1.3 Environmental Responsibility	12
4.2 The Policy Direction	13
4.2.1 The vision and overall policy goal	13
4.2.2 Policy objectives	13
4.3 Policy Issues and Related Policy Statements	14
4.3.1 Electricity subsector	14
4.3.2 Petroleum subsector	15
4.3.3 Coal and coal bed methane	16
4.3.4 Renewable energy	17

4.3.5	Biomass and waste energy.....	17
4.3.6	Energy efficiency and demand side management	18
4.3.7	Energy and environment.....	19
4.3.8	Energy and gender	19
4.3.9	Energy research and development	20
4.3.10	Information management and planning.....	20
4.3.11	International cooperation.....	21
4.3.12	Monitoring and evaluation	21
5.0	POLICY STATEMENTS AND RELATED HIGH LEVEL IMPLEMENTATION STRATEGIES.....	22
6.0	IMPLEMENTATION OF THE NEP.....	30
6.1	Actors involved in policy implementation	30
6.2	Capacity development for transition.....	31
6.3	Investment in the energy sector development.....	31
6.4	Convergence with other government policies	31
6.5	Communication and awareness raising	31

List of Tables

Table 1:	Regulatory instruments governing the energy sector	4
Table 2:	The NEP policy statements, objectives and high level strategies for 2020 - 2040 ..	22

List of Figures

Figure 1:	An overview of the NEP development process	2
Figure 2:	Actual and projected domestic electricity generation and imports for 2010 – 2040..	5
Figure 3:	Liquid fuels consumption for 2010 – 2019 period.....	6
Figure 4:	Cumulative effect of efficiency improvements in Botswana. Source: Danish Energy Management (2018)	9
Figure 5:	The Botswana energy sector actor arrangement.	30

Abbreviations & Acronyms

BEMP	Botswana Energy Master Plan
BERA	Botswana Energy Regulatory Authority
BOBS	Botswana Bureau of Standards
BOL	Botswana Oil Limited
BIH	Botswana Innovation Hub
BITRI	Botswana Institute of Technology Research and Innovation
BIUST	Botswana International University of Science and Technology
BPC	Botswana Power Corporation
BUAN	Botswana University of Agriculture and Natural Resources
CBM	Coal Bed Methane
CFL	Compact Fluorescent Lamp
CTL	Coal to Liquids
DOE	Department of Energy
GEF	Global Environment Facility
GHG	Greenhouse gas
IEP	Integrated Energy Planning
IRENA	International Renewable Energy Agency
JICA	Japan International Cooperation Agency
LPG	Liquefied Petroleum Gas
MCM	Morupule Coal Mine
MDG	Millennium Development Goals
MJ	Mega joules
Mtpa	Metric tonnes per annum
MJ/m ²	Mega joules per square metre
MMEWR	Ministry of Minerals, Energy and Water Resources
MMGE	Ministry of Minerals Resources, Green Technology and Energy Security
MSW	Municipal Solid Waste
MW	Megawatt

MWh	Megawatt hour
MOCs	Multinational Oil Companies
NDC	Nationally Determined Contributions
NDP	National Development Plan
NEES	National Energy Efficiency Strategy
NEP	National Energy Policy
NESC	National Electricity Standard Connection
NGO	Non-Governmental Organisations
NRSE	New and Renewable Sources of Energy
OECD	Organisation for Economic Co-operation and Development
PV	Photovoltaic
RSEB	Renewable Energy Strategy of Botswana
SACU	Southern African Customs Union
SADC	Southern African Development Community
SAPP	Southern African Power Pool
SDGs	Sustainable Development Goals
SWH	Solar Water Heater
UNDP	United Nations Development Programme

Glossary of Terms

A number of terms are used in this document and their meaning, as they appear in this document, is as defined below;

Affordable	A measure of the cost relative to the amount that the purchaser is able to pay and the consumer's capacity to afford the commodity.
Energy access	Access to electricity in the context of this document is determined by; $\frac{(\text{number of households connected}) \times (\text{average number of heads per household})}{\text{National population}}$
Bio-energy	Final energy carrier produced from biomass or any other organic material, waste or otherwise.
Clean energy	Energy source that causes minimal or no pollution to the environment when consumed.
Cooperative	A cooperative is an autonomous association of persons who voluntarily cooperate for their mutual social, economic, and cultural benefit. Cooperatives include non-profit community organizations and businesses that are owned and managed by the people who use its services and/or by the people who work there.
Economies of scale	The increase in efficiency of production as the number of goods being produced increases. Typically, a company that achieves economies of scale lowers the average cost per unit through increased production since fixed costs are shared over an increased number of goods.
Energy security	A condition in which the economy has access to sufficient energy resources for the foreseeable future at an acceptable risk level.
Energy policy	A set of policy decisions and actions adopted by the Government and the legislators, to lead the development of the energy sector in the country over the upcoming decade. The policy can be amended as implementation progresses to adapt to the international and environmental conditions and requirements. After its adoption, the energy policy is to be delineated into legal dispositions, investments (infrastructures, production, transport, distribution, governance and economic measures) and projects to achieve its set goals.
Energy carrier	A substance (energy form) or sometimes a phenomenon (energy system) that contains energy that can be later converted

	to other forms such as mechanical work or heat or to operate chemical or physical processes.
Gas	Refers to all gaseous fuels excluding liquefied petroleum gas (LPG)
Integrated energy planning	Integrated energy planning involves estimating how much energy all the different sectors (for example industry or households) will need in the future to deliver certain services; and then identifying a mix of appropriate sources and forms of energy to meet these energy service needs in the most efficient, socially beneficial and sustainable manner.
Price taker	Acceptor of market prices as a result of the inability to influence them.
Reserve margin	Available capacity over and above capacity needed to meet normal peak demand levels.
Self-sufficiency	To be able to maintain oneself or itself without outside aid hence minimising imports by increasing the use of indigenous energy resources.
Sustainable	Long-term maintenance of responsibility which has environmental, economic and social dimensions and encompasses the responsible management of resource use.

Executive Summary

A. Introduction

Since 1985, Botswana's energy sector developments have been guided by the Botswana Energy Master Plan (BEMP), which was last reviewed in 2002. Since this last review, developments have progressed without any primary guiding instrument for almost 15 years now. This National Energy Policy (NEP) therefore, outlines the government's intents for an effectively harmonized development and management of the energy sector post the BEMP period.

It is founded on three guiding principles being economic development, equity and environmental protection, with a view to contribute towards achievement of *National Prosperity, Sustainable Economic Development and Sustainable Environment* in line with the country goals outlined in the Botswana Vision 2036 and the eleventh national development plan (NDP 11). These two documents are the country's core high level planning instruments for the period 2017-2023 and 2017-2036 respectively.

The custodian of the NEP is the Ministry of Mineral Resources, Green Technology and Energy Security and its implementation is spearheaded by the state-owned utilities; Botswana Power Corporation (BPC) for electricity and Botswana Oil Limited (BOL) for liquid petroleum fuels. Regulation matters are handled by the Botswana Energy Regulatory Authority (BERA). Other actors involved in the sector include private sector, academia and research institutes, non-governmental organisations and communities.

B. Situational Analysis

Electricity Subsector

For a long time, Botswana used to import almost 80% of her electricity from neighbouring countries, mainly from the Republic of South Africa. Currently, the country's installed generation capacity stands at 732MW (600MW from Morupule B and 132MW from Morupule A) against a peak demand of 600MW. An additional capacity of 160MW also exists two diesel-generated peaking plants. Both Morupule A and Morupule B power plants have not operated at full capacity since 2018 due to varying challenges hence local generation still does not meet the local demand.

Coal is the main source of electricity generation in the country, followed by diesel. However, Botswana has ample renewable energy potential to augment generation from coal. Currently, solar energy contributes insignificantly to electricity generation despite the abundance of the resource. There is also wind and coal bed methane potential which have not been fully explored.

The NEP acknowledges that Botswana is capable of being self-sufficient in electric power supply by utilizing the locally available energy resources optimally.

Petroleum Fuels

Botswana is highly reliant on imports of refined petroleum products to meet the liquid fuels demand since the country does not have any proven crude oil reserves/refineries. By far, a large amount of liquid fuels supply comes from South Africa. As at 2018, the local consumption of petroleum products stood at about 1.2 billion litres per annum for petrol, diesel and illuminating paraffin combined, and about 20 million litres of aviation fuels per annum.

The strategic storage capacity for liquid fuels stands at approximately 18 days of national consumption against the international standard strategic storage capacity of 90 days. Commercial buffer stock stands at less than 5 days of national consumption against the standard of 14 days' cover. The adopted modes of transporting petroleum products are rail and road which are not economic for the country. The industry is dominated by multinational oil companies and the prices for petrol, diesel and illuminating paraffin are controlled by the Botswana Energy Regulatory Authority (BERA).

This Policy acknowledges the importance of increasing security of supply of petroleum products, facilitating the participation of local companies and ensuring that petroleum products are priced in a manner that will satisfy the players in the industry.

Energy Resource Availability

Botswana has abundant coal resources, estimated at about 212 billion tonnes. Estimates of 196 trillion cubic feet of coal bed methane (CBM) have also been recorded and there is ongoing exploration of this resource. Most of the coal extracted goes to power generation at Morupule power plant and the remaining small percentage is shared between local industrial use and export. For CBM, commercially viable gas exploration is required to firm up resource quantification and associated development programs around this resource.

Botswana receives over 3,200 hours of sunshine per year, with an average insolation on a flat surface of 21MJ/m². Satellite images have revealed that Botswana has abundant countrywide irradiation presenting the highest values of direct normal irradiance (DNI) and global horizontal irradiance (GHI) the western and south-western regions, with a slight decrease towards the east. The lowest values of irradiation are in a range of about 2,000 kWh/m²/annum (~5,5 kWh/m²/day) DNI and GHI on average. This amount of insolation is among the highest in the world, making solar energy a promising renewable energy resource for Botswana.

Reasonable wind speeds exist within the country with the highest wind resources potential located in the South-West, Central and Eastern parts of the country, with averaging wind speeds above 7m/s, wind power density above 200W/m² and annual energy production above 4.5 GWh/year. The wind potential has not been fully explored and has primarily been used on windmills for water pumping by farmers.

Botswana has theoretical biomass energy potential of 32 million GJ per year, estimated from a considerable biomass potential of 20 million tonnes per year. The use of livestock residues (cow-dung) seems to offer the highest practical opportunity for energy production

in Botswana, while municipal solid waste (MSW) can also contribute to the improvement of energy generation, especially at the city level. Other residues such as crop and agro-industrial residues, only offer a limited energy potential that could be tapped by rural communities. A feasibility study for production and use of biofuels in Botswana has revealed the potential for liquid bio-fuels production; mainly biodiesel from *Jatropha curcas* and ethanol from sweet reed.

Effective energy efficiency and conservation measures can save Botswana a significant amount of energy, especially from the demand side management point. This can offset carbon emissions from the country's coal dominated power generation.

The NEP seeks to promote and facilitate optimal usage of available energy resources to increase access to modern energy services to power economic growth and improve the livelihoods of Botswana

Energy and the environment

Botswana is a party to the United Nations Framework Convention on Climate Change (UNFCCC). Having adopted the Paris Agreement, in 2015 the government has made a voluntary commitment through its first Nationally Determined Contribution (NDC) to reduce the country's total greenhouse gas (GHG) emissions by 15% by the year 2030, with reference to 2010 emissions. Furthermore, the country is working towards providing affordable and clean energy to its general population in order to align with UN 2030 Agenda for Sustainable Development Goals, especially SDG7.

The policy acknowledges that Botswana is bound to formulate and implement policies that protect the environment and improves human livelihoods

Energy and gender

In Botswana it is estimated that 55% of households are headed by women. Botswana women play a predominant role in the informal sector, mostly in subsistence agriculture. This sector is unstable and limits their chances of economic empowerment hence most female-headed households are poor because they do not have access to or control over productive resources.

The government is thus focusing on mainstreaming gender into its operations in order to realize gender equality and empowerment of women.

This NEP recognises the different energy needs of men and women and calls for the inclusion and consideration of these gender differences into energy strategies and programmes during formulation and implementation

Energy research and development

Like it is in most countries, energy is the most contributing sector to Botswana's greenhouse gas (GHG) emissions. Studies conducted by the Organisation for Economic Co-operation and Development (OECD) and the International Renewable Energy Agency (IRENA) have demonstrated that the most effective way to reduce atmospheric emissions requires a transition from reliance on conventional fuels to increasing the use of renewable energies and improving energy efficiency of energy systems. A number of solutions are being explored in this regard.

Since energy transition does not take the same form in each country, each individual country ought to develop its own unique transition pathway because country situations vary. The energy transition process involves fundamental changes in the existing structures, cultures and practices of a societal systems. Since the energy sector depends highly on new technologies, it is important to accumulate knowledge that can be converted into technological progress and innovation in order to effectively transform Botswana's energy system.

This Policy recognises that innovation and R&D plays a critical role in shaping energy transition pathways and supports energy research and development

Energy planning and data management

Energy planning entails the process of developing long-range policies to help guide the future of the energy system. For Botswana, this process is conducted within government although to some extent the state-owned entities like BPC can also carry out this kind of planning. Ideally, planning ought to be carried out with input from different stakeholders drawn from government agencies, private sector or industry, academia, and other major actors in the energy sector.

Botswana has adopted the integrated energy resource planning (IEP) approach, which considers both the provision of energy supplies in order to attain energy self-sufficiency. Considering that energy planning should always reflect the outcomes of population growth and economic development, it is critical to have sufficient data in hand to carry out relevant planning.

The NEP acknowledges that there is inadequate energy planning in the country and seeks to support development of an energy data management system that is required to facilitate the desired integrated energy planning

C. The Policy Direction

The ***Vision*** of this Policy is to create an energy system that would ensure secure and reliable supply of modern energy services for all the sectors of the economy and to significantly reduce energy-related atmospheric emissions by the year 2040. The overall ***Goal*** of the NEP is to provide energy security for the country and to improve access to reliable and adequate supply of energy in order to facilitate a sustainable and low carbon economic development.

This NEP acknowledges that any future developments in the energy sector of Botswana will be shaped by the realities of the *past development performances* of the sector, the *availability of energy resources* and the *global context* within which the government operates. On this note, **20 Policy Statements** have been crafted in this regard. Specific objectives have been deduced for each Policy Statement to guide enactment, and the objectives are further broken down into high level implementation strategies. Table ES1 presents the NEP policy statements.

Table ES1: The policy statements for Botswana’s national energy policy

Subsector	Policy Statement
<p>① Electricity</p>	<p>P1 Electricity will be generated optimally from locally available energy resources to meet local demand and to ensure self-sufficiency</p> <p>P2 Transmission and distribution infrastructure will be enhanced to facilitate economic growth and universal access to electricity</p> <p>P3 Electricity tariffs will be cost-reflective in order to balance the interests of the investors, consumers and the environment</p>
<p>② Petroleum Fuels</p>	<p>P4 Petroleum products will be sourced and stored in a reliable and sustainable manner to ensure security of supply</p> <p>P5 Prices for petroleum products will be set in a manner that will balance the interests of suppliers, retailers and consumers</p> <p>P6 Citizen participation in the petroleum subsector will be facilitated to ensure economic countrywide supply of fuels</p> <p>P7 Adequate primary transport and secondary distribution infrastructure will be provided to increase access to petroleum fuels</p>
<p>③ Coal and Coal Bed Methane</p>	<p>P8 Measures will be put in place to exploit the vast coal resources using clean coal technologies in order to derive maximum benefit for sustainable economic diversification</p> <p>P9 An enabling environment will be created in order to facilitate investments and to fast-track developments in the gas sector</p>
<p>④ Solar & Wind Energy</p>	<p>P10 The government will support and facilitate the development of on-grid and off-grid solar in order to increase the contribution of solar energy in the energy supply mix</p> <p>P11 The government will explore the potential for wind and facilitate wind power development</p>
<p>⑤ Biomass & Biofuels</p>	<p>P12 The Government will ensure sustainable and efficient use of wood fuel to reduce resource and to protect the environment</p> <p>P13 Initiatives related to production and use of energy derived from biodegradable materials to offset the country’s carbon footprint</p>

⑥ Energy Efficiency and Demand Side Management	P14 Energy efficiency and conservation initiatives will be supported with a view to minimize energy wastage and to offset emissions from conventional power generation
⑦ Energy & the environment	P15 Energy extraction, production, transport and use will be done with minimal negative impacts on human health and on the environment
⑧ Energy gender	P16 Gender mainstreaming in the energy sector will be promoted to ensure alignment of gender concerns with appropriate health, safety and environmental standards
⑨ Energy Research and Development	P17 Research and development will be intensified to guide effective harnessing of the country's indigenous energy resources and efficient production and use of energy
⑩ Information Management & Planning	P18 An effective integrated energy planning will be ensured in order to achieve optimal use of locally available resources to drive sustainable economic growth and low carbon development
⑪ International Cooperation	P19 The NEP will promote regional energy trade and international cooperation in the energy sector
⑫ Monitoring & Evaluation	P20 There will be continual monitoring, regular review and evaluation of the impact of various policy positions and provisions to ensure that these remain relevant

1.0 INTRODUCTION

Botswana's energy sector developments have, since 1985, been guided by the Botswana Energy Master Plan (BEMP). The BEMP was subsequently reviewed in 1996 and 2002, and ever since the end period of the last review, Botswana's sector development has progressed without any overarching guiding instrument for more than 15 years.

To date a lot has transpired in the energy sector coupled with critical challenges centred mainly on the need to; increase access to modern energy services, provide affordable energy services, increase energy security, and deliver energy products and services in a manner that would not harm the environment. As such, a national energy policy is required to ensure that Botswana effectively addresses these challenges.

This is the National Energy Policy (NEP) of Botswana. It is outlined as follows: Section 2 presents the Policy foundation; Section 3 gives an overview of Botswana's energy sector. Section 4 outlines the policy framework which presents the policy guiding principles, the policy vision, goal and objectives as well as underlying policy issues and their related policy statements. Section 5 summarises the policy direction as it outlines the policy objectives and the related high level strategies that will facilitate the government to realize these objectives.

2.0 POLICY FOUNDATION

2.1 The Rationale

The National Energy Policy (NEP) outlines the government's intents for an effective development and management of the energy sector going forward. It gives a framework for the principles, prospects and choices that are required to optimise the role of energy and maximise Botswana's potential for a sustainable economic development. The NEP contributes towards achievement of national prosperity and economic diversification in line with the goals outlined in the Botswana Vision 2036 and the eleventh National Development Plan (NDP 11).

Aligned to the pillars of Vision 2036, the NEP seeks to contribute towards **Sustainable Economic Development** and **Sustainable Environment** by ensuring optimal usage of locally available energy resources. This will be realised through the extraction and beneficiation of available energy resources, distribution and transmission thereof and the sustainable utilization of the available energy. Further, in order to facilitate transformation from an upper middle-income country to a high-income country by 2036 as stipulated in the Vision, the NEP builds a foundation for an energy sector that is relevant and competitive at national, regional and global levels by exploiting new opportunities that are provided by globalization.

As the first medium term plan towards the implementation of Botswana’s Vision 2036, the NDP 11 (2017-2023) is built on the theme ‘*inclusive growth for the realisation of sustainable employment creation and poverty eradication*’ to be realised through six national priorities. This theme was informed by the development challenges faced by the country during implementation of NDP 10 hence calling for strategies to promote growth and create employment opportunities in the economy. Amongst the six national priorities outlined in NDP 11, those that are directly linked to energy sector development are; **economic diversification, social development and sustainable use of natural resources**. With regards to this, the NEP presents opportunities to diversify the economy by promoting business in the energy sector, increasing national access to modern energy services and ensuring that energy resources are exploited in a sustainable manner.

2.2 The Formulation Process

When the BEMP period came to an end, the then Ministry of Minerals, Energy and Water Resources (MMEWR) tasked the Department of Energy (DOE), which is the organ responsible for coordinating developments in the energy sector of Botswana, to oversee and steer the process of developing the country’s energy policy. The DoE drafted the Terms of References for the policy and appointed a consultancy team to assist with the stakeholder engagement process and development of the policy. The output of the consultancy was a zero draft National Energy Policy, which highlighted the main policy challenges that needed to be addressed in the to-be developed energy policy. Figure 1 shows the process of the NEP development.

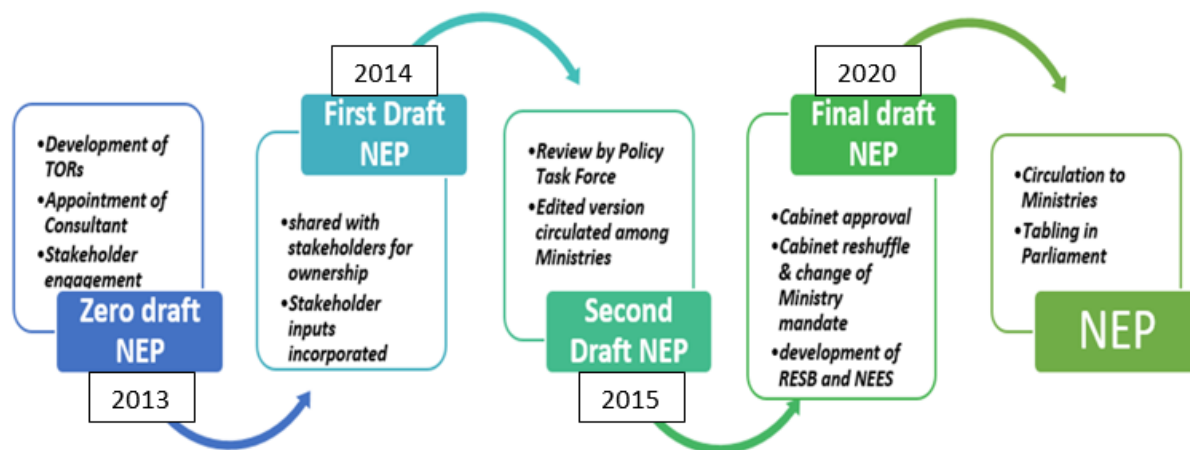


Figure 1: An overview of the NEP development process

The zero draft NEP was shared with key energy stakeholders including government ministries, the private sector, non-governmental organisations, and the research and academic institutions for their approval and ownership. Incorporating of their comments gave rise to the first draft NEP. One key element that was highlighted in the

first draft NEP was to establish a national oil company hence in 2013 Botswana Oil Limited (BOL) was established. This came prior to tabling of the First Draft before the National Parliament. This therefore, called for another review to take into account new developments that had taken place, including formation of BOL. This review was done by a Policy task Force that was appointed by the Permanent Secretary of MMEWR. The Task Force constituted representatives from Botswana Institute for Development Policy Analysis (BIDPA), BOL, Botswana Power Corporation (BPC), Department of Water Affairs (DWA), Department of Meteorological Services-Climate Change Unit, Attorney General's Chambers (AGC), and was led by the DOE. The resulting document, the second draft NEP was then approved by Cabinet in August 2015. This second draft NEP was then tabled in the National Parliament sitting of November 2016 but was not debated as Parliament had to address other pressing matters at the time. It was deferred for resubmission at a later date.

In 2018, whilst awaiting to take the draft to Parliament again, the Ministry facilitated the development of two subsector strategies towards acceleration of green technology development and low carbon energy development. The Renewable Energy Strategy of Botswana (RESB) and the National Energy Efficiency Strategy (NEES) were developed in 2019. The outcomes of these strategies as well as the changes that took place in the sector motivated a further review of the draft to prepare the final draft NEP version for tabling before the National Parliament in July 2020.

3.0 AN OVERVIEW OF THE ENERGY SECTOR

3.1 Organisational Setup and Regulatory Framework

The Ministry of Mineral Resources Green Technology and Energy Security (MMGE) through the DOE, as the government organ responsible for directing and coordinating overall developments in the energy sector, is the NEP custodian. The DOE is the lead policy-making authority of Government on all energy supply and demand matters. The Department is responsible for, among other things;

- i. Development of policies, strategies and plans that ensure national energy security
- ii. Rural electrification planning, funding and implementation
- iii. Defining procurement and off-take of responsibilities for new generation
- iv. Setup and administration of various energy funds
- v. Import control of petroleum products

The DOE is reinforced by state-owned entities in implementing its mandate, mainly through government-supported projects and programs. Botswana Power Corporation (BPC) is the country's state-owned power utility, which is mandated to generate, transmit and distribute electric power. Currently, BPC owns and operates the country's

major power stations, Morupule A and B coal-fired plants, as well as the transmission grid. The Electricity Supply Act (ESA) was amended in 2016 to allow for Independent Power Producers (IPPs) participation in the generation of power. However, BPC enjoys the monopoly for transmission and distribution of electric power.

The national oil company, Botswana Oil Limited (BOL) ensures security of supply of petroleum products, operation and management of the government strategic petroleum reserves and is also mandated to promote citizen participation in the petroleum fuels value chain. The Botswana Energy Regulatory Authority (BERA) on the other hand handles regulatory issues of the entire energy sector. BERA currently regulates the technical and economic aspects of the electricity sector, administers licences for sector activities and makes recommendations to the Minister of MMGE regarding issuance of licences. With regards to petroleum fuels, BERA regulates pump prices, issuing of licenses and granting of permits for construction of new facilities and ensures that that service standards are met.

In the absence of an Energy Act, the Botswana energy sector is currently governed by a number of statutory instruments, some not specific to energy. Table 1 shows some of these instruments which guide activities in the sector.

Table 1: Regulatory instruments governing the energy sector

Subsector	Guiding statutory instrument
Electricity	Electricity Supply Amendment Act, BERA Act and BPC Act
Oil and Gas	Oil and Gas Bill, Safety Guidelines, and BERA Act
Biomass & biofuels	Forest Act (Chapter 38:03), BOBS standards, Biofuels Guidelines
Solar	BOBS Standards, Rooftop Guidelines
Coal	BERA Act, The Coal Roadmap

This NEP recognises that in order to ensure effective implementation of the policy, a national energy act will be required to provide for a number of matters.

3.2 Electricity Subsector

Since the BEMP period, the government of Botswana has been striving for self-sufficiency in electricity. For a long time, about 80% of Botswana’s electricity was imported from neighbouring countries, especially from the Republic of South Africa (RSA) until the commissioning of Morupule B power plant in 2012. Currently, most of the country’s electricity requirements comes from local generation through a state-

owned entity, Botswana Power Corporation (BPC). Figure 2 shows an increasing trend of domestic electricity generation versus declining amounts of imported electricity over a 5 year period.

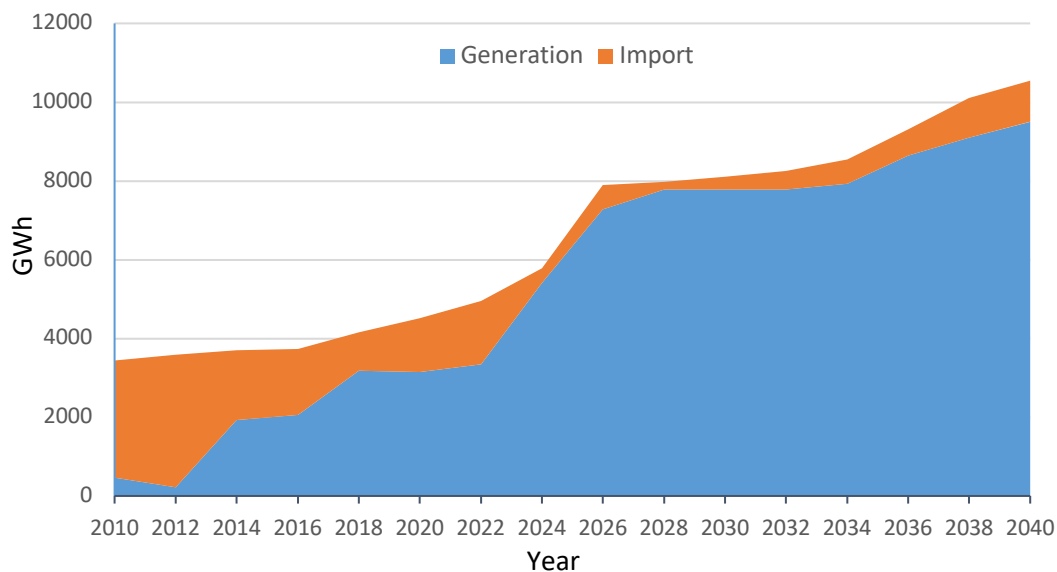


Figure 2: Actual and projected domestic electricity generation and imports for 2010 – 2040

Botswana’s current total electricity demands stands at about 4505 GWh. This demand comprises demand from all economic sectors including mining, industry, service sector and households. The demand is expected to grow up to 8637 GWh by the year 2040, a growth that is proportional to the growth of the economy (average GDP growth of 3.6%). Against this demand, Botswana has got two coal thermal power plants, (Morupule A and Morupule B) and two diesel-operated peaking plants, (Matshelagabedi and Orapa). Morupule A, whose lifetime ends in 2026 delivers on average around 843.35 GWh electricity per annum. Morupule B Power plant, which was commissioned in 2014, has not worked to its full capacity, and to date gives around 2299.5 GWh of electricity on annual basis. The plant is under remedial works, expected to be complete by the year 2023. Successful completion of these works will increase generation from Morupule B plant to the expected 4369.05 GWh annually

Orapa has an installed capacity of 90MW and Matshelagabedi 70MW. All these four generation plants are operated by BPC. Due to Morupule A and B having not been operating at full capacity due to their varying challenges, local demand could not be fully satisfied. As such, there are instances when the Orapa and Matshelagabedi generation plants are operating on fulltime basis as opposed to being used as peaking plants to augment the supply shortage. Where the peak demand cannot be met, the shortages are augmented through imports from Southern African Power Pool (SAPP) mainly Republic of South Africa and Namibia. These imports are not only costly to the economy, but are also compromising the energy security of the country.

The overall national electricity access rate is sitting at 61.58% (61.56% in urban areas, and 61.60% in rural). In order to increase access to electricity, the Government is engaged in a Rural Electrification Programme, which was established in 1975 to facilitate new connections and grid network extension. In 2010 the National Electricity Standard Connection Cost (NESC) was introduced with a view to increase household connections to the grid. NESC is a uniform cost for new household connections within the boundaries of a network supply area which eliminates situations whereby customers in the same supply area would pay different connection amounts depending on their proximity to the electricity backbone infrastructure.

3.3 The Petroleum Subsector

Botswana has no proven crude oil reserves and no crude oil refineries hence highly reliant on imports of refined petroleum products to meet the liquid fuels demand. By far, a large amount of supplies comes mainly from RSA and the rest from alternative routes including Namibia and Mozambique to enhance security of supply. Procurement, supply and distribution of the products is done by the private sector, which is largely comprised of the multinational oil companies.

As at 2018, the local consumption of petroleum products (petrol, diesel and illuminating paraffin) stood at about 1.2 billion litres per annum and about 20 million litres of aviation fuels per annum. The annual average rate of increase in petroleum products demand stood at approximately 3.5% between 2006 and 2017 as presented in Figure 3.

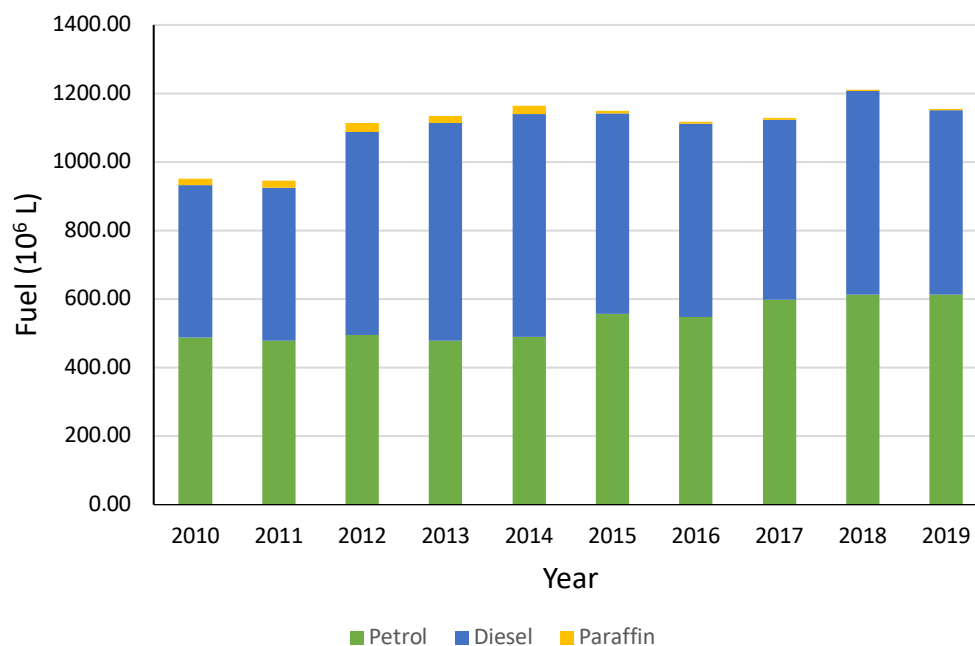


Figure 3: Liquid fuels consumption for 2010 – 2019 period

The petrol, diesel and illuminating paraffin prices are regulated by the Botswana Energy Regulatory Authority (BERA) whilst the price of other products such as aviation fuel and LPG are currently not regulated although the Act provides for their regulation. The strategic storage capacity for liquid fuels stands at approximately 18 days of national consumption against the international standard for strategic storage capacity of 90 days. In the same vein, commercial buffer stock currently stands at less than 5 days of national consumption against the preferred minimum of 14 days cover. At present, rail and road is used for transportation of petroleum products. Since the liquid fuels industry is about economies of scale, dividing the already small demand into many small import 'parcels' results in very high import prices for the country.

3.4 Key Local Energy Resources

Botswana has a variety of indigenous energy resources that can be exploited to satisfy the local demand. Amongst these are coal, natural gas (coal bed methane), solar potential, wind potential, biomass potential, and waste.

3.4.1 Coal and coal bed methane

Botswana's coal resources are estimated at 212 billion tonnes and currently only 2 have been proven, namely; Morupule, Mmamabula coal basins with a combined capacity of 7.2 billion tonnes. There are currently only two coal mines in operation, Morupule Coal Mine (MCM) and Minergy Coal (Pty) Ltd. Most of the coal produced at MCM goes to power generation at Morupule power plants and the rest is shared between local industrial use and export, with Minergy's coal shared between the local industry and export market. In 2011 the National Coal Roadmap was developed and it made some recommendations for monetization of Botswana coal.

The gas industry is still at early development stages in Botswana but the industry presents an opportunity for supply of clean thermal energy solutions. Estimates of 196 trillion cubic feet of coal bed methane (CBM) have been recorded and exploration is ongoing. Commercially viable gas exploration is required to firm up resource quantification and associated development programs which can transform Botswana's social and economic landscape.

3.4.2 Solar and wind energy potential

Taking into account the importance of limiting activities that could harm the environment as stated in Botswana's Vision 2036, the NEP recognizes the need to harness the available renewable energy resources potential as they have little negative impact on the environment. Botswana receives over 3,200 hours of sunshine per year, with an average insolation on a flat surface of 21MJ/m².

Again, satellite images have revealed that Botswana has abundant countrywide irradiation presenting the highest values of direct normal irradiance (DNI) and global horizontal irradiance (GHI) the western and south-western regions, with a slight decrease towards the east. The lowest values of irradiation are in a range of about 2,000 kWh/m²/annum (~5,5 kWh/m²/day) DNI and GHI on average. This amount of insolation is among the highest in the world, making solar energy a promising renewable energy resource for Botswana.

By far, small scale solar PV systems for lighting and refrigeration have been installed in some households and in some government institutions located in areas that are not connected to the national grid. The tourism industry is also making use of solar to power guest lodges and camps in some major tourist sites, like the Okavango Delta. The largest grid-connected solar plant is a 1.3MW solar PV pilot plant which was commissioned in 2012, funded by the Government of Japan. There also exists about 600 decentralised PV systems across the country producing an estimated amount slightly more than 1.26MW.

Reasonable wind speeds exist within the country with the highest wind resources potential located in the South-West and Eastern parts of the country, with averaging wind speeds above 7m/s, wind power density above 200W/m² and annual energy production above 4.5 GWh/year. The wind potential has not been fully explored and has primarily been used on windmills for water pumping by farmers.

3.4.3 Biomass and waste energy potential

Botswana has theoretical biomass energy potential of 32 million GJ per year. The estimates are derived from a considerable biomass potential of 20 million tonnes per year, for crop residues, agro-industrial residues, livestock residues (manure), municipal solid waste (MSW), forest harvesting residues, wood processing residues and energy crops for biofuels.

While forest harvesting residues represents almost 50% of the total energy potential, most of these residues are already used as fuelwood at household level. The use of livestock residues (cow-dung) seems to offer the highest practical opportunity for energy production in Botswana, while MSW can also contribute to the improvement of energy generation, especially at the city level. Other residues such as crop and agro-industrial residues, only offer a limited energy potential that could be tapped by rural communities.

A feasibility study for production and use of biofuels in Botswana was carried out in 2007 and the study indicated the potential for liquid bio-fuels production; mainly biodiesel from *Jatropha curcas* and ethanol from sweet reed. Following this, the Government collaborated with JICA on a scientific research to develop *Jatropha* species that can adapt to Botswana's climatic conditions for biodiesel production. On realization that *Jatropha* was not necessarily a viable feedstock, the program was

reviewed to include other potential biodiesel feedstocks. The government has, through the Botswana Bureau of Standards (BOBS) developed biofuels standards for Botswana.

3.5 Energy Conservation and Demand Side Management

By default, energy systems are inefficient and waste a lot of energy at different stages of the energy flow. A large proportion of this wasted energy is not being used due to a number of constraints. Previously, some energy efficiency measures have been employed in Botswana to reduce the amount of end-use electricity consumption.

A step-tariff Model was introduced by Botswana Power Corporation in 2010 to encourage efficient use of electricity. Again, efforts to reduce electricity demand were initiated at household level. These included replacement of incandescent bulbs with compact fluorescent bulbs (CFLs) in selected households and installation of devices to switch off geysers remotely during peak hours. Figure 4 shows the cumulative effects of efficiency improvements that were obtained from such initiatives and other measures over a 19-year period.

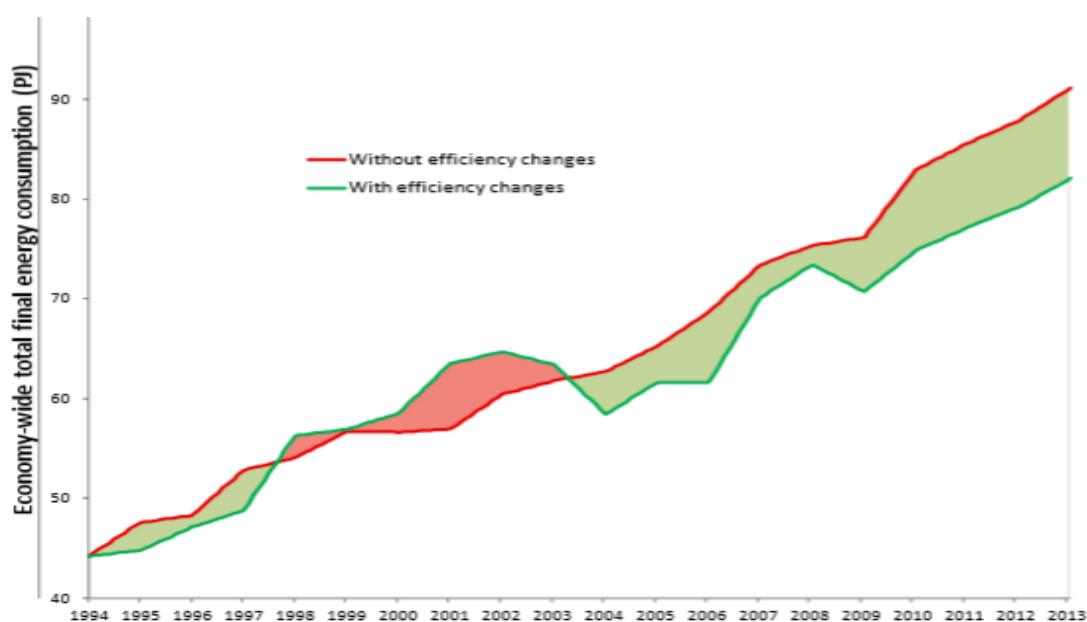


Figure 4: Cumulative effect of efficiency improvements in Botswana. Source: Danish Energy Management (2018)

According to Figure 3, the adoption of energy efficient measures significantly reduced the total final energy consumption, although improvements in efficiency were reversed due to fall-backs during 1998 and 2001. It is reassuring to note that these efficiency improvements occurred in the absence of any significant policy or regulatory measures imposed by the government. In 2018, the National Energy Efficiency Strategy (NEES) for Botswana was developed with a view to address barriers, resource limits, lack of

policy integration and accountability with regards to adoption of efficiency measures in the energy sector.

3.6 The Global Context

Botswana is a landlocked country with existing number of strategic partnerships and commitments in the energy sector at regional and international levels. She is a member of the Southern African Development Community (SADC) and the Interstate Oil Committee (IOC) under the Southern African Customs Union (SACU). Through the SADC Energy Protocol, member states are required to work towards regional integration and cooperation in energy development and as part of this regional integration, Botswana is eligible for electricity trading mainly via the Southern African Power Pool (SAPP).

3.6.1 Energy and environment

The current international environmental discussions and concerns are centred on the need to address climate change and the issue of global warming. As a party to the United Nations Framework Convention on Climate Change (UNFCCC) and having adopted the Paris Agreement, Botswana is striving to reduce atmospheric emissions to the atmosphere. The government has submitted a voluntary commitment through the Nationally Determined Contributions (NDC) to reduce total greenhouse gas (GHG) emissions by 15% by the year 2030, with reference to 2010 emissions. Furthermore, the country is working towards providing affordable and clean energy in line with Sustainable Development Goal number seven (SDG7).

Botswana is also a signatory of the Basel Convention which deals with the control of transboundary movement of hazardous waste and its disposal. Therefore, this policy recognises the need for proper waste disposal from the energy sector as well as handling of hazardous waste within the sector. Through these Treaties, Botswana binds herself to formulate and implement policies that protect the environment.

3.6.2 Energy and gender

Generally, energy issues are of concern to all. However, women are one of the most important actors in the energy sector, in terms of their contact, use and management of energy. In Botswana it is estimated that 55% of households are headed by women and the gender statistics show that females in Botswana are less represented in the formal sector and over-represented in the informal sector at 36% and 75%, respectively. Botswana women mostly play a predominant role in subsistence agriculture, perpetuated by wrong cultural and traditional beliefs that the women's role is child bearing and looking after the family.

The informal sector is unstable and limits their chances of economic empowerment hence most female-headed households are poor because they do not have access to or control over productive resources. The government is thus focusing on mainstreaming gender into its operations in order to realize gender equality and empowerment of women. In 1995, the government of Botswana developed a policy on women and development in order to align its national policies and legislation with regional and international obligations on gender equity and equality. However, despite some advancement, women in Botswana still have less access to, and control over, productive resources than men. This includes less access to modern energy. This Policy supports Gender mainstreaming in the energy sector.

4.0 THE FRAMEWORK OF THE NATIONAL ENERGY POLICY

Any future developments in Botswana's energy sector will be shaped by the realities of the past development performance of the sector, resource availability and the global context within which the government operates. These inform the broad strategies that will be adopted by the NEP to drive the development of the sector for the next **20 years**. They also inform the baseline, targets and indicators that will be used to measure progress towards the policy aspirations.

The global environment is highly dynamic and is characterised by uncertainty in a wide range of development parameters. As such, new models of development are needed to operate in such a dynamic world. **Sustainable development** and **low carbon development** have emerged globally as new paradigms that shape the global governments' development approaches. The overall aim being mainly to balance the objectives of the social, economic and environmental pillars of development and, where such balance is not possible, to negotiate trade-offs among them at local, national and global levels. This new paradigm is pinned by two main global frameworks; (i) Agenda 2030 on Sustainable Development and its associated sustainable development goals (SDGs), and (ii) the Paris Agreement on climate change and associated nationally determined contributions (NDCs). Effective implementation of these frameworks will transform the world's markets, technologies and social systems to enable them to serve the needs of the people, the environment and economies.

In the regional context, there also exists some instruments that will shape the future of the African continent, as well as development at the regional level. These will also influence Botswana's future energy developments. The Africa Agenda 2063, whose vision is for **an integrated, prosperous and peaceful Africa**, driven by its citizens and representing a dynamic force on the global arena is one such instrument. This

agenda is aligned to the global Agenda 2030 on sustainable development. The Southern African Development Community (SADC) region also has regional development strategies which influence development in the region.

Botswana's energy sector is highly reliant on conventional fuels; coal for electricity generation and petroleum based liquid fuels. This NEP presents clear high level plans and deliberate efforts to execute these plans towards transformation of Botswana's energy system towards achieving **security of supply** and energy **self-sufficiency** by assuming an optimal energy mix that will drive sustainable economic development. This is characterised by a gradual increase of clean energy, especially renewable energies, and improved efficiency into the energy system to ensure sustainability.

4.1 Policy Guiding Principles

Taking into account the global and regional transition with respect to energy development, the challenges faced by the country's energy sector, and in alignment with the country's Vision 2036 and national development plans, this National Energy Policy is anchored on three main principles; economic development, equity and environmental responsibility.

4.1.1 Economic development

Under this principle, the NEP ensures that adequate modern energy services and products are accessible for commercial activities. Energy will be used to generate income for the economy as a key driver of economic diversification by powering the country's economic development activities.

4.1.2 Equity

This policy ensures that energy is accessible to all, especially the low income and disadvantaged members of the community and that energy services are provided in an equitable and universal manner.

4.1.3 Environmental Responsibility

Modern energy technologies that are less harmful to the environment will be adopted. An increase in renewable energy use and improved efficiency of the energy system will be used as measures to offset the country's carbon footprint.

4.2 The Policy Direction

4.2.1 The vision and overall policy goal

The **vision** of this National Energy Policy is to create an energy system that would ensure secure and reliable supply of modern energy services for all the sectors of the economy and to significantly reduce energy-related atmospheric emissions by the year 2040.

The **overall goal** of the NEP is to ensure energy security and to improve access to reliable and adequate supply of energy in order to facilitate a low carbon and sustainable economic development for Botswana. Guided by the principles outlined in Section 4.1, this goal seeks to ensure that; (i) The NEP supports and drives Botswana's economic growth, (ii) The NEP improves the lives and livelihoods of Botswana, and that (iii) The NEP protects the environment and minimizes energy-related impacts on the environment.

4.2.2 Policy objectives

This goal will be realised through the following high level **objectives**;

- a. To diversify the national energy mix by promoting renewable energy sources, especially solar and clean coal technologies;
- b. To support the modernisation and expansion of energy infrastructure to meet the growing energy demand;
- c. To ensure equitable access to modern energy forms by the industry, rural communities and the disadvantaged groups;
- d. To provide effective governance and improved overall management of the energy sector;
- e. To ensure cost recovery for energy supply and delivery through adoption of cost-reflective tariffs and efficient modes of supply and delivery;
- f. To establish an effective and sustainable energy research and development platform that encourages innovation and promotes development of local skills;
- g. To facilitate effective stakeholder engagement in the development of the sector;
- h. To improve service delivery and facilitate private sector investment in the energy sector;
- i. To minimize the impacts of energy supply and consumption on the environment through increase of renewable energy in the supply mix and improved efficiency in energy use;
- j. To mainstream gender, age and socio-economic status issues in energy development programs;
- k. To provide reliable energy statistics to inform policy making and planning; and
- l. To proliferate regional and international cooperation in energy trade and overall development of the sector.

Subsequent to the above Policy objectives, this NEP outlines a number of high level strategies that will guide implementation towards achievement of these objectives and ultimate realization of the Policy goal. These strategies are presented in Section 5 of this document.

4.3 Policy Issues and Related Policy Statements

4.3.1 Electricity subsector

The current electricity demand stands at 600 MW and is expected to reach 936 MW by 2025. Currently, the installed generation capacity for Botswana stands at 732 MW from coal and 160MW from diesel peaking plants, even though the country is still faced with shortages of electric power. This is mainly due to the poor performance of Morupule B power plant and inadequacy of the distribution infrastructure. Even if operating at full-capacity, the current installed generation capacity would not meet the demand in the coming years. Considering these challenges and to ensure security of supply, this Policy calls for additional generation capacity to be developed through independent power producers (IPPs).

POLICY STATEMENT - P1

Electricity will be generated optimally from locally available energy resources to meet local demand and ensure self-sufficiency.

The Rural Electrification Programme is effectively connecting Botswana's villages to the national grid. This policy recognises the need to extend the electricity grid to all parts of the country in order to facilitate economic activities. To cater for villages and settlements that are located far from the national grid, the Policy calls for them to be powered using renewable energy decentralized off-grid systems since extending the network to these areas is not cost-effective for the government.

POLICY STATEMENT – P2

Transmission and distribution infrastructure will be enhanced to facilitate economic growth and universal access to electricity.

For a long time the government of Botswana has strived to provide affordable energy services to its people. To date, Botswana offers one of the cheapest electricity prices in the SADC region at an average of BWP 0.9187 per kWh (approx. USD 0.085) for domestic use. This tariff is however, not cost-reflective as it is subsidized by the government. With regard to supply-related costs, BPC is in agony of high costs that come from; (i) constant use of 'emergency' diesel power plants to augment power shortages, and (ii) high volumes of electricity imports from RSA to augment shortages. Cognisant of BPC's great financial losses in its operations and the government's

continuous supply of revenue towards subsidy and to the utility for its sustenance, the NEP promotes migration to cost-reflective electricity tariffs.

POLICY STATEMENT – P3

Electricity tariffs will cost-reflective in order to balance the interests of the investors, consumers and the environment

Transmission and distribution components of Botswana’s electricity value chain are naturally monopolistic and this comes with associated challenges. The NEP seeks to provide institutional and legal reforms to encourage private sector investments in this regard.

4.3.2 Petroleum subsector

Botswana is completely reliant on imports of refined petroleum products from her neighbouring countries, mostly from RSA. This over-reliance on a single source and route poses a high risk to security of supply. Further, Botswana has limited storage capacity which also poses a risk in cases where there can be prolonged fuel shortages. Sufficient storage in the supply chain can buffer the consumer against short term supply chain disruptions and price fluctuations. On this note, the NEP seeks to ensure security of supply.

POLICY STATEMENT – P4

Petroleum products will be sourced and stored in a reliable and sustainable manner to ensure security of supply

Currently petrol, diesel and illuminating paraffin prices are regulated by BERA and the Government whilst the price of other products such as LPG are not regulated. The high and volatile petroleum product prices and the lack of implementation of market based pricing negates effective and efficient regulation.

POLICY STATEMENT – P5

Petroleum products’ prices will be set in a manner that will balance the interests of suppliers and consumers

To date, procurement, supply and distribution of the products is done by BOL and the private sector, which is largely comprised of the multinational oil companies (MOCs). This has led to inequitable supply and distribution of petroleum products, especially in rural areas, which are considered financially unattractive for investment by the private companies. The dominance of MOCs has also limited citizen companies’ participation in the petroleum value chain.

POLICY STATEMENT – P6

Participation of citizens in the petroleum subsector will be facilitated to ensure economic supply of fuels to all parts of the country

At present rail and road are the primary modes of transporting petroleum products in the country. Since the liquid fuels industry is about economies of scale, dividing the already small demand into many small import 'parcels' results in very high import prices for the country. In this regard, this NEP will facilitate use of the most cost effective, efficient and safe mode of fuel transportation for Botswana.

POLICY STATEMENT – P7

Adequate primary transport and secondary distribution infrastructure will be provided to ensure economic countrywide fuel supply

4.3.3 Coal and coal bed methane

Botswana has abundant coal resources that are not yet significantly monetized despite coal presenting significant development opportunities for the country. Exporting coal to international markets is a viable option which is hampered by inadequate transportation infrastructure to the ports. The National Coal Roadmap of 2011, in addition to coal exports, identified opportunities for power generation, both for domestic and export, and conversion of coal to liquids, coal to gas amongst others. Botswana, though endowed with such large quantities of coal, faces the challenge of utilising this resource due to its negative effects to the environment. This policy facilitates activities of coal beneficiation for optimal utilization of the resource as well as adoption of clean coal technologies to minimize its impacts on the environment.

POLICY STATEMENT – P8

Measures will be put in place to exploit the vast coal resources using clean coal technologies to derive maximum benefit for economic diversification in an environmentally sustainable manner

Development of the gas industry, specifically CBM, in Botswana presents an opportunity for the supply of clean thermal energy solutions. The current exploration efforts for CBM are beginning to bear fruits with some CBM exploration companies having been issued with Mining Licenses. However, the industry faces a challenge of lack of a legal and regulatory framework. This policy lays a foundation for a robust legal and regulatory framework to facilitate development of a lucrative local gas sector.

The Orapa 2 X 45 MW Dual Fuel General Electric Lm 6000 Open Cycle Gas Turbines Power Plant is designed to operate on both gas and diesel and once the gas is commercially available, this plant will be fully operated on gas. The operation of the plant using gas will reduce the country's emissions from power generation as the gas is cleaner compared to diesel.

POLICY STATEMENT – P9

An enabling environment will be created to facilitate investments and to fast track developments in the gas sector

4.3.4 Renewable energy (solar and wind)

Despite the abundance of solar energy potential in Botswana, solar contributes insignificantly to the energy mix. It is mainly used for lighting, water heating and water pumping. The learnings from past experiences show that there are a number of barriers to solar energy development. These barriers cut across policy, institutional and regulatory framework, technology, market and capacity.

The initial capital cost for implementation of solar energy technologies is high in Botswana, despite the global trend of reducing costs. This comes from the fact that Botswana imports the technology in its entirety as there are no local manufacturers in this field. Again, the current subsidy on conventional fuels deems solar energy less competitive hence a less conducive environment to attract investment into solar development, to both local and foreign investors. The absence of an appropriate legal and regulatory framework also poses a challenge to investors as this brings little confidence on the system.

Botswana holds a history of failed projects and programs tied to poor quality of equipment, substandard workmanship and lack of maintenance of the installed systems. Some programs failed due to poor planning and execution. This policy endorses up scaling of solar energy use, both at small scale and large scale levels across the entire country.

POLICY STATEMENT – P10

The Government will support and facilitate initiatives that increase the development of on-grid and off-grid solar in order to increase the contribution of solar energy to the total energy supply mix

Wind has not been explored as much as solar due to the absence of data on the potential. Lately it has been realised that due to concerted global research and technological developments, the potential for wind power generation has increased and requires further exploration. Allocation of resources to ensure development of wind energy projects aligned with the national renewable energy strategy should continue to be pursued.

POLICY STATEMENT – P11

The government will explore the potential for wind and facilitate wind power development

4.3.5 Biomass and waste energy

Wood fuel continues to be a major source of energy for rural and low income urban communities; mainly for cooking, space heating and lighting in rural households especially for social ceremonies. This has given rise to increased trade of the resource

which exacerbates localised deforestation in some parts of the country. This policy puts some measures to ensure sustainable exploitation of the wood resource for energy.

POLICY STATEMENT – P12

The Government will ensure sustainable and efficient use of wood fuel to reduce over-exploitation of the resource and to protect the environment

The use of cow dung to generate biogas offers a practical opportunity for Botswana but currently, there are no existing guidelines to support the production and utilisation of the biogas technologies. Research on indigenous biodiesel feedstocks coupled with biodiesel trials to power vehicles are giving courage to Botswana's biodiesel undertakings. However, even though biodiesel standards are in place, there is no commercial production and usage of biodiesel. This policy seeks to promote the use of cow-dung for biogas, especially at household level and to facilitate off-take of the biodiesel industry as a clean alternative source to liquid petroleum fuels.

POLICY STATEMENT – P13

Initiatives related to production and use of energy derived from biodegradable materials will be promoted and facilitated in order to offset the country's carbon footprint

4.3.6 Energy efficiency and demand side management

Previously, initiatives on demand side management have only been concentrated in the electricity subsector although opportunities exist in other energy subsectors such as the petroleum. Although Figure 3 shows significant savings attained from various energy saving initiatives, there is evidence that some strategies were not sustained. For instance, users reverted to the use of cheaper incandescent bulbs for replacements of efficient LCDs afterwards.

POLICY STATEMENT – P14

Energy efficiency and conservation initiatives will be supported, particularly from the demand side, with a view to minimize energy wastage and to offset carbon emissions from conventional power generation

There is currently no reporting framework for energy efficiency and conservation measures and initiatives hence no data available to prove the effect of implementing efficient measures. This policy supports a long-term, sustainable energy efficiency program, which yields energy savings that will improve Botswana's energy security,

economic competitiveness and reduction of energy-related emissions through offset measures.

4.3.7 Energy and environment

Botswana is a party to the United Nations Framework Convention on Climate Change (UNFCCC). Having adopted the Paris Agreement, in 2015 the government has made a voluntary commitment through its first Nationally Determined Contribution (NDC) to reduce the country's total greenhouse gas (GHG) emissions by 15% by the year 2030, with reference to 2010 emissions. Furthermore, the country is working towards providing affordable and clean energy to its general population in order to align with UN 2030 Agenda for Sustainable Development Goals, especially SDG7.

POLICY STATEMENT – P15

Energy extraction, production, transport and use will be done with minimal negative impacts on human health and on the environment

4.3.8 Energy and gender

Generally, energy issues are of concern to all. However, women are one of the most important actors in the energy sector, in terms of their contact, use and management of energy. In Botswana it is estimated that 55% of households are headed by women and the gender statistics show that females in Botswana are less represented in the formal sector and over-represented in the informal sector at 36% and 75%, respectively. Botswana women mostly play a predominant role in subsistence agriculture, perpetuated by wrong cultural and traditional beliefs that the women's role is child bearing and looking after the family.

The informal sector is unstable and limits their chances of economic empowerment hence most female-headed households are poor because they do not have access to or control over productive resources. The government is thus focusing on mainstreaming gender into its operations in order to realize gender equality and empowerment of women. In 1995, the government of Botswana developed a policy on women and development in order to align its national policies and legislation with regional and international obligations on gender equity and equality. However, despite some advancement, women in Botswana still have less access to, and control over, productive resources than men. This includes less access to modern energy. This Policy supports Gender mainstreaming in the energy sector.

POLICY STATEMENT – P16

The government will promote gender mainstreaming in the energy sector and ensure alignment of gender concerns with appropriate health, safety and environmental standards

4.3.9 Energy research and development

The provision of energy services is capital intensive and heavily reliant on technology. It is thus important to come up with innovative ways of delivering these services. Currently, there is no research institution dedicated to carrying out energy research and development (R&D) to inform policy. However, there exists various institutions or think tanks that carry out energy research from various perspectives. These include Botswana Institute for Technology Research and Innovation (BITRI), the University of Botswana (UB), Botswana International University of Science and Technology (BIUST), Botswana University of Agriculture and Natural Resources (BUAN), and Botswana Innovation Hub (BIH). Regrettably, there is neither a clearly defined collaboration among and/or between these researchers nor is there any between the researchers, the industry and the policy makers.

Recognising that coordination of efforts in R&D is key to promoting innovation, technology application and development for deployment of appropriate modern energy services; the NEP seeks to aid coordination of research activities in the energy sector as well as facilitate development and establishment of academic/industry strategic research alliances.

POLICY STATEMENT – P17

Research and development will be intensified to guide effective harnessing of the country's indigenous energy resources

4.3.10 Information management and planning

Energy planning provides a roadmap that can guide future energy infrastructure and policy development. The government of Botswana adopted an implementation of the Integrated Energy Planning (IEP) concept during the eighth National Development Plan (NDP 8) period. This was done to ensure that; (i) supporting legal and regulatory frameworks are developed for the energy sector, (ii) energy infrastructure is developed and resource capacity is strengthened, (iii) there is continuous energy forecasting, and (iv) an up-to-date energy data base is developed and availed.

This country, like most developing countries is faced with challenges of data collection and management, which is crippling the energy planning and informed development processes. This policy acknowledges that data management is a challenge in Botswana and there is insufficient energy data to inform accurate planning in the sector. Therefore, the NEP seeks to ensure that energy data is accurate, available and accessible for planning purposes.

POLICY STATEMENT – P18

An effective integrated energy planning will be ensured in order to achieve optimal use of locally available energy resources towards sustainable economic growth, economic diversification and low carbon development

4.3.11 International cooperation

Botswana has existing strategic partnerships and commitments in the energy sector at regional and international levels. She is a member of the Southern African Development Community (SADC) and the Interstate Oil Committee (IOC) under the Southern African Customs Union (SACU). Through the SADC Energy Protocol, member states are required to work towards regional integration and cooperation in energy development. As part of this regional integration, Botswana is eligible for electricity trading mainly via the Southern African Power Pool (SAPP).

POLICY STATEMENT – P19

The NEP will promote regional energy trade and international cooperation in the energy sector

4.3.12 Monitoring and evaluation

Regular collection of information about all activities geared towards implementation of the policy will demonstrate whether the objectives are being met and will help policy makers to identify and address any prevailing challenges quickly. Proper evaluation will show whether the policy is giving the presumed outputs and whether it is making a difference. Evaluations thus keep track of key outcomes and impacts related to the various implementation initiatives and assess whether the objectives, aims and goals of this NEP are being achieved.

POLICY STATEMENT – P20

There will be continual monitoring, regular review and evaluation of the impact of various policy positions and provisions to ensure that they remain relevant

5.0 POLICY STATEMENTS AND RELATED HIGH LEVEL IMPLEMENTATION STRATEGIES

Table 2: The NEP policy statements, objectives and high level strategies for 2020 - 2040

POLICY STATEMENT	POLICY OBJECTIVES	HIGH LEVEL STRATEGY
Electricity Subsector		
P1 Electricity will be generated optimally from locally available energy resources to meet local demand and to ensure self-sufficiency	<p>P1.1 To increase installed generation capacity from about 732MW to 1430 MW by the year 2040 from available local resources (coal, solar, wind and CBM)</p> <p>P1.2 To promote sustainable use of indigenous energy resources, especially solar for electricity generation</p> <p>P1.3 To power all the areas located far from the national grid using decentralized off-grid systems to ensure universal access by 2040</p>	<p>P1.1.1 Lure the private sector to investment in the construction and ownership of additional power plants.</p> <p>P1.1.2 Promote the development of IPPs through competitive bidding processes for specified generation capacity allocations</p> <p>P1.2.1 Create opportunities for mini- and micro-generators to feed into the national grid and off-grid mini-grid networks</p> <p>P1.3.1 Guide the integrated energy resource planning through deliberate decisions that prioritize power generation from renewables and decentralised systems in way that will optimise the long-term cost of electricity supply</p>
P2 Transmission and distribution infrastructure will be enhanced to facilitate economic growth and universal access to electricity	P2.1 To ensure open access to modern energy services.	<p>P2.1.1 The country's transmission infrastructure and grid capacity will be improved to accommodate decentralised and intermittent generation</p> <p>P2.1.2 Quantify and manage transmission losses based on the best practice</p> <p>P2.1.3 Support interconnections with neighbouring countries to increase Botswana's trading opportunities and/or improve security of supply</p>
P3 Electricity tariffs will be set in way that will balance the interests of the investors, consumers and the environment	P3.1 To ensure that electricity tariff policies provide a basis for sustainable power supplies over the long term.	P3.1.1 The costs of electricity distribution to be optimised such that end-user electricity prices correctly reflect fixed and variable costs and convey relevant price signals to encourage efficiency

	<p>P3.2 To make Botswana a preferred regional electricity supplier</p>	<p>P3.1.2 Conduct regular and cost reflective tariff adjustments to improve the viability of the industry and to facilitate private sector participation</p> <p>P3.1.3 Set industrial electricity charges in a manner that ensures equity, social justice and cost recovery</p> <p>P3.1.4 Adopt cost reflective electricity tariffs that promote efficient use of energy</p> <p>P3.1.5 Incorporate Pricing of electricity will take into account the environmental cost associated with its generation</p> <p>P3.2.1 Implement relevant grid technologies that improve the management of the distribution grid, reduce losses, enhance quality of supply, and increase the grid's capacity to accommodate small-scale grid connected decentralised generation, storage and demand side measures.</p>
<p>Petroleum Subsector</p>		
<p>P4 Petroleum products will be sourced and stored in a reliable and sustainable manner to ensure security of supply</p>	<p>P4.1 To ensure security of supply of petroleum products</p> <p>P4.2 To ensure equitable access to petroleum products</p>	<p>P4.1.1 Construct government-owned storage facilities in the country and facilitate access to storage facilities within the region</p> <p>P4.1.2 Oil industry participants will be legislated to maintain set levels of commercial buffer stocks.</p> <p>P4.1.3 Promote utilisation of alternative supply routes and sources for petroleum products</p> <p>P4.1.4 Facilitate development of domestic sources of fuel such as renewable fuels and liquid fuels derived from coal</p> <p>P4.2.1 Reform the institutional arrangement to promote increased access to petroleum products</p>

<p>P5 Prices for petroleum products will be set in a manner that will balance the interests of suppliers, retailers and consumers</p>	<p>P5.1 To ensure continued citizen and private sector participation in the retailing and wholesaling of petroleum products.</p> <p>P5.2 To continue regulating petroleum pump prices to ensure affordability.</p>	<p>P5.1.1 Manage the impact of the volatility of the petroleum products prices on the economy.</p> <p>P5.1.2 Apply where necessary, cross subsidies between petroleum products to achieve specific national development objectives.</p> <p>P5.2.1 Regulate selected petroleum products prices in a manner that promote countrywide availability.</p> <p>P5.2.2 Ensure appropriate measures in place to guarantee affordable petroleum product prices.</p>
<p>P6 Citizen participation in the petroleum subsector will be facilitated to ensure economic countrywide supply of fuels</p>	<p>P6.1 To promote meaningful citizen participation in the petroleum industry</p>	<p>P6.1.1 Facilitate and promote participation of cooperatives in the distribution of petroleum products to remote areas through the national oil company</p> <p>P6.1.2 Promotion of investment in the upstream, midstream and downstream activities in the petroleum value chain</p>
<p>P7 Adequate primary transport and secondary distribution infrastructure will be provided to increase access to petroleum fuels</p>	<p>P7.1 To ensure adequate petroleum products storage capacity, and extend petroleum products distribution infrastructure to all parts of the country.</p> <p>P7.2 To promote safe transportation, storage and handling of petroleum products</p>	<p>P7.1.1 Development of a legal framework for the petroleum sector in order to facilitate investment in petroleum products infrastructure.</p> <p>P7.2.1 Promote use of global best practices in the storage, handling and transportation of Liquefied Petroleum Gas (LPG).</p>
<p>Coal and coal bed methane</p>		
<p>P8 Measures will be put in place to exploit the vast coal resources using clean coal technologies in order to derive maximum benefit for sustainable economic diversification</p>	<p>P8.1 To promote emerging clean technologies and derivatives that include beneficiation, gasification, coal bed methane</p> <p>P8.2 Ensure adequate and competitively priced coal supply to mining, industry, and manufacturing sub-sectors.</p>	<p>P8.1.1 Utilise appropriate and environmentally friendly technologies to convert coal to liquids and coal to gas.</p> <p>P8.2.1 Secure long-term coal supplies for the thermal power plants.</p> <p>P8.3.1 Promulgation of enabling legislation to facilitate private sector participation in the subsector.</p>

	<p>P8.3 To promote private sector participation in the coal supply chain.</p> <p>P8.4 To facilitate optimal exploitation of the country's indigenous and vast coal resources to drive economic growth.</p> <p>P8.5 To promote local consumption of coal for energy and facilitate export of coal and coal products.</p>	<p>P8.4.1 Ensure deployment of clean coal technologies in the development of the coal subsector.</p> <p>P8.4.2 prepare the legal, regulatory and institutional framework conditions needed to enable the potential future use of CBM</p> <p>P8.5.1 Develop appropriate infrastructure to facilitate coal exports.</p>
<p>P9 An enabling environment will be created in order to facilitate investments and to fast-track developments in the gas sector</p>	<p>P9.1 To facilitate private sector participation and development of the downstream gas industry.</p> <p>P9.2 To have a national gas infrastructure accessible to all suppliers and distributors.</p>	<p>P9.1.1 Collaborate with key stakeholders to exploit available gas resources.</p> <p>P9.1.2 Ensure effective economic regulation of the gas industry.</p> <p>P9.2.1 Develop gas storage and transport infrastructure including collaboration with neighbouring countries.</p>
Renewable energy – solar and wind		
<p>P10 The government will support and facilitate the development of on-grid and off-grid solar in order to increase the contribution of solar energy in the energy supply mix</p>	<p>P10.1 Facilitate development and use of concentrated solar thermal power and photovoltaic electricity generation.</p> <p>P10.2 Facilitate appropriate financing mechanisms for utilization of renewable energy technologies.</p> <p>P10.3 Promote development and growth of solar energy based industries.</p>	<p>P10.1.1 Develop mandatory standards for solar energy equipment and installations.</p> <p>P10.1.2 Develop mandatory standards for solar energy equipment and installations.</p> <p>P10.1.3 Mainstream solar energy programmes into all levels of education systems.</p> <p>P10.1.4 Promote the use of solar energy especially in households, hospitality and small businesses.</p>

<i>P11 The government will promote further exploration of the wind potential and facilitate wind power development</i>	<i>P11.1 Promote the development and use of wind for power generation.</i>	<i>P11.1 Facilitate further exploration for wind energy potential P11.2 Promote power generation from wind in areas that have wind potential</i>
Biomass energy and waste		
<i>P12 The Government will ensure sustainable and efficient use of wood fuel to reduce resource and to protect the environment</i>	<i>P12.1 Facilitate sustainable harvesting and usage of the wood fuel resource</i>	<i>P12.1.1 Promote the production and use of efficient wood fuel based technologies for clean cooking and space heating. P12.1.2 Promote the use of alternative fuels as substitutes for firewood for cooking, especially in government institutions.</i>
<i>P13 Initiatives related to production and use of energy derived from biodegradable materials to offset the country's carbon footprint</i>	<i>P13.1 To increase the contribution of bio-energy in order to diversify the energy mix. P13.2 Promote investment in infrastructure to produce energy from agro processing. P13.3 Development and implementation of waste to energy technologies as a waste management solution</i>	<i>P13.1.1 Facilitate construction of biogas plants for conversion of organic waste to produce gas as a thermal energy for households, commercial and industrial use. P13.1.2 Mainstream bio-energy into the school curriculum at primary, secondary and tertiary levels.</i>
Energy conservation and demand side management		
<i>P14 Energy efficiency and conservation initiatives will be supported with a view to minimize energy wastage and to offset emissions from conventional power generation</i>	<i>P14.1 To promote efficient use and management of available energy resources for present and future generations</i>	<i>P14.1.1 Establish appropriate pricing regime for energy services that will provide incentives to domestic, commercial and industrial customers to voluntarily manage their energy consumption P14.1.2 Develop legislation that encourages the use of efficient energy equipment and appliances. P14.1.3 Establish incentives to improve energy conservation and efficient use of energy across sub sectors.</i>

		<i>P14.1.4 Mainstream energy efficiency, conservation and management programmes in all level of the education system</i>
Energy and the Environment		
<i>P15 Energy extraction, production, transport and use will be done with minimal negative impacts on human health and on the environment</i>	<i>P15.1 To minimize environmental impacts from energy production and use;</i> <i>P15.2 To promote safe use of energy products</i> <i>P15.3 To promote generation of energy from available waste</i>	<i>P15.1.1 Ensure adherence of energy products and technologies to environmental quality standards</i> <i>P15.1.2 Ensure adherence to safety procedures and standards for handling of petroleum products</i> <i>P15.1.3 Ensure that optimal energy mix is achieved to realise attainment of the country's set emission targets</i> <i>P15.1.4 To promote the production and use of low-carbon fuels</i> <i>P15.2.1 Ensure that the production, transportation, processing and use of energy do not result in health or safety problems</i>
Energy and gender		
<i>P16 Gender mainstreaming in the energy sector will be promoted to ensure alignment of gender concerns with appropriate health, safety and environmental standards</i>	<i>P16.1 To promote the use of modern forms of energy by women in households</i> <i>P16.2 To support the capacity development of women in the energy sector</i> <i>P16.3 To ensure participation of women in the formulation and implementation of energy interventions</i>	<i>P16.1.1 Facilitate development of programs for dissemination of modern energy technologies to replace the traditional energy uses in rural areas</i> <i>P16.2.1 Support training and capacity building programs targeting women in rural communities</i> <i>P16.3.1 Facilitate inclusive development of solar and other renewable forms of energy for off-grid communities</i>
Energy research and development		

<p>P17 Intensified research and development towards effective harnessing of the country's indigenous energy resources and efficient production and use of energy.</p>	<p>P17.1 To promote effective and well-focused energy research and development to contribute to the development of the sector.</p> <p>P17.2 To promote innovation in the energy sector towards optimal utilization of the country's energy resources</p>	<p>P17.1.1 Enhance collaboration between research institutions, government and policy makers in finding solutions to problems inhibiting the effective and efficient utilisation of energy</p> <p>P17.1.2 Give priority to adaptive research and development in energy technologies while promoting basic energy research</p> <p>P17.1.3 Facilitate resource mobilization for energy Research and Development</p> <p>P17.2.1 Provide incentives to encourage tertiary institutions to develop research programmes for the application and implementation of renewable energy technologies especially solar, biogas, biodiesel and wind</p>
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Information management and planning

<p>P18 An effective integrated energy planning will; be ensured in order to achieve optimal use of locally available resources to drive sustainable economic growth and low carbon development</p>	<p>P18.1 To develop and maintain a comprehensive information database in support of energy resources management and development;</p> <p>P18.2 To evaluate optimal approaches to monetising of country's energy resources</p> <p>P18.3 To evaluate the impact of energy policy decisions</p> <p>P18.4 To ensure reliable and timely access to energy related data and information;</p>	<p>P18.1.1 Build adequate institutional capacity including human resource as well as information and communication technology</p> <p>P18.1.2 Promote strategic partnerships between the public and private sectors to finance and develop energy diversification programmes and projects</p> <p>P18.2.1 Legislate and develop Integrated Resource Plan</p> <p>P18.3.1 Timely development and communication of an integrated energy resource plan</p> <p>P18.4.1 Provide for a mandatory provision of energy related data and information</p>
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International cooperation

<p>P19 Promotion of regional energy trade and international cooperation</p>	<p>P19.1 To ensure regional developmental synergies</p> <p>P19.2 To harmonise energy policies in a manner that promotes competitiveness, access to regional and global markets and socio-economic development</p>	<p>P19.1.1 Engage and participate in regional and international initiatives</p> <p>P19.1.2 Develop regional knowledge networks</p> <p>P19.1.3 To honour regional and international agreements the country has entered into</p> <p>P19.1.4 Ensure introduction and use of higher quality products conforming to global development trends</p> <p>P19.2.1 Promote, pursue and implement projects with high regional impact and relevance</p>
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Monitoring and evaluation

<p>P20 There will be continual monitoring, regular review and evaluation of the impact of various policy positions and provisions to ensure that these remain relevant</p>	<p>P20.1 To provide a review mechanism that will ensure the policy framework for sustainable development and management of energy resources are maintained in the national interest</p> <p>P20.2 To assess the performance of the energy sector and all stakeholders in realising the national development objectives related to the provision, management and development of energy resources</p> <p>P20.3 To build necessary capacity for carrying out the monitoring, evaluation and review of the Policy</p>	<p>P20.1.1 Develop an integrated monitoring framework that is compatible with national, regional and international standards</p> <p>P20.1.2 Facilitate the exchange of data and information among stakeholders with specific multi sectoral forums established to track the implementation of the Policy</p> <p>P20.2.1 Ensure measureable indicators are agreed on and used for monitoring and evaluation of policy implementation</p> <p>P20.2.2 Link the policy evaluation process to the national energy accounts in order to assess performance in the sectorial application of energy</p> <p>P20.3.1 Promote awareness raising on the use of coal and other related implications</p> <p>P20.3.2 Promote awareness creation campaigns on the methods and benefits of energy conservation and management</p>
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6.0 IMPLEMENTATION OF THE NEP

This section outlines the high-level pragmatic approach towards implementation of this Policy. Taking into account the limitations that come with execution, an Implementation Plan will be developed and issued as a separate document to complement this Policy. The Plan will outline the key actors required for implementation, modes of investment mobilization for energy sector development, human resource capacity building, strengthening of R&D, and a monitoring framework for the policy.

6.1 Actors involved in policy implementation

Team work and total commitment of all actors in Botswana’s energy sector should be the primary driving principle to ensure smooth implementation of the NEP. Figure 5 outlines the various actors involved in Botswana’s energy sector, who are the centre of energy transition.

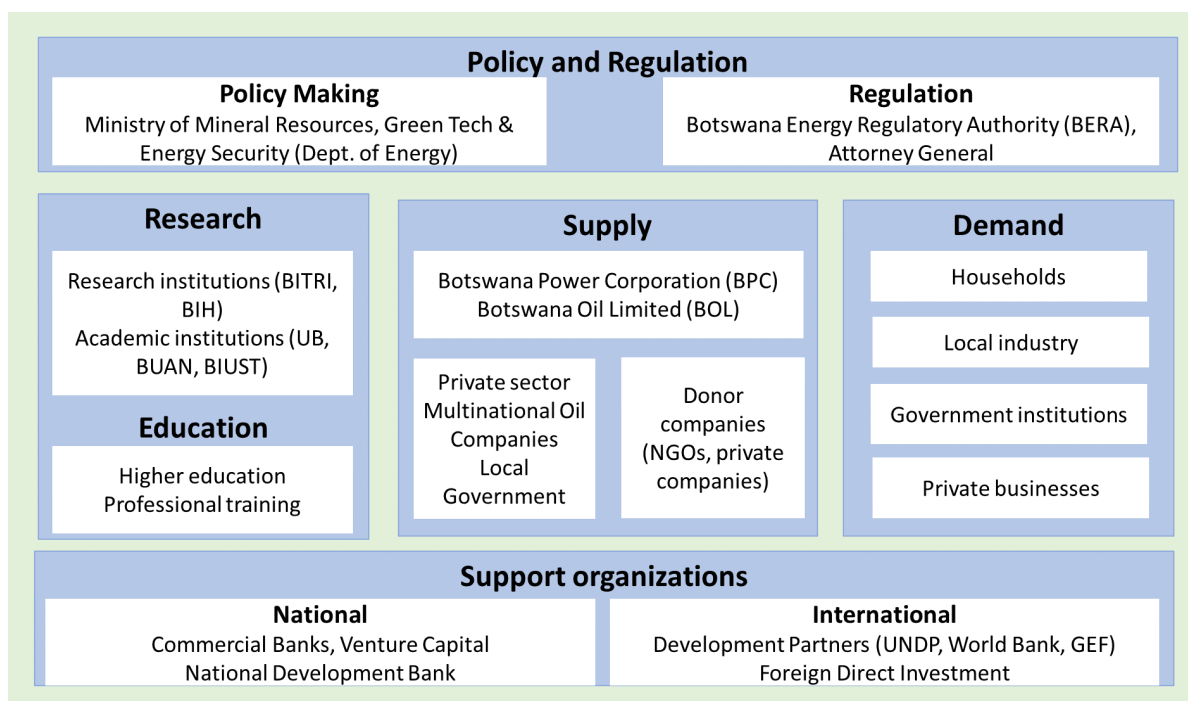


Figure 5: The Botswana energy sector actor arrangement.

These actors are structured according to the various roles that they supposedly play in the energy sector development. There is need for a central point of coordination to ensure that each actor group contributes accordingly to the development of the sector. The Implementation Plan will clearly define the mandates and roles of the various actors and how they will be coordinated during the Policy implementation process.

6.2 Capacity development for transition

In order to facilitate an effective development of the energy sector, the government of Botswana is obligated to build the necessary levels of human resource capacity across the board. Various actor groups have varying capacity needs hence capacity building programs should be tailored according to these various needs.

This Policy seeks to attain maximum ownership and management control of the major aspects of the energy sector by Botswana. Therefore, the IP outlines the support in terms of training, which will be given to Botswana in all fields of energy development and management during the NEP period.

Again, it is critical to cultivate comprehensive local content in all aspects of energy sector operations. On this note, the Implementation Plan will outline the support for capacity building in indigenous manufacturing of energy technologies.

6.3 Investment in the energy sector development

By nature, the energy sector requires huge capital investment especially to develop infrastructure in the in the mid-term to long term. Infrastructure for petroleum, power and renewable energy subsectors is costly. The government alone cannot drive the sector and needs private sector investment at the forefront for a successful development. This Policy is calling for an increase in private sector development and the IEP will suggest various available options for financing of infrastructure projects and programs in the energy sector of Botswana.

The Policy seeks to provide a conducive legal, fiscal and regulatory environment to attract investment into the energy sector. This will give the private sector assurance to invest in the sector comfortably. Again, this will also ensure efficient and transparent pricing regime for energy services as it is one of the challenges faced by the country. The IP will give details on this.

6.4 Convergence with other government policies

Energy is one of the main drivers of economic growth as it facilitates productivity in other sectors of the economy. Therefore, it is critical for the Policies driving these various sectors to be in alignment with the NEP. The IP will indicate how the Policy, Planning, Monitoring and Evaluation Divisions of relevant Ministries, Departments and Agencies will collaborate with the MMGE and how they can be strengthened, if necessary, for effective implementation of the NEP.

6.5 Communication and awareness raising

The IP will define how the MMGE, as the custodian of the NEP will interact with other relevant Ministries, Departments, the private sector, communities, Members of Parliament, District Councils and many other stakeholders and actors to discuss

issues relating to the implementation of the Policy. A comprehensive programme will be outlined to create awareness and ensure acceptance of energy transformation proposed by the NEP among policy makers and the general public.

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