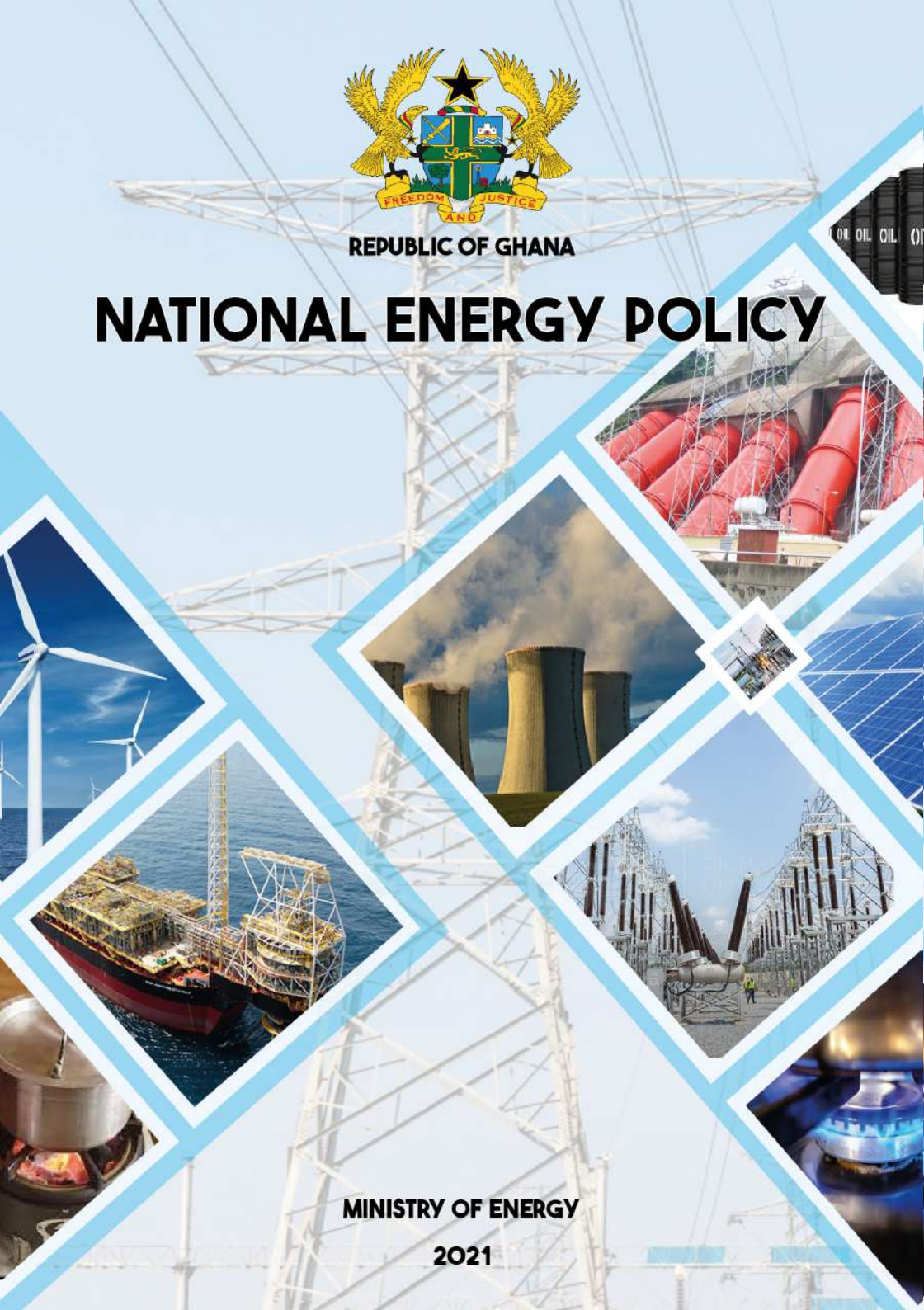




REPUBLIC OF GHANA

NATIONAL ENERGY POLICY



MINISTRY OF ENERGY

2021



MINISTRY OF ENERGY

NATIONAL ENERGY POLICY

*Energy Sector, an Engine for Economic Growth and
Sustainable Development*

2021

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ABBREVIATIONS AND ACRONYMS

African Refiners and Distributors Association	ARDA
Africa Centre for Economic Policy	ACEP
African Mining Vision	AMV
African Union	AU
Article	Art.
Association of Ghana Industries	AGI
Automatic Adjustment Formula	AAF
Billion cubic feet	Bcf
Beneficial Owners	BO
Billions of barrels of oil equivalent	bboe
Bui Power Authority	BUI
Build-Operate-Transfer	BOT
Bulk Oil Distribution Companies	BDCs
Bulk Oil Storage and Transportation Company Limited	BOST
Chamber of Bulk Oil Distribution	CBOD
Civil Society Organisations	CSOs
Combined Heat and Power	CHP

Compressed Natural Gas	CNG
Cylinder Recirculation Model	CRM
Deep Sea Mining	DSM
Division for Ocean and Law of the Sea	DOALOS
Economic Community of West African States	ECOWAS
ECOWAS Centre for Renewable Energy & Energy Efficiency	ECREEE
ECOWAS Regional Electricity Regulatory Authority	ERERA
Electricity Company of Ghana	ECG
Electricity Distribution Companies	DISCOs
Electricity Market Oversight Panel	EMOP
Electricity Supply Industry	ESI
Enclave Power Company	EPC
Energy Commission	EC
Environmental and Social Impact Assessment	ESIA
Environmental Impact Assessment	EIA
Environmental Protection Agency	EPA
Exclusive Economic Zone	EEZ
Exploration and Production	E&P

Extractive Industries Transparency Initiative	EITI
Foreign, Commonwealth and Development Office	FCDO
Gas Processing Plant	GPP
Ghana Oil and Gas for Inclusive Growth	GOGIG
Ghana Atomic Energy Commission	GAEC
Ghana Boundary Commission	GBC
Ghana Cylinder Manufacturing Company	GCMC
Ghana Energy Development and Access Project	GEDAP
Ghana Extractive Industries Transparency Initiative	GHEITI
Ghana Grid Company Limited	GRIDCo
Ghana Institute of Management and Public Administration	GIMPA
Ghana Maritime Authority	GMA
Ghana National Fire Service	GNFS
Ghana National Gas Company Limited	GNGC
Ghana National Petroleum Corporation	GNPC
Ghana Nuclear Power Programme Organization	GNPPO
Ghana Oil Company Limited	GOIL
Ghana Ports and Harbour Authority	GPHA

Ghana Revenue Authority	GRA
Ghana Standards Authority	GSA
Greenhouse Gases	GHGs
Health, Safety, Security, and Environment	HSSE
Independent Power Producers	IPPs
Information and Communications Technology	ICT
Institute of Statistical, Social and Economic Research	ISSER
International Atomic Energy Agency	IAEA
International Oil Companies	IOCs
International Seabed Authority	ISA
Japan International Cooperation Agency	JICA
kilotonnes of oil equivalent	ktoe
Kilowatt	kW
kilowatt-hour	kWh
Kumasi Institute of Technology, Energy and Environment	KITE
Kwame Nkrumah University of Science and Technology	KNUST
Legal Instrument	LI

Liquefied Natural Gas	LNG
Liquefied Petroleum Gas	LPG
LPG for Development	LPG4D
Measurement, Reporting and Verification	MRV
Megawatt	MW
Member of Parliament	MP
Metropolitan, Municipal and District Assemblies	MMDAs
Middle East Respiratory Syndrome	MERS
Ministry of Energy	MoEn
National Anti-Corruption Plan	NACAP
National Development Planning Commission	NDPC
National Electrification Programme	NEP
National Electrification Scheme	NES
National Interconnected Transmission System	NITS
National LPG Promotion Programme	NLPGPP
National Maritime Security Strategy	NMSS
National Oil Company	NOC
National Petroleum Authority	NPA

Nationally Determined Contributions	NDCs
Non-Associated Gas	NAG
Non-Governmental Organisations	NGOs
Northern Electricity Department	NED
Northern Electricity Distribution Company	NEDCo
Nuclear Power Ghana Limited	NPG
Nuclear Regulatory Authority	NRA
Oil Marketing Companies	OMCs
One Million barrels	MMbbl
Open Government Partnership	OGP
Petroleum Exploration and Production Law	PEPL
Petroleum Hub Development Corporation	PHDC
Petroleum Exploration and Production Law	PEPL
Photovoltaic	PV
Plan of Development and Operation	PDO
Power Purchase Agreements	PPAs
Productive Uses of Energy	PUE
Provisional National Defence Council	PNDC

Public Interest and Accountability Committee	PIAC
Public Utilities Regulatory Commission	PURC
Public-Private Partnership	PPP
Renewable Energy	RE
Research and Development	R&D
Residual Fluid Catalytic Cracker	RFCC
Sankofa Gye-Nyame	SGN
Science, Technology, Engineering and Mathematics	STEM
Severe Acute Respiratory Syndrome	SARS
Small and Medium Scale Enterprises	SMEs
Southern Electricity Distribution Zone	SEDZ
square kilometer	sqkm
Sustainable Development Goals	SDGs
Tema Oil Refinery	TOR
Trade Union Congress	TUC
Tweneboa Enyenra Ntomme	TEN
United Nations Convention on the Law of the Sea	UNCLOS
United States Agency for International Development	USAID

Volta River Authority	VRA
Voluntary Principles	VPs
Wassa Association of Communities Affected by Mining Organisation	WACAM
West African Gas Pipeline Authority	WAGPA
West African Gas Pipeline Company Limited	WAGPCo
West African Gas Pipeline Project	WAGP
West African Power Pool	WAPP
Wholesale Electricity Market	WEM

FOREWORD

Cabinet at its forty-seventh meeting on 25th March, 2023 approved the reviewed National Energy Policy of Ghana which is intended to guide the development and management of Ghana's energy sector, especially during this era of the global call to transition to clean energy use.

I am honoured to present to you an energy policy which does not only create a conducive environment for increased investment in the energy sector in Ghana but also seeks to put in place a framework for the efficient management of Ghana's energy resources to sustainably create wealth through value addition and revenue generation.

The formulation of this policy went through an extensive consultative process which involved the review of policies of several countries, discussions with institutions of Government, local authorities, civil society organizations, organized and non-organized labour as well as consultation with key development partners and the academia. We also engaged Ghanaians across the length and breadth of the country to ensure that the peculiar energy needs and issues in various parts of the country are captured and addressed. This is to ensure that the policy continues to remain relevant in the fast-changing global energy sector over the period.

The implementation of this Policy, through continuous consultation with stakeholders, may require the amendment of existing legislations and the creation of new legislations across the entire energy sector.

This Policy extensively incorporates the implementation of the National Energy Transition Framework of Ghana which guarantees the best fuel supply security through the provision of a cost-efficient diversified energy mix to accelerate socio-economic development and to achieve universal access to electricity by 2024.

The policy direction on upscaled adoption of clean cooking fuels and associated technologies will positively improve the livelihood and health of women and children who are the main gatherers of firewood for cooking.

The introduction of new technologies such as Modern Renewable Energy, Nuclear Power, Carbon Capture Utilization and Storage, Hydrogen and Electric Vehicle (EV) charging stations to diversify our energy mix has the potential to create millions of new job opportunities and enable Ghana gain access to the future green trade market.

I wish to use this opportunity to register my profound gratitude to His Excellency, Nana Addo Dankwa Akufo-Addo, President of the Republic of Ghana, for his guidance in the development and management of the energy sector in Ghana in general and in the formulation of this Policy in particular.

It is my hope that this National Energy Policy document will serve as a blueprint to transform Ghana's energy sector into a sustainable climate-resilient low-carbon energy economy, that will accelerate development, and provide quality service to homes and industry.



DR. MATTHEW OPOKU PREMPEH (MP)
MINISTER FOR ENERGY

ACKNOWLEDGEMENTS

The 2021 National Energy Policy has been prepared with the active involvement of technical staff at the Ministry of Energy (MoEn), Energy Commission (EC) and other Sector Agencies. The team provided the framework for the revision of the existing National Energy Policy developed in 2010. The framework served as a working document and was discussed at the Ghana Energy Summit in June 2017.

The Ministry wishes to express appreciation to His Excellency, the President, Nana Addo Dankwa Akufo-Addo for sanctioning the Summit, which provided a platform for engagement with key stakeholders in the Energy Sector.

The Ministry acknowledges the tireless efforts of the Hon. Minister for Energy, Hon. Dr. Mathew Opoku Prempeh and his Deputy Ministers, Hon. William Owuraku Aidoo, Hon. Dr. Mohammed Amin Adam and Hon. Egyapa Mercer as well as the former Deputy Minister Hon. Joseph Cudjoe in drafting and finalising this energy policy.

I wish to thank previous Hon. Ministers for Energy, Hon. Boakye Kyeremateng Agyarko and Hon. John-Peter Amewu for initiating and continuing the review process respectively and to the Senior Presidential Adviser, Hon. Yaw Osafo Maafo for the lead role he played at the Summit.

Also, worth acknowledging are the roles played by my predecessors, the former Chief Directors, Mr. Lawrence Apaalse and Prof. Thomas Akabzaa, the former and current Executive Secretaries of the Energy Commission, Dr. Ofosu-Ahenkorah and Ing. Oscar Amonoo-Neizer respectively for supporting the technical team in the preparation of the draft document.

We also recognise the work of some key officials from the National Development Planning Commission (NDPC), and the Environmental Protection Agency (EPA) for providing the guidelines in the preparation of the Policy.

The Ministry acknowledges the UK's Foreign, Commonwealth and Development Office (FCDO) - Ghana Oil and Gas for Inclusive Growth, (GOGIG) for supporting the Ministry at various stages of the process.

The Ministry also appreciates comments and discussions from other stakeholders such as institutions of Government, Local Authorities, Development Partners, Civil Society Organizations, the National House of Chiefs and the Academia.

Finally, and by no means the least, the Ministry commends the dedicated Policy Drafting and Harmonisation Team from the Ministry of Energy and the Energy Commission, led by Dr. Robert B. M. Sogbadji and Mr. Salifu Addo respectively.



MRS. WILHELMINA ASAMOAH
CHIEF DIRECTOR
MINISTRY OF ENERGY

EXECUTIVE SUMMARY

Introduction

Ghana's developmental goal is to create an optimistic, self-confident and prosperous nation, through the creative exploitation of our human and natural resources, and to operate within a democratic, open and fair society in which mutual trust and economic opportunities exist for all.

This development agenda is largely dependent on the optimal development and utilisation of its energy resources and provision of energy services in a reliable, cost-effective and environmentally friendly manner. The purpose of a comprehensive national energy policy is to provide a framework and strategies to meet the energy needs of the country and address current and future challenges. The Government of Ghana recognises energy as a key driver for sustainable socio-economic development of the country. In this regard, Governments in the past have come up with policies and interventions to develop the energy sector.

The Energy Challenge

The existing National Energy Policy was developed in 2010, and since then, there have been significant changes in the power and petroleum sub-sectors, which call for a review of the Policy. Ghana's total energy supply has to grow significantly to help achieve the developmental goal. The challenge is how to increase the energy supply and also sustainably expand the energy infrastructure in the country in line with the global energy transition.

Vision and Mission

The Vision of the Energy Sector is to be self-sufficient in the provision of sustainable energy and for export.

The mission of the Energy Sector is to make competitively priced energy universally accessible and readily available in an environmentally sustainable manner for the local market and for export.

Energy Policy Platform

This National Energy Policy outlines the energy sector goals, objectives, and issues and their respective policy directions. The Policy covers the broad spectrum of issues relating to the following areas:

- i. Power Generation, Transmission and Distribution
- ii. Renewable Energy
- iii. Nuclear Power
- iv. Petroleum (Upstream and Downstream)
- v. Energy Transition
- vi. Energy Efficiency and Conservation
- vii. Cross-Cutting Areas (Health Safety Security and Environment, Gender, Local content and Local Participation, and Research and Development)

A summary of the sector policy framework is provided below.

Power

The goals for the power sector are to: accelerate the achievement of universal access to electricity in the country; integrate planning system to meet Ghana's growing electricity demand reliably and cost-effectively in a sustainable manner; achieve cost-competitive electricity generation. In addition, develop transmission and distribution systems that facilitate efficient and cost-competitive power evacuation and transportation; strengthen the electricity distribution system to enhance a competitive electricity retail market; have an efficient electricity pricing system for both local and the export market.

The issues with the pursuance of these goals are poor financial health of the utilities; excess installed generation capacity over demand; high system losses in electricity generation and distribution; inadequate infrastructure to take excess gas from indigenous sources for power generation.

Given these goals and issues, the policy focuses on the creation of enabling environment for private sector participation; procurement of the country's electricity generation through a timely competitive procurement plan; ensuring timely investments in the expansion of the country's transmission infrastructure to reduce transmission losses; attraction of private sector investment capital as strategic partners in distribution infrastructure; provision of special but cost-competitive rates for exports of electricity to the sub-region; expansion of interconnections with neighbouring countries to facilitate wider electricity exports.

Renewable Energy

The goal is to increase the contribution of Renewable Energy (RE) in the overall energy production mix of the country through efficient production, transportation, distribution as well as end-use efficiency and conservation.

Major issues in the sector are difficulty in accessing land for Renewable Energy (RE) projects due to land ownership structure; insufficient regulatory framework; inadequate data on various renewable energy resources and their utilisation; inefficient management of the production, transportation and marketing of wood-fuel; insufficient regulatory framework to support private sector participation in RE deployment; low public awareness of RE Technologies and benefits.

Consequently, policy directions in addressing these issues are defining the role of the private sector for small and medium-scale hydropower

development; provision of adequate and reliable data on RE resources and utilisation through research; establishment of an appropriate regulatory framework for RE development; collaborating with the relevant institutions to demarcate specific areas for RE development in the land use and spatial plan for Ghana; increment of public awareness of the benefits of RE technologies; and creation of fiscal and pricing incentives to enhance the development and use of renewable energy.

Nuclear Power

The goal is to integrate nuclear power into the national electricity generation mix as baseload to guarantee long-term supply security, address issues of climate change and air pollution.

Issues affecting the sub-sector are inadequate coordination among key players in the development of the nuclear power programme; lack of commitment to the implementation of long-term power sector plans affecting long-term projects; limited industrial capacity in the development of the nuclear programme; inadequate funding and financing mechanism for the nuclear programme; public concerns about the risks and safety of nuclear power plants.

Policy directions to address the issues are to enhance coordination between the nuclear power programme and key energy sector players; the government shall commit to and sustain the implementation of long-term power sector plans; development and implementation of a functioning mechanism for funding and financing the nuclear programme; establishment of strategic bilateral partnerships with nuclear power countries and international institutions; education and sensitisation of the public (policymakers, legislators, media, educational Institutions, chiefs and opinion leaders) to address their concerns on nuclear power in the energy mix; continuous development of regulatory frameworks to

address issues of safety, security and safeguards in accordance with international best practices.

Petroleum Upstream

The goal for the upstream industry is to ensure that Ghana's petroleum resources are managed transparently and sustainably.

The major issues facing the sub-sector are insufficient data on some of the country's sedimentary basins; inadequate development and production infrastructure; low recovery efficiency; inadequate legal, regulatory and fiscal frameworks; potential boundary disputes; dwindling reserves; effect of natural disasters and national health emergencies.

The policy focuses on: the acceleration of the reconnaissance exploration programme; acquisition of sufficient data on all the sedimentary basins; promotion of infrastructure for hub-based development and production; promotion of enhanced recovery methods to improve recovery efficiencies; ensuring passage and enforcement of relevant regulations for the efficient and sustainable conduct of petroleum activities.

Petroleum Downstream

The goal for the downstream industry is to ensure an effective and efficient functioning downstream petroleum industry.

The main issues identified are inadequate refinery and storage capacity; inadequate strategic stock of petroleum products; inadequate infrastructure for downstream operations; inefficient mode of transportation and distribution of petroleum products; weak financial and technical regulatory capacity of the petroleum industry; low access to liquefied petroleum gas (LPG); and huge investment requirements for natural gas infrastructure development.

Policy directives espoused to address the above issues are mobilisation of public and private sector investment to expand national crude oil refining capacity, trading, storage and transportation to neighbouring countries and land-locked nations in the sub-region; development of petroleum infrastructure in designated areas to support Ghana becoming a petroleum hub; enhancement of the regulatory environment for the private sector participation in the development of a transportation network; development and implementation of a petroleum transportation infrastructure network to link the West African sub-regional markets; improvement of governance and legislative framework in the downstream industry; promotion of LPG through the implementation of the LPG for Development Programme; and the development of a robust, transparent and predictable pricing regime.

Energy Transition

In 2015, world leaders met in Paris to address the negative impacts of climate change. The leaders, through an Agreement, decided to encourage governments of the world to promote clean energy production and use with the aim of holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change.

The goal is to develop low-carbon energy resources and infrastructure to deliver clean energy in an environmentally responsible manner for socio-economic growth.

Although climate change concerns form the basis for Energy Transition, it must be situated within the context of the Sustainable Development Goals (SDG), particularly SDG 7 which is to ensure access to affordable, reliable, sustainable and modern energy for all.

Ghana has significant oil and gas resources which must be taken into consideration in the transition to a low carbon economy. It is part of other frameworks which seek to efficiently and transparently exploit oil and gas resources and hence a balance must be sought when approaching the Energy Transition from a national perspective.

Energy Efficiency and Conservation

Energy Efficiency refers to products or systems using less energy to do the same or better job than conventional products or systems. Commitment to ensuring efficient production, transportation, as well as end-use efficiency and conservation of energy is critical to the efficient management of the economics of the energy sector as well as reducing carbon emission per energy use.

The goal is to ensure efficient production, transportation, distribution as well as end-use efficiency and conservation of fuel and energy across the economy.

The main issue of this sector is the limited awareness of energy conservation and fuel substitution measures. The policy objectives to address this issue are: improve upon demand-side management to reduce wastage in the energy sector through energy-efficient buildings and the development of standards and labels for appliances; promote fuel efficiency and conservation through continuous education and public awareness programme on efficient use of energy and conservation; encourage fuel switching into cleaner fuel through the use of LPG and improved Cookstoves promotion for cooking.

Cross-Cutting Areas

The cross-cutting areas include Local Content and Local Participation; Health, Safety, Security and Environment (HSSE); Mainstreaming Gender and Persons with Disabilities; and Research and Development.

The goals are: to maximise Local Content and Local Participation in the energy sector; secure energy systems from physical and cyber-attacks at all times; protect the health, safety and security of people working in the energy value chain; ensure that energy is produced, transported and utilised in an environmentally sustainable manner; mainstream gender and persons with disabilities in energy sector activities; and promote research into energy production, supply and utilisation to ensure sustainable exploitation and use of energy resources.

The main issues are limited local content and local participation in the energy sector; inadequate security interventions on oil and gas, power and related installations; inadequate skilled human resources to ensure cybersecurity; inadequate enforcement of safety and security regulations in the energy value chain; limited technical capacity and expertise in HSSE within the energy sector; inadequate emergency response and readiness to disasters associated with the entire energy value chain; inadequate health and social baseline information for impact assessment and planning; low participation of women and persons with disabilities in managerial positions in the energy sector; low awareness of gender issues in the energy sector among policymakers and the general public; and inadequate gender-disaggregated energy data which creates difficulty for proper planning of gender issues in the energy sector.

In view of these goals and issues, the policy focuses on enforcement of Local Content and Local Participation regulations; creation of enabling environment to enhance in-country fabrication, installation and manufacturing of components used in the energy industry; collaboration with national security agencies to develop and implement national security strategies for the Energy Sector; development of necessary guidelines with the support of agencies and relevant stakeholders for safe, secure and environmentally friendly work processes in organisations; investment in capacity building in HSSE in the energy sector; enforcing

the development and timely updates of emergency response plans across the entire energy value chain; ensuring collection and timely update of all necessary health and social information to inform policy and planning; supporting the capacity development of women and persons with disabilities in the energy sector; encouragement of female enrolment to Science, Technology, Engineering and Mathematics (STEM) education and skills training programmes; building of gender sensitive capacity of decision makers and technical officers in all energy sector institutions, facilitate gender mainstreaming into energy related interventions; enhancement of gender-disaggregated energy data collection, management and publication towards ensuring gender responsive analysis and planning.

CHAPTER 1: INTRODUCTION

1.1. BACKGROUND AND RATIONALE

The growth of a country is largely dependent on the optimal development and utilisation of its energy resources and provision of energy services in a reliable, cost-effective and environmentally friendly manner. Governments in the past have come up with policies and interventions to develop the Energy Sector of Ghana. The purpose of this national energy policy is to provide a framework for the management and development energy sector.

The commercial¹ discovery of oil and gas in 2007, among other developments in the sector, necessitated the formulation of the 2010 Energy Policy. The policy provided the initial framework for the development and utilisation of indigenous oil and gas resources.

There have been significant changes in the national and global energy landscape since the adoption of the 2010 Energy Policy. The share of hydropower is reducing relative to thermal power generation (Figure 1.1). This trend is expected to continue in the years ahead.

¹ The first commercial oil production in Ghana started in the middle 1970s with average production in the range of 6,000-8,000 barrels per day until 1980s when it dropped significantly to less than thousand barrels a day till the end of the last decade. It never recovered until it was shut down in the middle of this decade.

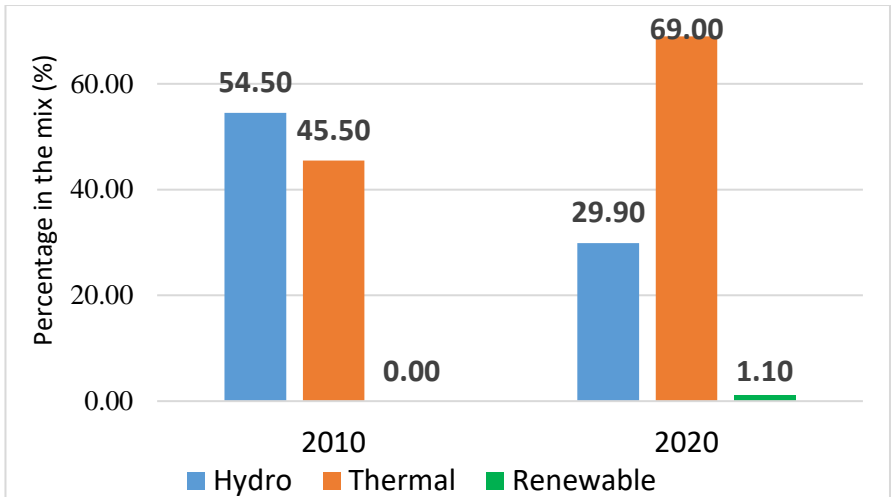


Figure 1.1 Comparison of Electricity Generation Mix, 2010 and 2020 respectively.

Besides, oil has now surpassed biomass as the most important energy source; biomass has dropped from about 60% share in 2010 to an average of 35% in 2020.

Over the period under review, the Energy Sector has been confronted with challenges that affect the development of the economy. In the power sector, the challenges include over-supply of relatively high-priced electricity, high technical and commercial losses, high indebtedness among the utilities, use of obsolete equipment and insufficient power generation.

In Petroleum Upstream, the challenges include: inadequate data and information on geology of the basins, especially, eastern and central basins; the low pace of exploration in Eastern and Central Basins, inefficiency in production; weak institutional capacity and overlaps;

inadequate exploration supporting infrastructure and gaps in the legal; regulatory and fiscal frameworks.

The recent outbreak of the COVID-19 pandemic and the global energy transition paradigm have further exposed the extreme vulnerability of the petroleum upstream sector such as supply disruptions, lower demand for petroleum, and lower investment levels.

In Petroleum Downstream, the challenges include: inadequate distribution infrastructure; inadequate national strategic stock for petroleum products; low capacity and low capitalisation of the Tema Oil Refinery; inadequate supply of petroleum products, low automation in downstream operations, and inefficient mode of transporting petroleum products.

Some of the legislation to streamline the operations of the Energy Sector include the Petroleum Commission Act, 2011 (Act 821), the Petroleum Revenue Management Act, 2011 (Act 815), as amended (Act 893), Local Content and Local Participation Regulations, 2013 (L.I.2204) and the Renewable Energy Act 2011 (Act 832), as amended Act 2020 (Act 1045), among others.

Ghana has also signed onto international and regional treaties and protocols such as the Sustainable Development Goals (SDGs), Paris Agreement, AU Agenda 2063 and ECOWAS White Paper on Energy Access. The ratification of these treaties and protocols would require realignment within the context of the national energy development agenda.

In view of all these developments, it has become necessary to revise the 2010 Energy Policy to reflect these changing circumstances and to develop a framework to meet present and future energy needs for the socio-economic development of the country.

1.2. POLICY SCOPE

This Policy covers the following areas: power (generation, transmission and distribution), petroleum (upstream and downstream), Energy Efficiency and Conservation, Energy transition and cross-cutting issues of the energy sector.

1.3. POLICY FORMULATION PROCESS

The draft policy framework was prepared by experts drawn from Energy Sector Institutions and was presented as a working document for the first-ever Energy Summit held in Accra in June 2017. Stakeholders at the Summit included relevant Government Institutions and players in the Energy Sector such as regulators, state-owned utility companies, Independent Power Producers (IPPs), International Oil Companies (IOCs), the Oil Marketing Companies (OMCs), the Chamber of Bulk Oil Distributors (CBOD), Civil Society Organisations (CSOs) and some Development Partners.

The Ministry of Energy, after the Summit, came up with a draft policy and undertook a nationwide stakeholder consultation in the four geographical zones of the country in March 2018 to solicit for inputs and comments. The Northern Zone was held in Tamale for stakeholders in Upper West, Upper East and Northern regions. The Central Zone was held in Kumasi for the Ashanti, then Brong Ahafo and Eastern regions. The Western Zone was held in Takoradi for the Central and Western regions, and that of the Southern Zone was held in Accra for stakeholders in Greater Accra and the then Volta regions.

Key participants included MMDAs, the Regional Coordinating Councils, Regional Houses of Chiefs, the Trade Union Congress, Civil Society Organisations and the Academia.

After the nationwide stakeholder consultations, comments and submissions from the various stakeholders were collated and reviewed as inputs into the Policy.

1.4. CONTENT AND STRUCTURE

This Policy is structured into four main chapters. Chapter 1, the introduction, gives the background, rationale, policy scope, policy formulation process, content and structure. Chapter 2 deals with the policy context. It describes the Global, Regional and, National context, Situational Analysis, Vision, Goal, Core Values and Guiding Principles. Chapter 3 presents the Institutional, Legal and Fiscal frameworks in the country's energy sector and within ECOWAS. The last chapter presents the policy goals, objectives, issues and respective policy directions for the various energy sub-sectors as well as for cross-cutting areas.

CHAPTER 2: POLICY CONTEXT

This chapter focuses on energy-related issues at the global, regional and national levels as well as conventions and commitments that Ghana has signed on to which impact the nation's energy developmental agenda.

2.1 GLOBAL CONTEXT

Ghana is a signatory to several global protocols and agreements relating to sustainable energy production and use. These commitments feed into policy formulation towards the achievement of universal energy access to the citizens while meeting climate change mitigation requirements. Prominent among these are the Sustainable Development Goals (SDGs), the Paris Agreement and the Extractive Industries Transparency Initiative (EITI).

The SDGs, are aimed at ending poverty, protecting the planet and ensuring that all people enjoy peace and prosperity. While Ghana recognises the relevance of all the Goals, SDG 7² would be critical in the energy development and moving Ghana from a lower-middle-income to upper-middle-income economy.

In addition to the SDGs, Ghana ratified the Paris Agreement in 2016 which requires each country to determine, plan, and regularly report on the contributions towards mitigating climate change. In compliance with the Paris Agreement, there is a need for measures to reduce Greenhouse gas (GHG) emissions. Ghana's emission of 0.51 tonnes of CO₂ per capita³ (0.04% of global emissions) is far below the global average 4.7 tonnes of CO₂ per capita.

² 'Ensuring Access to Affordable, Reliable, Sustainable and Modern Energy for All'

³ Emission Database for Global Atmospheric Research (EDGAR)

However, the country has to consider a sustainable mix of adaptation and mitigation strategies in consonance with global GHG emissions reduction efforts. For instance, with the increasing fossil-fired thermal plants in the electricity generation mix, there would be the need for more mitigation actions such as energy efficiency and conservation activities and afforestation programmes.

During COP26, Ghana signed onto the global commitment to decarbonize towards a net-zero. This global energy transition agenda has brought imminent danger to the petroleum industry such as the financing for petroleum projects which has declined in favour of low carbon energy, creating further uncertainty for petroleum markets. The need for further exploration and petroleum producers to recoup their investments while creating a balance between fossil fuel production and environmental sustainability have therefore become policy imperatives. Ghana must therefore outline policy framework to address the possibility of stranded assets and job losses to take advantages of the benefits of the energy transition agenda such the creation of new job markets, embrace new technologies and consolidate energy security and energy access.

Ghana signed on to the Extractive Industries Transparency Initiative (EITI) in 2003 after the launch of the initiative at the World Summit on Sustainable Development in 2002 in Johannesburg. The Initiative is a global standard for improving transparency and accountability in the oil and gas and mining sub-sectors. EITI encouraged member countries to develop a framework to promote transparency of payments in the Extractives. The Initiative was extended to the petroleum sector in 2013 after commencing oil production from the Jubilee Field in 2010. The Ghana EITI (GHEITI) produces Annual Reports and highlights the gaps in the mining and petroleum sectors.

Ghana is also committed to the Open Government Partnership (OGP) founded in 2012 with over 70-member countries; the OGP connects governments, CSOs, and businesses. Ghana is required to open up its contracting processes to publish contracts and provide information on Beneficial Owners (BO) of companies. The country also commits to Voluntary Principles (VPs) on Security and Human Rights in the extractives. Under VPs, companies, governments and NGOs engage in dialogue to address security-related Human Rights abuses.

The effects of natural disasters, conflicts, and global pandemics such as the recent COVID-19, SARS, MERS and other health emergencies also continue to disrupt the electricity and oil and gas markets significantly. Under these conditions, there is disruption in the oil and gas value chain leading to delays in new oil and gas projects due to reprioritisation of capital.

2.2 REGIONAL CONTEXT

Ghana, as a member of the African Union (AU), endorsed the African Mining Vision (AMV), a framework created by AU in 2009 to ensure that Africa utilises its mineral resources strategically for broad-based inclusive development. The Africa Union (AU's) Agenda 2063 calls on Africa to harness all its resources to ensure the provision of modern, efficient, reliable, cost-effective, renewable and environmentally friendly energy. The AU requires nations to sustainably use the ocean's resources for economic growth, improved livelihoods, and jobs while preserving the health of the ocean ecosystem (Blue Economy). At the ECOWAS level, Ghana is expected to support and contribute to regional projects and programmes on energy. The long-term goal is for Ghana to become a regional energy hub through the export of gas and petroleum products and increase electricity supply to the West Africa Power Pool (WAPP).

The ECOWAS Renewable Energy Policy stipulates that member countries shall increase the share of renewable energy (including medium and large hydro), to 35% by 2020 and 48% by 2030 in their electricity mix⁴.

2.3 NATIONAL CONTEXT

Ghana's demographic, economic and labour characteristics are changing with increasing per capita consumption of energy as the economy grows.

Ghana's population has increased from 25 million in 2010 to 30.8 million in 2020. The increasing population, in no doubt, calls for an increase in energy supply. The National Electrification Scheme (NES)⁵ was initiated in 1989 at the time when the percentage of households connected to the grid was about 20%. The NES is instrumental in the country's achievement of electricity access which stood at 86.63% as of the end of December 2020, one of the highest in Sub-Saharan Africa.

The participation of women and the physically challenged in the energy sector is low in the country, particularly in the area of policy formulation. This, therefore calls for equal participation in all aspects of the energy value chain.

2.4 SITUATIONAL ANALYSIS

In 2010, the country attained a lower-middle-income status with a per capita income of US\$1,225 with corresponding electricity consumption of 364 kWh per capita.

The per capita income and per capita electricity consumption have been growing steadily, reaching US\$2,337 and 534 kWh respectively as of

⁴ ECOWAS Renewable Energy Policy (EREP), 2013. ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE)

⁵ National Electrification Planning Study, Acres International, Canada 1991.

2020⁶. For the country to leapfrog from its current lower-middle-income status to upper-middle-income by 2030, the prevailing income per capita is expected to reach about US\$8,000. Achieving the upper-middle-income status would further require higher electricity consumption averaging around 5,000 kWh per capita.

Ghana's energy landscape was dominated by biomass, which accounted for 44% of the 5,573 ktoe final energy that was consumed in 2010. Oil consumption has now surpassed biomass as the most important energy source with an average share of about 49.2% as of 2020.

On electricity, the installed generation capacity for grid power supply had increased from 2,165 MW in 2010 to 5,288 MW at the end of 2020 with a Thermal Capacity of 3,649 MW (constituting 69%), Hydro Capacity of 1,580 MW (29.9%) and Solar Capacity of 59 MW (1.1%). Hydropower had been the main source of electricity till 2016 when it was overtaken by the thermal generation sources which use oil and gas as the main fuel source.

In addition, Ghana's annual electricity consumption per capita, even though has increased from about 337 kWh in 2010 to 534 kWh in 2020⁷ due to the improvement in electricity supply among other factors, is still below the global minimum average of 1,000 kWh for a typical lower-middle-income developing country.

The improved regulatory regime and the decline in the cost of solar equipment present enormous opportunities to scale-up investments in Renewables, particularly solar and wind. However, increasing penetration of intermittent solar and wind power poses transmission-

⁶ Ghana Key Energy Statistics Handbook, 2021 Edition

⁷ Ghana Key Energy Statistics Handbook, 2021 Edition

coupling challenges to the existing grid network and for that matter requires additional innovative, technological and regulatory regimes.

The average end-user tariff increased steadily between 2010 and 2016. Despite a marginal reduction between 2016 and 2020 the prevailing tariff is still high and consequently contributing to the high suppressed demand. Ghana is confronted with an over-supply of relatively high-priced electricity due to unfavourable Power Purchase Agreements (PPAs).

Ghana is endowed with an area of 253,151km² offshore sedimentary basins consisting of 232,968km² covering up to the outer limits of the Exclusive Economic Zone and 20,183km² of extended continental shelf recently affirmed by the United Nations. Out of these, over 62,000km² is currently under petroleum exploration and production license. There is also an inland sedimentary basin of about 106,000km². Total national oil and gas reserves as of December 2020 were 938.26 mmbbl of oil and 1.92 Tcf of gas. The contributions are from the following fields; Greater Jubilee, TEN, Sankofa Gye Nyame and Pecan Deep Water Tano /Cape Three Points fields.

Total oil production from inception to December 2020 across all producing fields was 453.38 mmbbls comprising;

- 312.46 mmbbls from Jubilee since November 2010
- 39.45 mmbbls from TEN since August 2016 and
- 51.47 mmbbls from Sankofa Gye Nyame (SGN) since May 2017

The average daily oil production across the three (3) producing fields from inception to December 2020 was 183,361 bopd.

The total gas evacuated for domestic use from all fields from inception to December 2020 was 255.03 Bcf comprising;

- 144.71Bcf from Jubilee field since December 2014
- 14.93Bcf from TEN field since May 2017 and
- 95.39 Bcf from SGN since August 2018

The Saltpond field has ended its production life, and the decommissioning of the field has commenced. It is anticipated that the three oil and gas producing fields would peak during the next decade and start declining by 2030. There is, therefore, the need to step up the pace of exploration activities.

Liquefied Petroleum Gas (LPG), which is regarded as a cleaner cooking fuel, has the potential to reduce wood fuel use as a home cooking fuel. The National LPG penetration share of household cooking fuel increased from 18% in 2010 to 25.3% in 2020⁸.

The total national LPG storage capacity coverage is, however, a challenge since the distribution centres are largely found in southern Ghana, and along the coast.

The limited storage capacity nationwide would thus continue to constrain local distribution and access. In 2020, LPG supplied was almost 332,370 tonnes. Approximately 75% was imported and the remaining 25% was produced locally with almost all the supply coming from the Gas Processing Plant (GPP) at Atuabo.

The Government is targeting 50% of the population to have access to LPG for domestic, commercial and industrial usage by the end of 2030. Consequently, Government has introduced the Cylinder Recirculation Model (CRM) for distribution of LPG as well as a new National LPG

⁸ Ghana Key Energy Statistics Handbook, 2021 Edition
<https://www.energycom.gov.gh/files/Key%20Energy%20Statistics%20Handbook%202021.pdf>

Promotion Programme (NLPGPP) that provides certain interventions to enable the switch to LPG. The Government has commenced the implementation of the LPG for Development (LPG4D) Programme that consolidates all of the Government's efforts in the promotion of LPG including the CRM and NLPGPP.

2.5 ENERGY SECTOR VISION

The Vision of the Energy Sector is to be self-sufficient in the provision of sustainable energy and for export.

2.6 ENERGY SECTOR MISSION

The mission of the Energy Sector is to make competitively priced energy universally accessible and readily available in an environmentally sustainable manner for the local market and export.

2.7 CORE VALUES AND GUIDING PRINCIPLES

The core values of the Energy Sector are Equity, Citizen Participation, Transparency, Safety, Security of Investment, Efficiency, Energy Security and Environmental Sustainability.

CHAPTER 3: GHANA ENERGY SECTOR

The chapter presents the structure of the energy sector comprising the Ministry, the regulators and the service providers, their responsibilities as well as linkages between industries and the sub-sectors. The chapter also outlines and discusses the opportunities and challenges of the sector.

3.1 INSTITUTIONAL AND LEGAL FRAMEWORK

3.1.1 Ministry of Energy

The Ministry is responsible for the formulation, coordination, monitoring and evaluation of policies and programmes for the energy sector. The Ministry has oversight responsibilities over the Sector Agencies in the implementation of sector policies.

3.1.2 Regulatory Institutions

The key agencies that regulate the Energy Sector are the Energy Commission (EC), National Petroleum Authority (NPA), and Petroleum Commission (PC); others include the Public Utilities Regulatory Commission (PURC), the Environmental Protection Agency (EPA) and the Nuclear Regulatory Authority (NRA).

Energy Commission

The Energy Commission (EC) was established by the Energy Commission Act, 1997, (Act 541) to manage the development and utilisation of energy resources of Ghana.

The Act also provides the legal, regulatory and supervisory framework for the granting of licenses for the transmission, wholesale, supply,

distribution and sale of electricity and natural gas and related matters⁹. The Act also mandates the EC to promote the efficient use of energy.

Public Utilities Regulatory Commission

The Public Utilities Regulatory Commission (PURC) was set up under the Public Utilities Regulatory Act, 1997 (Act 538) as part of the utility sector reform process.

It is the economic or fiscal regulator of utility services in the electricity and water sectors. PURC is also responsible for setting tariffs for the supply, transportation and distribution of natural gas services for power generation.

Petroleum Commission

The Petroleum Commission (PC) was established under the Petroleum Commission Act, 2011, (Act 821), to regulate and manage the utilisation of petroleum resources and to coordinate their policies. The Petroleum Commission is also mandated to promote local content and local participation and manage the national petroleum data repository.

National Petroleum Authority

The National Petroleum Authority Act, 2005, (Act 691) established the National Petroleum Authority (NPA) to regulate, oversee and monitor activities in the petroleum downstream industry in Ghana.

Its activities include coordinating the procurement of petroleum products and monitoring changes in parameters affecting petroleum-pricing

⁹ Energy Commission regulated all energy service companies in the country till July, 2005 when the downstream petroleum sub-sector activities were legally farmed out to National Petroleum Authority. Akosombo and Kpong hydroelectric dams are also excluded from being governed by the EC Act.

formula to ensure the promotion of fair competition amongst petroleum service providers.

Environmental Protection Agency

The Environmental Protection Agency (EPA) was established by the EPA Act 1994 (Act 490). The Act grants the EPA the mandate to advice on policy formulation on the environment, prescribe standards, guidelines, issue environmental permits, and pollution abatement notices.

The Act also empowers the EPA to request an Environmental Impact Assessment (EIA) prior to any activity that could affect the environment.

Nuclear Regulatory Authority

The Nuclear Regulatory Authority (NRA) was established by the Nuclear Regulatory Authority Act 2015, (Act 895) to provide for among others, the regulation and management of activities and practices for the peaceful use of nuclear materials and installations, which would include those for energy production.

3.2 ENERGY SERVICE PROVIDERS

3.2.1 POWER SECTOR

The Power Sub-Sector of Ghana is unbundled with separate jurisdictions into Generation, Transmission and Distribution.

Generation

Generation and wholesale supply of electricity are liberalised and are undertaken by state owned and privately-owned entities usually referred to as Independent Power Producers (IPPs).

Volta River Authority

The Volta River Authority (VRA) is a state-owned generation agency established under the Volta River Development Act 1961, (Act 46) with the core mandate of developing and generating electrical power by such

means as the Authority deems fit for industrial, commercial and domestic users in Ghana and neighbouring countries.

Bui Power Authority

The Bui Power Authority was established by an Act of Parliament, the Bui Power Authority Act 2007 (Act 740), with the mandate to plan, execute and manage the Bui Hydro Electric Project. The BPA amended Act 2020 (Act 1046), mandates BPA to develop renewable and other clean energy alternatives sources.

Nuclear Power Ghana Limited

Nuclear Power Ghana (NPG) Limited was approved by Cabinet to be the Owner-Operator of the first Nuclear Power plant in Ghana and was subsequently incorporated in 2018. Stakeholders of NPG Limited are the VRA, BPA and the Ghana Atomic Energy Commission (GAEC).

Independent Power Producers

There are Independent Power Producers¹⁰ (IPPs) licensed to build, own and operate power plants. As of 2020, IPPs accounted for 46% of the total installed capacity.

Transmission

The Ghana Grid Company (GRIDCo) is the only transmission utility in the country. It was established in accordance with the Energy Commission Act, 1997 (Act 541) and the Volta River Development (Amendment) Act, 2005 (Act 692), which provided for the establishment and exclusive operation of the National Interconnected Transmission System (NITS) for electricity by an independent utility and the separation

¹⁰ For all the licensed IPPs, visit Energy Commission website <http://www.energycom.gov.gh/licensing/licensing-renewable-energy-sector/register-of-licenses>

of the transmission functions of the Volta River Authority (VRA) from its other activities within the framework of the Power Sector Reforms.

GRIDCo is the operator of the NITS and is responsible for the real-time dispatch (monitoring, coordination and control) of power system operations as well as cross-border power exchanges with neighbouring countries.

Distribution

There are three power distribution entities in the country comprising two state-owned utilities: Electricity Company of Ghana (ECG) and Northern Electricity Distribution Company (NEDCo).

There is only one private distributor which operates in the Free-Zone Enclave and industrial estates in the Greater Accra region.

Electricity Company of Ghana

The Electricity Company of Ghana (ECG) is a limited liability Company wholly owned by the Government of Ghana and is the oldest electricity distribution entity in the country. It was incorporated under the Companies Code, 1963 (Act 179) in February 1997. ECG is responsible for the distribution of electricity in southern Ghana including south of Volta and up to Ashanti Region, an area coverage referred to as Southern Electricity Distribution Zone (SEDZ).

Northern Electricity Distribution Company Limited

The Northern Electricity Distribution Company Limited (NEDCo) was created in 1987 as the Northern Electricity Department (NED) of VRA, as part of the arrangements to expedite the Northern Grid Extension and Systems Reinforcement Project.

The Volta River Development Act, 1961, (Act 46) was amended to extend VRA's mandate to the distribution of electricity in Ghana and to implement the northern distribution zone component of the National Electrification Programme (NEP). NEDCo is responsible for electricity distribution in the Northern Zone of Ghana.

3.2.2 PETROLEUM SECTOR

The Petroleum sector of Ghana is categorised into Upstream and Downstream operations.

Upstream

Petroleum Upstream covers exploration, development and production of oil and gas. The activities include pre-licensing and licensing of blocks, approval of development plan, regulation of the extractions, gathering and export, and associated wastes as well as decommissioning.

The operators in the upstream segment are Ghana National Petroleum Corporation (the National Oil Company), Exploration & Production (E&P) Companies and Service Companies.

Ghana National Petroleum Corporation

The Ghana National Petroleum Corporation (GNPC) was established under the PNDC Law 64 in 1984 and mandated to undertake the exploration, development, production and disposal of petroleum and to advise Government on petroleum matters. Currently, the GNPC is a commercial operator holding the Government's interests in all Petroleum Agreements.

Exploration and Production (E&P) Companies

Besides the NOC, there are several E&P Companies currently involved in the upstream operations in the country.

Service Companies

In addition to the NOC and E&P Companies, several registered Service Companies provide specialised services to support the upstream operations.

Downstream

The petroleum downstream in Ghana includes crude oil refining and processing, storage, transportation, marketing and retailing and import and export of refined petroleum products.

Oil Refinery, Gas Processing and Petrochemical industry

There are currently three oil refineries in the country, one gas processing plant and petroleum hub under development.

Tema Oil Refinery

Tema Oil Refinery (TOR) was established in 1963 as a state refinery for processing crude into petroleum products. Until 2014, TOR was the only refinery in Ghana. TOR, which started as a simple hydro skimming plant with a capacity of about 6,000 barrels per stream day is now the only complex oil refinery fitted with Residual Fluid Catalytic Cracker (RFCC) with a processing capacity of 45,000 barrels a day. However, technical and operational challenges have limited the operations of the refinery. There are other two smaller private sector operated oil refineries in the country.

Ghana National Gas Company Limited

Ghana National Gas Company Limited (GNGC) was established in 2011 as a limited liability company with the responsibility to build, own and operate the national gas infrastructure required to ensure the role of a gas transmission utility.

Bulk Oil Storage and Transportation Company

The Bulk Oil Storage and Transportation Company Limited (BOST) was incorporated in December 1993 as a limited liability company with the Government of Ghana as the sole shareholder. BOST is responsible for bulk transportation and holding strategic stocks of petroleum products for the country. The functions of BOST have been expanded to include the export of petroleum products to other countries, particularly in the West African sub-region.

Bulk Oil Distribution Companies

The Bulk Oil Distribution Companies¹¹ (BDCs) are responsible for the importation of petroleum products to the Ghanaian market and are represented by the Chamber of Bulk Oil Distributors (CBOD).

Oil Marketing Companies

The Oil Marketing Companies¹² (OMCs) are responsible for the distribution and retailing of petroleum products. They are largely Ghanaian-owned.

Ghana Oil Company Limited

Ghana Oil Company Limited (GOIL), formerly Agip, was established in the 1960s and was later fully acquired by the Government in 1974. GOIL was listed on the Ghana Stock Exchange in 2007 with Government holding the majority shares.

GOIL undertakes marketing and distribution of petroleum products through over 300 outlets nationwide.

¹¹ For more information visit Chamber of Bulk Oil Distribution Companies website: <https://cbodghana.com/>

¹² For more information visit Association of Oil Marketing Companies website: <http://www.aomcs.org/>

Ghana Cylinder Manufacturing Company

Ghana Cylinder Manufacturing Company (GCMC) Limited was incorporated as a limited liability company in 1998 to produce Liquefied Petroleum Gas (LPG) cylinders of all sizes for the domestic and export markets. It is solely owned by the Government of Ghana. The major purpose of its establishment was to promote wider usage of LPG as a substitute for charcoal and firewood for cooking.

Petroleum Hub Development Corporation

The Petroleum Hub Development Corporation (PHDC) was established under the Petroleum Hub Development Corporation Act, 2020 (Act 1053) to promote and develop a petroleum and petrochemical hub.

3.3 ECOWAS REGION ENERGY ENTITIES

There are currently five major ECOWAS region energy entities in West Africa.

3.3.1 The West African Power Pool

West African Power Pool (WAPP) was established in 2000 under the auspices of the Economic Community of West African States (ECOWAS). WAPP aims at establishing a reliable power grid for the sub-region and a common electricity market.

3.3.2 The West African Gas Pipeline Company Limited

West African Gas Pipeline Company Limited (WAGPCo) is a limited liability company that owns and operates the West African Gas Pipeline. The company, established in 2003, has its headquarters in Accra, with field offices in Nigeria, Benin, and Togo.

The main mandate of WAGPCo is to transport natural gas through the West African Gas Pipeline in a safe, responsible and reliable manner.

3.3.3 The West African Gas Pipeline Authority

The West African Gas Pipeline Authority (WAGPA) was established in 2003 by the Treaty on the West African Gas Pipeline (WAGP) Project. Its function is to regulate and facilitate the activities of the WAGPCo.

3.3.4 ECOWAS Regional Electricity Regulatory Authority

ECOWAS Regional Electricity Regulatory Authority (ERERA) which was established in 2008, is the regional regulator for cross-border electricity trading in West Africa.

3.3.5 ECOWAS Centre for Renewable Energy & Energy Efficiency

ECOWAS Centre for Renewable Energy & Energy Efficiency (ECREEE) established in 2010 is a specialised agency with a mandate to promote renewable energy and energy efficiency markets. It acts as an independent body but within the legal, administrative and financial framework of ECOWAS rules and regulations.

3.4 LEGAL, REGULATORY AND FISCAL FRAMEWORK

3.4.1 Renewable Energy Act

The Renewable Energy Act 2011, (Act 832), provides for the development, management, utilisation, sustainability and adequate supply of renewable energy for the generation of heat and power.

3.4.2 Electricity Market and Trading Regulation

The Electricity Regulations, 2008, (LI 1937) provides for the creation of a competitive electricity market.

The Electricity Market Oversight Panel (EMOP), established in 2017 by the Energy Commission, to supervise the operation and administration of the Wholesale Electricity Market (WEM) and to carry out its functions independent of the Transmission Utility.

The mission of EMOP is to institutionalise a fully functional, well-administered contestable Wholesale Electricity Market in Ghana where there is fairness and transparency, to boost investor confidence and drive efficient operations of market participants in an effort to provide adequate, safe, efficient and reliable electricity to support the socio-economic development of the country.

3.4.3 Electricity (Local Content and Local Participation) Regulations

The Parliament of Ghana passed the Energy Commission (Local Content and Local Participation) (Electricity Supply Industry) Regulations, 2017 (L.I. 2354) into law in 2017. The objective of the Regulations is to achieve at least fifty-one percent (51%) equity participation in wholesale supply and distribution in the Electricity Supply Industry (ESI) in Ghana and sixty percent (60%) local content.

The Regulations also seek to develop capacity in the manufacturing industry for electrical equipment, appliance and renewable energy equipment.

3.4.4 Petroleum (Exploration and Production) Act

The Petroleum (Exploration and Production) Act 2016 (Act 919) is the main legislation that regulates the grant of licence for upstream petroleum activities and regulates the exploration, development and production of petroleum in Ghana.

3.4.5 Petroleum (Local Content and Local Participation) Regulations

Pursuant to Act 821, the Petroleum (Local Content and Local Participation) Regulations 2013 (LI 2204) was passed in July 2013 to, among other things, 'promote the use of local expertise, goods and services, businesses and financing in the petroleum industry value chain and their retention in the country'. The Regulations focus on ensuring maximum participation of indigenous Ghanaian companies, increased local capacity and the safeguards of the interest of foreign participants in the oil and gas sub-sectors. The Regulations apply to contractors, subcontractors, service providers, licensees and allied entities in the petroleum sub-sector. The Act provides minimum thresholds for indigenous equity participation in petroleum activities.

3.4.6 Environmental Assessment Legislations

Environmental Assessment Regulations provide the requirement for the different assessments of all activities with the potential to affect the environment adversely. The energy sector requires strict compliance with the Environmental Protection Agency Act, 1994 (Act 490), the Environmental Assessment Regulation 1999 (LI 1652) and best environmental practices in the international petroleum industry.

3.4.7 Petroleum Revenue Management Act

The Petroleum Revenue Management Act 2011 (Act 815) establishes the Petroleum Holding Fund, the Ghana Stabilization Fund and the Ghana Heritage Fund stipulates how revenues accruing from petroleum operations to the state are to be disbursed and utilised.

3.4.8 Petroleum (Exploration and Production) (Measurement) Regulations

The objective of the Petroleum (Exploration and Production) (Measurement) Regulations, 2016, L.I. 2246 is to ensure that accurate

measurement forms the basis for the determination of revenue accruing to the Republic from the production of petroleum.

3.4.9 Petroleum (Exploration and Production) (Health, Safety and Environment) Regulations

The Petroleum (Exploration and Production) (Health, Safety and Environment) Regulations, 2016, (L.I. 2258) seeks to promote safe and safeguard prudent petroleum operations and ensure that operators carry out petroleum activities in accordance with these regulations and applicable laws and standards.

3.4.10 Petroleum (Exploration and Production) (Data Management) Regulations

The purpose of Petroleum (Exploration and Production) (Data Management) Regulations, 2016, L.I. 2257 is to specify the format, contents and standards required for the preparation and submission of Geophysical, Geological, Engineering and Production Data related to petroleum exploration, development and production to support the efficient exploitation of the country's hydrocarbon resources.

3.4.11 Petroleum (Exploration and Production) (General) Regulations

Pursuant to subsections (1) and (2) of section 94 of the Petroleum (Exploration and Production) Act, 2016, Act 919, the Petroleum (Exploration and Production) (General) Regulations, 2018 (L.I. 2359) was passed to prescribe for matters necessary for carrying out petroleum operations and giving effect to the Act. These Regulations were recently amended by the passage of the Petroleum (Exploration and Production) (General) (Amendment) Regulations, 2019 (L.I. 2390).

3.4.12 Energy Sector Levy Act 2015 (Act 899)

The Energy Sector Levy Act is to consolidate existing energy sector levies, promote prudent and efficient utilisation of the proceeds generated from the levies, impose a price stabilisation and recoveries levy, and facilitate sustainable long-term investments in the energy sector.

3.4.13 Income Tax

Taxation of activities in the energy sector are regulated under the Income Tax Act, 2015 (Act 896).

3.4.14 Other Regulations

Other legislative Instruments and regulations passed to support the energy industry include the following;

- i. Petroleum Commission (Fees and Charges) Regulations, 2015 (L. I. 2221)
- ii. National Petroleum Authority (Prescribed Petroleum Pricing Formula) Regulations, 2012 (LI 2186)
- iii. Natural Gas Distribution and Sale (Technical and Operational) Rules, 2007 (LI 1911)
- iv. Natural Gas Distribution and Sale (Standard of Performance) Regulations, 2007 (LI 1912)
- v. Natural Gas Transmission Utility (Technical and Operational) Rules, 2007 (LI 1913)
- vi. Natural Gas Transmission Utility (Standards of Performance) Regulations, 2008 (LI 1936)
- vii. Energy Efficiency Standards and Labelling (Non-Ducted Air Conditioners and Self-Ballasted Fluorescent Lamps) Regulations, 2005 (LI 1815).
- viii. Energy Efficiency Standards and Labelling (Household Refrigerating Appliances) Regulations, 2009 (LI 1958)
- ix. Energy Efficiency (Prohibition of Manufacture, Sale or Importation of Incandescent Filament Lamp, Used Refrigerator, Used Refrigerator-Freezer, Used Freezer and Used Air-Conditioner) Regulations, 2008 (LI 1932)

- x. Energy Efficiency Standards and Labelling (Light Diode and Self-Ballasted Fluorescent Lamps) Regulations, 2017 (LI 2353).
- xi. Electricity Transmission (Technical, Operational and Standards of Performance) Rules, 2008 (LI 1934)
- xii. Electricity Supply and Distribution (Standards of Performance) Regulations, 2008 (LI 1935)
- xiii. Electricity Regulations, 2008 (LI 1937)
- xiv. Electricity Supply and Distribution (Technical and Operational), 2005 (LI 1816), and
- xv. Electrical Wiring Regulations, 2011 (LI 2008)

CHAPTER 4: SUB-SECTOR POLICY GOALS, OBJECTIVES, ISSUES AND POLICY DIRECTIONS

4.1 POWER SECTOR

The goal of the Power sector is to achieve price-competitive universal electricity access for sustainable economic development and export.

4.1.1 Power Sector Overview

The provision of reliable and sustainable electric power is crucial to the socio-economic development of the country. It is therefore essential to ensure that the electricity sector is vibrant and solvent to be able to respond to the needs of the growing economy.

It is noteworthy that the sector continues to make strides in achieving its objectives, but it has also faced some major setbacks. The power distribution utilities have suffered severe under-recovery of revenue due to high system losses and low levels of revenue collection, leading to a cascade of debts in the electricity supply value chain.

To ensure that power generation capacity consistently meets the power demands of the country and for export to the ECOWAS region, it is important that additional power generation capacity is procured in a competitive and timely manner based on projections determined through a comprehensive planning process.

Key areas of concern are:

- Power Sector Generation Planning
- Sustainable Gas Supply for Power Generation and other uses
- Transmission Infrastructure and Operations
- Distribution Infrastructure and Operations
- Access to Electricity

- Renewable Energy Promotion
- Integration of other cost-effective baseload power sources to improve the security of supply.
- Financing, Pricing and Competitive Procurement
- Integrated Development and Utilisation of Energy Resources along the Sub-Region

Power Sector Generation Planning

Ghana's Power sector has been plagued by power shortages since 1983 with recurring incidents of load shedding between 1994 and 2015. Since then, a number of public and private generation projects have been completed in line with Government policy. The country now has adequate generation capacity and has developed an integrated generation Master Plan to enhance planning and prevent a recurrence of power shortages in the future.

Sustainable Gas Supply for Power Generation and Other Uses

The natural gas industry in Ghana is in its nascent stage but growing at a fast pace as the sources of gas increase. Natural Gas in Ghana comes from domestic fields and imports from Nigeria through the West African Gas Pipeline. LNG is being pursued as an additional source. The primary use of natural gas would be for the generation of power.

Transmission Infrastructure and Operations

GRIDCo will continue to develop and expand the transmission network to accommodate expansion in power generation. These developments shall focus on the ability to safely transmit power from different sources to the load centres across the National Interconnected Transmission System (NITS).

Distribution Infrastructure and Operations

Distribution utilities are required to provide quality and reliable power supply and services to their customers.

The utilities, however, are saddled with high technical and commercial losses, low rates of revenue collection, unreliable and overloaded lines and transformers, and challenges with customer service.

Access to Electricity

The Ministry of Energy has been implementing the National Electrification Scheme (NES) with the objective of achieving universal access to electricity supply (90% access) by 2024. Since the inception of the programme in 1990, access to electricity has continuously increased from about 20% to 86.63% as of December 2020.

Renewable Energy Promotion

Ghana has abundant renewable energy resources in the form of solar, wind, biomass, tidal wave and hydro. Significant efforts have been made in the development of solar energy for utility-scale, distributed generation and off-grid applications. Limited progress has been made on the other forms of renewables and also non-electricity solar applications such as solar thermal for drying and water heating. Solar thermal energy for drying has the potential for crop and food processing to reduce post-harvest losses, whilst solar water heating is an energy conservation option for heating in commercial/services sector as well as residential settings.

Interest in renewable energy sources, largely solar and wind, is now very strong and growing as alternate options since installation costs keep dropping. However, they are intermittent and usually not suitable as baseload power unless deployed with extensive storage systems such as batteries, which eventually make it cost-prohibitive.

Integration of nuclear as cost-effective baseload power source to improve the security of supply

Nuclear energy has over the decades formed the backbone of the power systems of most developed countries. It has over the years provided low-cost power production for homes and industry.

Nuclear power has the advantage of greater security of supply and non-emission of Greenhouse Gases (GHGs). In Ghana's quest to improve upon energy security in the future, the energy sector has commenced the necessary steps of incorporating nuclear power as the next clean baseload option for the country.

Financing, Pricing and Competitive Procurement

Electricity prices in Ghana are relatively high compared to other countries in the ECOWAS region. End-user tariff after the load shedding in 2007 averaged 12.6 UScent/kilowatt-hour (kWh) whilst the end-user tariff from 2013 to 2020 averaged 15.8 UScent/kWh.

The price of electricity has a major impact on the viability and competitiveness of business and industry in the country and is also a matter of significant concern to residential users. Electricity tariffs are relatively high to consumers, particularly businesses and industries, which in turn feed into an uncompetitive business climate. The tariff setting also remains opaque and unclear to key stakeholders. Low tariffs could be achieved through the review of the tariff structure, provision of fully cost-reflective tariffs, competitively pricing of electricity and the efficient operation of the utilities to reduce losses. This will eventually contribute to the reduction in the current prevailing power sector debt burden.

Over the years, many of the nation's power generation plants have not been procured through competitive processes.

This has led to the high cost of electricity generation in the country making tariffs paid by commercial and industrial entities much higher than those paid by similar businesses in other countries that they compete with. This adversely affects the competitiveness of local businesses, ultimately leading to job losses.

Integrated Development and Utilisation of Energy Resources in the ECOWAS Region

The West Africa region benefits immensely from developing and utilising energy resources across the region such as the WAGP and the WAPP. Regional integration of energy resources will facilitate economic growth, socio-political and security objectives among member states. It is imperative for regional government to invest in the regional connection transmission network to improve power exchanges in the region.

4.1.2 Energy Planning

Sub-Goal

To develop an integrated planning system to meet Ghana's growing electricity demand reliably and cost-effectively in a sustainable manner.

Policy Objective

To coordinate and develop a power sector plan in line with integrated energy sector plans.

Issue

Coordination constraints in the implementation of approved energy plans and related recommendations.

Policy direction

- Ensure adherence to the approved energy plans and strategies.
- Ensure adherence to the electricity and fuel supply-demand plans using licensing requirements.

4.1.3 Generation

Sub-Goal

To achieve cost-competitive electricity generation and energy security in a sustainable manner.

Policy Objectives

- To expand generation to meet local demand and for export.
- To attain a cost-competitive diversified generation mix for enhancement of energy security as well as mitigating any potential environmental challenges.
- To facilitate both private and public investments in power generation.
- To consolidate all hydro assets and separate them from thermal generation.
- To ensure and preserve the financial health of generation utilities.

Issue 1

High cost of thermal electricity generation.

Policy direction

- Implement a supply plan utilising competitive bidding for all future procurement of electricity supply.
- Develop a standard Power Purchasing Agreement template to be used across the industry.

Issue 2

Excess generation capacity due to low patronage

Policy direction

- Grow demand for power such as the introduction of electric propulsion vehicles into the economy.
- Explore new export market.
- Develop competitive pricing regime.

Issue 3

The potential impact of climate variability on hydroelectricity generation.

Policy direction

- Ensure prudent reservoir management of hydropower plants.

Issue 4

Frequent breakdown of some power plants.

Policy direction

- Maintain adequate reserve margin.
- Ensure preventive and corrective maintenance.

Issue 5

Relatively low generation efficiencies of the thermal plants.

Policy direction

- Use licensing requirements to ensure adherence to efficiency standards.
- Convert simple cycle power plants to combined cycle power plants.

4.1.4 Transmission

Sub-Goal

To develop a grid transmission system that facilitates adequate, efficient and cost-competitive power transmission.

Policy Objectives

- To build an adequate, safe and reliable transmission network for the supply of electricity to all parts of the country and for export.
- To ensure and preserve the financial health of the transmission utility.

Issue 1

Delay in payment of transmission service charge by off-takers.

Policy direction

- Ensure proper oversight of financial management in the sector.

Issue 2

The inability of the transmission system to handle large generation from variable renewable sources.

Policy direction

- Develop strategy and plan for dealing with intermittent generation.

Issue 3

Inadequate investment in transmission network.

Policy direction

- Support strategic transmission infrastructure investments, using both private and public funding approaches.

4.1.5 Distribution

Sub-Goals

- To accelerate the achievement of universal access to electricity in the country.
- To strengthen the electricity distribution system to enhance a competitive electricity retail market.

Policy Objectives

- To develop an electricity distribution system that makes electricity universally accessible throughout the country.
- To seek adequate investment to improve the electricity distribution network and the quality of electricity supply.
- To introduce retail competition in the supply of electricity.
- To ensure the reduction of distribution systems losses to meet industry's benchmark.
- Ensure and preserve the financial health of the distribution utilities.

Issue 1

Limited grid electricity access in rural and island communities.

Policy direction

- Develop hybrid/renewable energy-based mini-grids as an integral part of rural access strategy, particularly for island/peninsula communities.

- Increase funding for the National Electrification Scheme.
- Extend uniform pricing regime of grid electricity to cover mini-grids and build the cost into the overall tariff setting.

Issue 2

Low revenue generation due to low level of electricity consumption in grid-connected rural and island communities.

Policy direction

- Continue to promote productive uses of electricity as an integral part of the Rural Electrification Programme.

Issue 3

Low revenue collection by distribution companies from the sale of electricity.

Policy direction

- Modernise metering and data collection system to improve revenue collection.
- Enforce administrative and legal sanctions.
- Improve customer services delivery.

Issue 4

Low reliability of distribution network.

Policy direction

- Use licensing requirements to ensure adherence to efficiency standards.
- Promote investment in the network infrastructure.

- Strengthen the regulatory institution and enforcement mechanisms.

Issue 5

Inability of the distribution companies to sustain the maintenance of the distribution infrastructure leading to high technical and commercial losses.

Policy direction

- Facilitate investment by distribution utilities to improve performance (efficiency and reliability).
- Implement projects to reduce distribution system losses and improve system reliability (reduce outages and improve quality).
- Introduce private sector participation in the retail end of the distribution segment to improve commercial performance.
- Introduce private sector participation in the retail end of the distribution segment to improve technical and commercial performance.

Issue 6

Punitive tariff structure for industry.

Policy direction

- Re-structure the current tariff regime to make industrial tariff competitive
- Improve efficiency in electricity delivery services

Issue 7

Lack of sustainable mechanisms to address ownership and finance the operations and maintenance of street lighting infrastructure.

Policy direction

- Develop sustainable mechanisms to address ownership and finance the operations and maintenance of street lighting infrastructure.

Issue 8

- Financial burden due to excess grid capacity

Policy direction

- Ensure competitive procurement of power plants

4.1.6 Financing and Tariff Setting

Sub-Goal

To have an efficient electricity pricing system for both the local and the export markets

Policy Objectives

- To set a competitive tariff without impairing the financial health of the distributing utilities.
- To restructure the tariff regime to provide uniform pricing for all consumers

Issue 1

Lack of clarity in the tariff setting and approval process.

Policy directions

- Institute an open and transparent review of electricity tariffs.

- Publish detailed tariff structure, including calculations and assumptions.

Issue 2

Lack of cost-reflective tariff.

Policy directions

- Ensure consistent application of the Automatic Adjustment Formula (AAF) for electricity tariff.
- Regulate operations of the distribution services to achieve financial sustainability of the utility companies as well as ensure consumer protection.
- Institute mandatory independent financial and technical audit of proposals submitted by utilities.

Issue 3

Unsustainable cross-subsidisation of residential consumers by non-residential customers.

Policy directions

- Facilitate the delivery of competitively-priced power to all classes of consumers as well as for export.
- Establish the necessary but rational level of taxes and levies on electricity costs to provide for other social needs such as street lights, rural electrification, ancillary services and energy efficiency, which is to be reduced periodically.

Issue 4

The high price of electricity, making most local industries uncompetitive to operate.

Policy direction

- Develop and implement a mechanism to monitor the availability of power plants by the Grid Operator.
- Re-structure the current tariff regime to make industrial tariff competitive
- Improve efficiency in electricity delivery services

Issue 5

Relatively high and non-competitive electricity tariff.

Policy directions

- Facilitate the regular review the methodology of the tariff structure to make it competitive.
- Ensure efficient cost in the operation of the transmission and distribution utilities.
- Ensure competitive procurement of additional power.

4.1.7 Electricity Regulation

Sub-Goal

To achieve uniform rules of practice for generation, transmission, wholesale supply, distribution and sale of electricity.

Policy Objectives

- To review the power sector regulators Acts to reflect current trends.
- To create a unified regulator for economic and technical regulation.

- To create, enforce and continuously review and apply a fair, transparent and predictable regulatory framework for the electricity sector.

Issue 1

Lack of regulatory framework for mini-grid.

Policy direction

- Develop a regulation for mini-grid electrification.

Issue 2

Non-compliance of the regulatory framework for competitive procurement of new generation capacity.

Policy directions

- Strengthen, monitor and enforce regulations and licence conditions at all times.
- Ensure that efficiency, cost-effectiveness and innovation are achieved through the regulatory framework.
- Ensure that all licensees apply best utility practices throughout the industry.

Issue 3

Challenges with balancing cost reflectivity and affordability.

Policy directions

- Create an environment for retail competition in the electricity market.
- Encourage private sector participation in the distribution of electricity.

Issue 4

Non-profitability of NEDCo area with lifeline customer base.

Policy directions

- Complete the decoupling of NEDCo from VRA.
- Liaise with appropriate authorities to incentivise investors to locate industries in NEDCo operational area.

4.1.8 Electricity Market and Trading

Sub-Goal

To achieve competitive electricity market in Ghana.

Policy Objectives

- To accelerate the development and full operationalisation of the electricity market;
- Encourage private sector participation in the retail end of electricity distribution.

Issue

Delay in the full operationalization of the electricity market.

Policy directions

- Enhance accelerated development and operation of the electricity market and remove all bottlenecks to competition.
- Support the development of retail competition in the electricity market.
- Facilitate the entry of Independent Power Producers (IPPs) through competitive bidding.
- Ensure improved performance of electricity utility companies.

- Promote and provide the enabling environment to support regional initiatives towards the development and utilisation of energy resources in the region in conformity with ECOWAS Energy Protocols.
- Implement rules for the operation of the electricity market.
- Create and enhance the domestic electricity market for the residential, industrial and commercial customers.

4.1.9 Competitive Pricing for Strategic Industries

Sub-Goal

To have an electricity pricing mechanism that makes the country's strategic industries sustainable and economically competitive.

Policy Objective

To dedicate significant low-cost generation sources to strategic industries.

Issue

Lack of competitively priced power for electricity-intensive strategic industries.

Policy direction

- Establish competitive industry tariffs for electricity-intensive strategic industries.

4.2 RENEWABLE ENERGY

4.2.1 Renewable Energy Sector Overview

Ghana considers renewable energy as an option to contribute to the overall energy supply mix and to minimise the adverse effects of energy production on the environment. The development of renewable energy in Ghana would contribute to our quest to transition the energy sector to a low carbon pathway in line with global drive for energy transition.

Ghana's renewable energy resources include hydro, solar, wind, bioenergy, tidal waves and all forms of energy sources that could be used to generate energy while emitting little or no greenhouse gases (GHG).

Hydropower

Hydropower plants in the Volta River basin comprising Akosombo, Kpong and Bui are the most developed renewable energy resource in the country. Yet to be developed are the small and medium-scale hydro resources of capacities less than 100MW.

A total of 21 potential sites that could be developed for power generation have been assessed in the country. Other sites with much bigger potential can be profitable if only they are developed as hybrid schemes or for multi-purpose (water supply, irrigation, transportation) use.

Solar Energy

Ghana is well endowed with solar energy resources, which could be exploited for electricity generation and thermal applications such as water heating and crop drying.

The average solar irradiation per day in different parts of the country ranges from 4 to 6 sunshine hours¹³ with a solar irradiation intensity of up to about 5.7 kWh/m²/day.

¹³ 1 sun hour = 1 peak sunshine hour equivalent to 1000 W/m²

Solar Photovoltaic (PV) technologies are becoming increasingly available for a wide range of applications requiring electricity for telecommunication, irrigation, off-grid and grid-tied applications for commercial and residential use.

The capacity of Solar PV electricity installations as of December 2020 was about 88.7MW with over 65% in grid-connected areas¹⁴.

Contribution from the solar resource in the national electricity mix including stand-alone off-grid solar systems thus accounts for just about 2.0% of electricity installed capacity.

Solar water heating could supplement commercial and residential water heating needs as an energy conservation measure, whilst solar crop drying could also help mitigate post-harvest losses of both cash and food crops.

Wind Energy

Wind energy, like solar, is intermittent and is yet to record any significant installation in the country. Currently, no grid-connected wind energy system has been installed in the country.

Ghana's wind power potential falls within moderate to high wind speed ranging from 5m/s – 9m/s at 50m – 120m above ground level, mainly along the east coast.

Tidal Wave

Ghana has a coast line measuring 550km with the high potential of generating electricity from tidal wave. However, this resource potential is yet to be assessed.

¹⁴2021 National Energy Statistics
<https://www.energycom.gov.gh/files/2021%20published%20Energy%20Statistics.pdf>

Bioenergy

In 2020, bioenergy (mainly biomass) accounted for about 36% of the total primary energy used in the country¹⁵. These comprised mainly of wood from various sources such as farmlands and forest plantations.

Firewood and charcoal are still dominant fuels for cooking, food processing and heating in households and commercial facilities as well as the small and medium scale industries in the country.

The extraction and processing of wood from the forest generate large quantities of wood wastes, which currently serve as the major source of firewood but could also serve as fuel for power generation.

Ghana has had an indigenous charcoal industry, which met the needs of many households. Charcoal, now a foreign exchange earner, has compounded the harvesting of wood from forests contributing to deforestation. It is imperative to cultivate woodlots in charcoal-producing communities to curb the dependence on the natural forest.

The vast arable and degraded landmass of the country has the potential for the cultivation of crops and fast-growing plants that could also be converted into bioenergy. The development of alternative transportation fuels such as gasohol and other biofuels can supplement fuels for the transportation sector and contribute to the acceleration of the energy transition agenda.

Effective regulation of the bioenergy (Biofuel and Biomass) industry shall require the establishment of procedures on:

¹⁵ 2021 National Energy Statistics
<https://www.energycom.gov.gh/files/2021%20published%20Energy%20Statistics.pdf>

1. Permitting, inspection and handling for the processing of biofuel feedstock into liquid biofuels such as biodiesel.
2. The use and processing of agricultural and animal wastes as a biofuel feedstock.
3. Quality assurance of the products to be within acceptable standards.

In addition to effective regulations, biofuel production, supply and marketing strategies shall focus on the use of fiscal incentives and the establishment of adequate storage and distribution facilities throughout the country.

Renewable Energy-Based Mini-Grid Electrification

Mini-grids have a long history of electrifying remote communities in developing countries and have emerged as a viable and scalable option for last-mile electrification in Ghana. Renewable energy mini-grids have the unique ability to increase energy access in remote areas while providing high-quality energy to households and businesses. Through the Ghana Energy Development and Access project (GEDAP), Ghana piloted mini-grid pilot projects in five island communities in the Volta Lake and the Volta River. The Government of Ghana opted for the public sector-led business model for the development of mini-grids and subsequently mainstreamed it into the National Electrification Scheme to ensure that mini-grid customers enjoyed the same level of services and benefits available to national grid customers. The focus of mini-grid shall be on islands and lakesides as well remote mainland communities where the reach of the national electricity grid is financially and economically prohibitive.

4.2.2 Renewable Energy sector Goals, Objectives, Issues and Policy Directions

Sub-Goal

The goal is to increase the contribution of renewable energy to the overall energy mix of the country.

Policy Objectives

- To increase the supply of energy from renewable sources.
- To promote the development and use of proven and competitively-priced renewable energy technologies.
- To deploy renewables energy for electricity supply in remote and island communities as an alternative source to grid extension.
- To increase the penetration of non-electricity applications of renewables such as solar water heaters and crop dryers.
- To support the sustainable production and supply of bioenergy for local consumption and export.
- To promote the local manufacture of renewable energy technologies.

Issue 1

Difficulty in accessing land for renewable energy projects due to land tenure system.

Policy direction

- Demarcate specific areas for renewable energy development.
- Establish an appropriate regulatory framework for renewable energy development.

Issue 2

Potential agriculture lands being used for large-scale renewable energy installation.

Policy directions

- Explore the use of water surfaces non-agriculture lands for renewable energy development.
- Explore the option of tidal and wave energy within the maritime domain.

Issue 3

Inadequate data on renewable energy resources and their utilisation.

Policy direction

- Conduct renewable resource assessment and mapping to provide adequate and reliable data on renewable energy resources and utilisation.

Issue 4

Insufficient regulatory framework to support private sector participation in renewable energy deployment.

Policy direction

- Establish the Renewable Energy Authority.

Issue 5

Inadequate Local Content and Local Participation in the renewable energy industry.

Policy directions

- Promote Local Content and Local Participation in the renewable energy industry.
- Encourage Private Investment in Renewable Energy Industry.

Issue 6

Difficulty in accessing long-term low-cost financing, especially for interested residential customers.

Policy directions

- Initiate and promote capacity building for financial institutions.
- Operationalise the Renewable Energy Fund.
- Facilitate the development of low-cost financing schemes for renewable energy end-users.

Issue 7

Inadequate skilled manpower in the development and deployment of renewable energy technologies.

Policy direction

- Promote technical and vocational education and training to local entrepreneurs.
- Establish a certification regime for trained renewable energy technicians and engineers.

Issue 8

Low public awareness of renewable energy technologies and benefits.

Policy direction

- Increase public awareness of the benefits of renewable energy technologies.

Issue 9

Disposal of renewable energy waste.

Policy direction

- Establish renewable energy recycling and waste management industry.
- Promote the proper disposal of renewable energy waste through regulations.

Issue 10

Inefficient management of the production, transportation and marketing of wood fuel.

Policy direction

- Intensify the promotion of commercial cultivation of woodlots and non-woody plant species.

Issue 11

Lack of regulations to facilitate the development of bioenergy and the non-existence of bioenergy pricing mechanisms.

Policy direction

- Develop regulations to promote and govern the bioenergy (biofuel, biogas and biomass) industry.
- Promote the blending of biofuel with petroleum products.

4.2.3 Distributed Renewable Energy Generation

Sub-Goal

To create the enabling environment to enhance the contribution of distributed renewable energy in the overall electricity supply mix.

Policy Objective

- To increase investment in distributed renewable electricity generation in a manner that sustains the viability of the distribution companies.

Issue 1

Inadequate regulatory regime for distributed generation.

Policy direction

- Develop regulations for distributed renewable systems.

Issue 2

Lack of Net-Metering tariff regime.

Policy directions

- Engage with relevant stakeholders to ensure a tariff regime that is fair to both consumers and utilities.
- Promote renewable energy distributed generation, including a Net-Metering Scheme.

Issue 3

Impact of distributed renewable energy generation on the revenue of electricity distribution companies.

Policy direction

- Develop and or adopt innovative business models to ensure the financial sustainability of distribution companies.

4.2.4 Off-Grid Renewable Electricity

Sub-Goal

To increase the contribution of off-grid renewable electricity in the generation mix.

Policy Objective

To deploy off-grid renewable energy solutions in a sustainable manner to facilitate universal access to electricity.

Issue 1

Difficulty in extending the national grid to islands, lakeside and remote rural communities.

Policy directions

- Develop mini-grid electrification options for islands, lakeside and remote rural communities in line with the National Electrification Scheme.
- Intensify the promotion of stand-alone renewable energy options for isolated homes and facilities that cannot benefit from mini-grid systems.
- Intensify the promotion of solar lanterns as a pre-electrification solution.

Issue 2

Importation of substandard renewable energy products.

Policy directions

- Develop a regulatory framework and standards for renewable energy products and systems.
- Ensure enforcement of standards for renewable energy products.

Issue 3

High investment cost of off-grid renewable energy stand-alone systems in remote areas.

Policy direction

- Develop innovative financing schemes for off-grid electrification.

Issue 4

Lack of financing mechanism for the operation and maintenance of public renewable energy installations.

Policy direction

- Provide adequate budget for the operation and maintenance of public renewable system installations.

4.2.5 Bioenergy and End-Use Technologies

Sub-Goal

To increase the contribution of bioenergy in the renewable energy supply mix.

Policy Objectives

- To establish sustainable, efficient and affordable wood fuel value chain.
- To develop and improve capacity for efficient biomass conversion technologies and end-use devices.
- To develop and promote the supply of biofuels such as biogas and bioethanol for households and commercial use.
- To develop regulatory frameworks for the promotion and efficient utilisation of bioenergy resources.

Issue 1

Unsustainable exploitation, processing and use of wood fuel resources.

Policy directions

- Promote the sustainable cultivation, harvesting and utilisation of fast-growing wood fuel resources.
- Discourage harvesting of fuelwood from uncultivated sources.
- Promote the use of agricultural and wood wastes as wood fuel.

Issue 2

Adverse health and environmental impacts of biomass conversion and end-use devices.

Policy directions

- Implement behavioural change campaigns
- Promote the development and use of clean biomass cookstoves.
- Promote efficient end-use biomass technologies

Issue 3

Low penetration of efficient biomass conversion technologies (charcoal, briquette, pellets, etc.).

Policy direction

- Promote the development and use of efficient and clean biomass conversion technologies.

Issue 4

Low efficiency of available biomass cookstoves.

Policy direction

- Promote research and development of efficient biomass cookstoves and fuels that meet the needs of consumers.

Issue 5

High cost of improved biomass cookstoves and fuels.

Policy directions

- Provide incentives to attract private sector investment in the local production of improved cookstoves.
- Establish sustainable, cost-effective and marketable wood fuel production methods.

Issue 6

Low prioritisation and support for biomass fuels and end-use devices.

Policy direction

- Provide incentives for the development, commercial production and use of efficient biomass conversion technologies.

Issue 7

Low public awareness of the benefits of efficient biomass cookstoves.

Policy direction

- Increase public awareness of the benefits of efficient biomass cookstoves

Issue 8

Limited technical capacity for the design, production, installation and management of other technologies such as biogas and bioethanol plants.

Policy direction

- Train entrepreneurs in the design, production, installation and marketing of bioenergy technologies.

Issue 9

Low awareness of the potentials of biogas and bioethanol as alternative sustainable bioenergy sources.

Policy direction

- Promote the adoption of biogas and bioethanol in households, public institutions, industries and commercial ventures as an alternative energy source.

Issue 10

Lack of pricing mechanism for liquid biofuels.

Policy directions

- Develop a pricing mechanism for liquid biofuels.
- Promote blending of biofuels in petroleum products.

Issue 11

Lack of adequate regulatory frameworks for the bioenergy industries.

Policy direction

- Develop regulations for the promotion of bioenergy (biofuel, biogas, biomass, etc.) industries.

4.2.6 Other Non-Electricity Renewable Energy Systems

Sub-Goal

To increase the contribution of non-electricity renewables in the overall energy supply mix.

Policy Objective

To promote the non-electricity applications of renewable energy to supplement the country's sustainable energy needs.

Issue

Low utilisation of non-electricity renewable energy technologies such as solar water heaters, wind water pumping systems, solar crop dryers and solar air-conditioners.

Policy directions

- Increase awareness of the benefits of non-electricity renewable energy technologies.
- Promote the productive uses of renewable energy in irrigation, crop drying and processing.

- Promote the use of wind water pumping systems, solar water heaters, solar air-conditioners and other non-electricity renewable energy technologies application.

4.3 NUCLEAR POWER

4.3.1 Nuclear Power Sector Overview

The long-term national vision of Ghana harnessing atomic energy to enhance its national development projects was first echoed by the first president, Dr. Kwame Nkrumah on November 25th 1964 during the inaugural ceremony of the Ghana Nuclear Reactor Project¹⁶. Progress on earlier plans to harness nuclear energy for power slowed down until 2008 when Cabinet approved the adoption of nuclear power as part of Ghana's energy supply mix.

The Ghana Nuclear Power Programme Organization (GNPPO)¹⁷ has therefore been set up with the mandate to see to the development and implementation of the necessary nuclear infrastructure for the country's first nuclear power plant. The Ministry of Energy coordinates the activities of the GNPPO. The Ghana Nuclear Power Programme is being developed in accordance with the roadmap document of the GNPPO¹⁸ based on a framework provided by the International Atomic Energy Agency (IAEA)¹⁹. The IAEA nuclear power development framework outlines 19 nuclear infrastructure requirements for newcomer countries like Ghana.

¹⁶ Ghana Atomic Energy Commission, *At a Glance*, GAEC, Kwabenya, 1988.

¹⁷ Office is currently in the Ministry of Energy.

¹⁸ NPID-120000-STG-001, the Roadmap for Ghana Nuclear Power Programme, Revision 0, GNPPO, January 2016.

¹⁹ Milestones in the Development of a National Infrastructure for Nuclear Power, IAEA Nuclear Energy Series, Safety Guide, Revision 1, NG-G-3.1, IAEA, Vienna, Austria, 2015

According to the roadmap of GNPPPO, the first nuclear power plant is expected to be integrated into the national electricity supply mix by 2030.

The roadmap for Ghana's nuclear power programme has identified actions for each of the 19 IAEA infrastructure requirements. These include funding and financing, nuclear safety, regulatory framework, environmental protection, human resource development and industrial involvement. These actions have been adopted by the GNPPPO. Appropriate agencies to be responsible for the various infrastructure actions in the roadmap have been identified. The Ghana Atomic Energy Commission (GAEC) handles the technical aspects of GNPPPO's role, the Nuclear Regulatory Authority regulates all activities associated with nuclear safety, and Nuclear Power Ghana Limited as the owner-operator of the first nuclear power plant in Ghana. The GNPPPO has carried out studies, including a self-evaluation²⁰ of Ghana's infrastructure for nuclear power, in accordance with the IAEA methodology.

Infrastructural issues being addressed include the following:

Legal and Regulatory Requirements

Legal and regulatory requirements of the nuclear energy programme have to be factored into the decision to start up a nuclear energy programme. Ghana has ratified all international legal and regulatory commitments in accordance with the IAEA. However, some national regulations need to be amended in accordance to international practice to fully regulate the nuclear energy sector.

Independent and Strong Regulator

There is a need for a strong and independent regulatory body to ensure a safe, secure and environmentally sound nuclear power industry in the

²⁰ NPID-120000-PRG-001, Integrated Nuclear Infrastructure Review Mission, Self-Evaluation Report, Revision 1, GNPPPO, November 2016.

country. In this regard, the role and mandate of the regulatory body must be clear, with transparency, accountability and a culture of independence and responsibility as key tenets of the organisation. Consequently, the Nuclear Regulatory Authority was established in 2015 by the Nuclear Regulatory Authority Act (Act 895) to regulate all activities in the nuclear sector.

Responsible Owner/Operator

The introduction of nuclear energy into Ghana's energy mix requires the establishment of an owner/operator organisation to build the human and physical infrastructure that would support the nuclear power programme throughout its life cycle. In view of the above, Cabinet approved the establishment of the Owner/Operator in 2018. Subsequently, Nuclear Power Ghana Limited (NPG) was incorporated jointly by the Volta River Authority, Bui Power Authority and the Ghana Atomic Energy Commission. The independence of NPG is key to ensure compliance with regulatory requirements for nuclear safety, security and safeguards.

Spent Fuel and Nuclear Waste Management

Operation of nuclear power plants would produce a number of different levels of waste that will need to be managed in different ways. Radioactive waste must be managed in a safe and environmentally acceptable manner in accordance with international best practice for its long-term storage and management.

Decommissioning

Due to the long operational lifespan of a nuclear plants before decommissioning, the GNPPPO shall ensure that the operator of the nuclear facility draws up a plan for the decommissioning, provide a sound financial plan and ensure that funds are available to cover the decommissioning costs when needed, even in the event of a premature shutdown.

Siting Considerations

Siting assessment criteria shall be developed for the selection of potentially suitable site(s) for the construction of nuclear power plant(s). Potentially suitable sites must be acquired by the Government. Such site(s) should be acquired as early as possible and preserved for future nuclear power project(s). The size of an acquired site should be large enough to enable the construction of a minimum of two conventional sized nuclear power plants per site.

Funding and Finance

Funding and financing mechanisms shall be put in place to address the uncertainties and risks associated with developing and financing nuclear power programmes and projects, as well as maintain the needed hard and soft nuclear infrastructure.

These projects are generally characterised by large capital requirements, long construction periods and uncertainty over costs and schedules.

Infrastructure Development

The generation and transmission of nuclear electricity necessitate a significant amount of hard and soft infrastructure. Government shall, therefore, ensure that all regulatory activities and radiation protection, research and development for nuclear energy as well as education programmes for human nuclear resource under the 19 IAEA infrastructure recommendations, are developed in accordance with international standards.

Design Considerations

The selection of nuclear power reactor types shall be influenced by detailed Reactor Technology and Regulatory Assessments by the GNPPO. Technology assessment includes the following; technology maturity, self-reliance, siting considerations, economics, local industry participation, grid connectivity, and operational history.

Development of Human Resource

Qualified and competent personnel are essential for the safety, security and reliability of nuclear power plant operation and maintenance, of which nuclear engineers form only one-twelfth of the required workforce. The GNPPPO shall, therefore, liaise with all relevant agencies to build up the remaining workforce from the existing generation plants and equip them with the protocols of working at the nuclear plant.

Preparation Phase, Public Acceptance and Participation in Decision-Making

An effective and clear public information programme shall be established with relevant stakeholders on all aspects of research and development, construction and operation of nuclear facilities, radiation and radioisotope applications, regulation and licensing, and policymaking of the national nuclear power programme. This is to enhance continuous public acceptance and cooperation.

International Cooperation

The nuclear power industry is a global community. Government shall continue to establish strategic bilateral partnerships and alliances with more advanced nuclear power countries, technical organisations, as well as new and expanding nuclear power countries in order to share experiences.

Third-Party Liability

Government through the regulatory body shall ensure that legislative and regulatory regime for third-party nuclear liability is put in place for the mutual benefit of all parties in accordance with international best practice. This is to avoid ruinous claims for damages and the need to protect the population.

4.3.2 Nuclear Power Sector Goals, Objectives, Issues and Policy Directions

Sub-Goal

To integrate nuclear power into the national electricity generation mix as baseload to guarantee long-term supply security, address the issues of climate change and reduce air pollution.

Policy Objectives

- To secure competitively priced baseload electricity for long-term energy supply through the utilisation of nuclear energy.
- To develop a resilient energy infrastructure to include nuclear power generation.

Issue 1

Inadequate coordination among key players in the development of the nuclear power programme.

Policy direction

- Enhance coordination amongst the nuclear power programme and key energy sector players.

Issue 2

Limited industrial capacity in the development of the nuclear programme.

Policy direction

- Create an enabling environment for local industries to upgrade and expand facilities and programmes for effective industrial participation.

Issue 3

Inadequate funding and financing mechanism for nuclear power programme.

Policy direction

- Develop and implement a functioning mechanism for funding and financing nuclear power programme.
- Establish strategic bilateral and multilateral partnerships with nuclear power countries and international Institutions.
- Encourage Public-Private Partnership (PPP) investments in the development of nuclear power projects.

Issue 4

Public concerns about the risks and safety of nuclear power plants.

Policy direction

- Educate and sensitise the public (policymakers, legislators, media, educational institutions, chiefs and opinion leaders) to address their concerns.
- Regularly review regulatory frameworks to address issues of safety, security and safeguards in accordance with international best practices.
- Ensure the deployment of proven technology for the first nuclear power plant to engender public confidence.

4.4 PETROLEUM

The goal of the Petroleum sector is to make Ghana's petroleum industry transparent and sustainable for the benefit of present and future generations.

4.4.1 Upstream Overview

Ghana has four (4) sedimentary basins, three (3) of which are offshore (Western, Central and Eastern) and one (1) inland basin (Voltaian). The Voltaian basin, approximately 103,600 km², is currently undergoing intensive exploration. The scope involves the acquisition, processing and interpretation of 2D and 3D seismic data, collection and analysis of subsurface gases for geochemical studies and drilling of two exploration wells. The Western and Eastern Basins are also endowed with outer continental shelves designated as Western Continental Shelf Region and Eastern Continental Shelf Region respectively, which have not been explored.

Currently, there are three (3) producing fields; Jubilee, Tweneboa-Enyenra-Ntomme and Sankofa-Gye Nyame, all of which are in the Western Basin.

Jubilee Field

The Jubilee field which was discovered in 2007 straddles the West Cape Three Points and Deepwater Tano Blocks.

Under the Petroleum Exploration and Production Law (PNDC Law 84) and Article 8.20 of the Petroleum Agreements, the discoveries were unitised to optimise production. Oil production commenced in November 2010 and by the end of December 2020, a total of 312.46 million barrels of oil and 516.49 bcf of associated gas had been produced.

In addition to the Jubilee Field, there have been several discoveries, including TEN and Sankofa-Gye Nyame fields which are in production.

Tweneboa-Enyenra-Ntomme (TEN) Field

The TEN development Field covers an area of about 463 km² in the Deepwater Tano Block approximately 60km offshore Ghana and about 25 kilometres (km) from the Jubilee Field. The Field lies in water depths

of 1,000 to 2,000 metres. Production from the TEN fields commenced in August 2016. Cumulative production from the Field stood at 89.45 million barrels of oil and 179.88 bcf of gas as of December 2020.

Sankofa – Gye Nyame (SGN) Field

The Sankofa – Gye Nyame Field is made up of Sankofa Main oil discovery, Gye Nyame oil discovery and Sankofa East non-associated gas discoveries. Phase-1 (Oil production) came on stream in May 2017 while Phase-2, which involves the exploitation of non-associated gas commenced in August 2018. Cumulative production of oil and associated gas from the SGN fields as of December 2020 was 51.47 million barrels and 97.70 bcf respectively. Production of Non-Associated Gas (NAG) was 170.81 bcf as of December 2020.

4.4.2 Petroleum Exploration and Exploitation

The primary concern to address and ensure transparency, accountability, industry predictability and development sustainability include:

- a) Pre-licensing
- b) Licensing and Exploration
- c) Development, Production and Decommissioning
- d) Transportation

a) Pre-Licensing

Pre-licensing covers the following:

Clarification of jurisdiction

Ghana gives due recognition to any previous arrangements with neighbours regarding boundaries. Where discoveries are transboundary in nature, Ghana shall cooperate with its neighbours for the optimal exploitation of the resources.

No exploration shall be undertaken at an area where the Ghanaian jurisdiction is unclear due to unresolved boundaries with neighbouring states.

Assessment of Petroleum Potential

Mechanisms for assessing or verifying petroleum potential shall be established, thus, ensuring that at all times, Government has a well-founded assessment of the nation's petroleum potential.

Environmental and Social Impact Assessment (ESIA)

All activities that may be deemed to significantly impact the quality of the environment shall be subjected to national environmental and social impact assessment regulations.

Local Administration

Due regard shall be taken to coordinate with local administrative bodies to harmonise and ensure synergies among local and national goals and interests and also with relevant laws in all undertakings.

Expectation Management

In view of the uncertainties and risks associated with petroleum operations, and in order to minimise the high and unrealistic expectations, every effort shall be made to pre-empt the dissemination of false and/or unfounded information about petroleum operations, by providing the public with accurate, pro-active and objective information promptly.

b) Licensing and Exploration

Licensing in Ghana according to section 10(3) of Petroleum (Exploration and Production) Act 2016, Act 919 can only be undertaken through an open, transparent and competitive public tender process.

In order to encourage investment in the upstream petroleum industry and the selection of qualified oil companies to operate in Ghana, it is important that the licensing process remains transparent. Licensing issues that must be regulated and monitored for transparency encompass:

- (i) Licensing of Blocks
- (ii) Diversity of licensees
- (iii) Reconnaissance licences
- (iv) Work Programmes
- (v) Government monitoring of operations and approvals
- (vi) Periodic reports on petroleum operations.

Licensing of Blocks

Ghana shall have a competitive bidding process and where necessary, may adopt direct negotiation for entering into a petroleum agreement. Licensing rounds shall be consistent with the desired rate of resource exploitation.

Diversity of Licensees

In the interest of enriching the petroleum environment and promoting competition, the grant of petroleum agreements to several upstream petroleum companies with varied experiences in exploration and production shall be encouraged. Further, to promote internal controls, the formation of consortia among prospective contractors shall be encouraged to operate within each contract area.

Reconnaissance Licences

The acquisition of substantial data is of prime importance to the upstream petroleum industry and to the nation as a whole. Consequently, granting of reconnaissance licences will be encouraged to ensure that they do not interfere with petroleum operations.

Work Programmes

In as much as Government recognises the rights of investors to make returns on their investments, the benefits of upstream petroleum operations to the nation as a whole shall remain paramount at all times. As one of the criteria in determining the quality of a work programme, the added value in terms of services and benefits that contribute to the development goals and interests of the nation shall be considered.

Government Monitoring of Operations and Approvals

Established systems for monitoring and auditing upstream petroleum operations to ensure compliance with applicable laws and contract terms shall be enforced. In addition, avenues for open dialogue and cooperation with upstream petroleum companies shall be enhanced.

Periodic Reports on Petroleum Operations

In addition to annual budgetary reports on the petroleum sub-sector, the Ministry responsible for petroleum shall oversee and coordinate periodic briefings to Parliament, other public agencies and the general public on upstream petroleum operations throughout each year. These will serve the purpose of ensuring transparency, accountability and the management of expectations.

c) Development, Production and Decommissioning

In view of the Government's interest in managing upstream petroleum operations to ensure optimal and sustainable production, it shall be ensured that field development activities are carried out in a safe and environmentally responsible manner in accordance with the following;

Discovery, Appraisal and Delineation

All discoveries shall be evaluated or appraised to determine their commerciality.

Unitisation and Joint Development

For petroleum accumulations that extend beyond the boundaries of one contract area into one or more other contract areas, or an area not covered by a petroleum agreement, unitisation agreements shall be required for development of the accumulations in a coordinated and optimal manner.

Where a petroleum accumulation extends into the land or continental shelf of another country, transboundary resource management models, such as joint development, should be encouraged taking cognisance of existing international cross-boundary treaties.

Plan of Development and Operation

A Plan of Development and Operation for a commercial discovery (PDO) shall be submitted by the Operator for approval by the Minister.

Government shall approve decommissioning plans and monitor their implementation in a manner that meets legislative requirements, best available engineering and environmental practices and avoid unnecessary taxpayer exposure. Established mechanisms shall be enforced in order to avoid the possibility of decommissioning becoming a national liability.

Monitoring Reservoir Performance

In view of the fact that reservoir performance may dictate changes to the PDO, reservoir performance shall closely be monitored, and dialogue with the Operators shall be encouraged. Such is expected to improve the PDO to ensure optimal recovery at all times.

Tail-end Plan Approval

The decision by a contractor or field operator that further field production is no longer commercial does not necessarily preclude further production under different licences. Strategies for maintaining production in order to maximise resource recovery shall, therefore, be proactively pursued.

d) Transportation of Petroleum

Transportation issues in the petroleum industry are closely linked to environmental, safety and metering issues.

Thus, in addition to legislation, guidelines addressing issues of responsibilities and rights associated with the transportation of petroleum will be drawn encompassing at least the following:

Transportation Infrastructure

Transportation of petroleum shall be guided by the national interest in ensuring that all transportation infrastructure is optimally designed, utilised and operated so as to maximise production and utilisation. The interest of third parties to use the infrastructure shall be secured fairly and equitably, and regulated by legislation where necessary.

Permits and Approvals for Transportation Plans: Development and operation of minimum field infrastructure and pipelines for the production and transportation of the resource to the primary market shall not require separate licences if developed as part of the field development plans. All other infrastructure shall be developed and operated under separate licences.

Government shall require optimal and efficient utilisation of infrastructure through the sharing of capacity by industry participants. All petroleum infrastructure shall be operated on the basis of fair, equitable and open access principles detailed in legislation. A legal framework shall be provided for the eventual transfer of infrastructure to the State, where applicable.

Transportation Treaties with Neighbouring Countries: To avoid conflict in the event of cross-border activities in accordance with the existing international treaties, cordial transportation or passage agreements with neighbouring countries shall be put in place.

4.4.3 Petroleum Upstream Sector Goals, Objectives, Issues and Policy Directions

Sub-goal

Increase Ghana's share in the petroleum sector.

Objectives

The objectives are:

- To explore and develop the petroleum resources of the country.
- To acquire sufficient and quality data on all the sedimentary basins in the country.
- To ensure strict compliance with the Petroleum (Exploration and Production) Act, 2016, Act 919 and other related Laws and Regulations.
- To promote the development of marginal discoveries.
- To address the gaps, strengthen and enforce the legal, regulatory and fiscal frameworks.
- To create a favourable environment for investment in the upstream industry and minimise economic risk.
To collaborate with relevant bodies in minimising the possibility of boundary disputes.
- To promote Ghanaian Content and Ghanaian Participation in the upstream industry.
- To improve cost and recovery efficiency of producing fields.
- To ensure the provision of adequate infrastructure to link Upstream and Downstream operations.
- To ensure sustainable operations to minimise social and environmental impacts.
- To build a resilient petroleum industry against natural disasters and national health emergencies.

- To explore and establish the hydrocarbon potential of the extended continental shelf regions.

Issue 1

Insufficient data on the Voltaian Basin, offshore Central and Eastern Basins and the extended continental shelf regions.

Policy directions

- Acquire sufficient quality data on all the sedimentary basins in Ghana.
- Improve data quality to boost confidence in exploration.
- Accelerate the reconnaissance exploration programme in the Voltaian Basin.
- Pursue aggressive promotion of the Basins to attract investment, particularly Majors and Large Independents, into the industry.
- Initiate research programmes to unearth the resource potential of the Extended Continental Shelf Regions.

Issue 2

Inadequate development and production infrastructure.

Policy directions

- Promote infrastructure for hub-based development and production.
- Promote the construction of infrastructure networks to link upstream and downstream.

Issue 3

Inadequate Ghanaian Content and Ghanaian Participation.

Policy directions

- Facilitate partnership among Ghanaian companies with requisite technical and financial capabilities.
- Sustain the accelerated oil and gas capacity programme.
- Ensure the utilisation of local expertise in the procurement of local goods and services.
- Ensure the transfer of technology and know-how to Ghanaians.
- Incentivise local companies to develop relinquished marginal fields.
- Promote temporary warehousing of local participation requirements by NOC or related state enterprises where there is no private sector capacity.
- Establish a National Petroleum Technology Institute to develop Ghanaian technological research capability for the petroleum industry.
- Promote local fabrication and construction capability.

Issue 4

Low recovery efficiency.

Policy directions

- Promote enhanced recovery methods to improve recovery efficiencies.
- Create an environment for the sharing of facilities and capacities by industry players for optimum resource exploitation.
- Introduce fiscal based incentives to enhance recovery efficiency.

Issue 5

Gaps in the legal, regulatory and fiscal frameworks.

Policy directions

- Ensure attractive and predictable legal, fiscal and regulatory regimes to encourage investors.
- Ensure passage and enforcement of relevant regulations for the efficient and sustainable conduct of petroleum activities.
- Ensure clarity in Institutional and Regulatory roles in the natural gas sector.
- Ensure that production facilities conform to international standards.
- Ensure that the operation of the gas transmission network is a natural monopoly.
- Encourage the amendment of the Ghana Boundary Commission (GBC) Act, 2010 (Act 795) to include implementation of Article 82 of the United Nations Convention on the Law of the Sea (UNCLOS) for the exploitation of seabed and subsurface resources of the Outer Continental Shelf such as oil and gas.

Issue 6

High capital requirements and financial risk of petroleum exploration and development.

Policy directions

- Promote competitive tender processes in the award of petroleum exploration and production rights.
- Attract companies that have financial and technical capacity.

Issue 7

Potential international boundary disputes.

Policy directions

- Delimit and demarcate Ghana's boundaries and proactively resolve disputes with neighbours.
- Ensure the implementation of the United Nations' Recommendations on the Outer Limits of the Continental Shelf beyond 200 nautical miles.
- Collaborate with relevant bodies to establish agreements with neighbouring countries to avoid conflict in the event of cross-border activities.
- Promote dialogue with cross-border communities affected by oil activities and implement appropriate mitigation measures.

Issue 8

Impact of natural disasters and national health emergencies or pandemics.

Policy directions

- Implement fiscal incentives such as cost uplifts, investment allowances, and investment credits to reduce the cost of operations, particularly for companies that retain activity and labour during national emergencies.
- Toll or adjust work programmes in return for accelerated activity when conditions have become normalised after natural disasters.
- Develop a National Petroleum Emergency Plan to regulate operations of petroleum service companies during national emergencies.
- Review fiscal regime to address volatility in the industry arising from crisis.

Issue 9

Dwindling reserves.

Policy directions

- Accelerate exploration to increase reserves and production.
- Ensure an attractive and enabling environment through legal, fiscal and regulatory regimes to encourage investors.
- Promote competitive tender processes in the award of production rights and exploration.
- Promote enhanced oil recovery methods in development and production areas, and in producing fields.

4.4.4 Downstream Overview

The Petroleum Downstream in Ghana includes importation, exportation, storage, transportation, marketing, retailing of petroleum and refined products as well as refining and processing of petroleum.

4.4.5 Operational Guidelines

To achieve the goal of meeting local and export requirements for petroleum and refined products, the framework for operational guidelines shall include the following:

- i. Optimisation of the downstream industry
- ii. Strategic stock management
- iii. Access to petroleum products
- iv. Competitive pricing of petroleum products
- v. Quality of petroleum products
- vi. Health, Safety, Security and Environmental standards
- vii. Ghanaian Content and Ghanaian Participation
- viii. Broad relationships among Petroleum Service Providers (PSPs)
- ix. Coordination and Cooperation with other Regulatory agencies
- x. Government participation in the Downstream Industry
- xi. Carbon footprint reduction

- xii. Clean cooking solutions
- xiii. Expansion of gas pipelines for domestic and export markets
- xiv. Automation of downstream operations
- xv. Combat illegal fuel trading activities

Optimisation of the Downstream Industry

In order to optimise infrastructure development in the downstream industry, an Infrastructure Master Plan shall be developed to guide the investment priorities of the country, i.e., to increase refining capacity, storage, transportation and distribution infrastructure in all parts of the country and to provide for exports. Public-Private partnership shall be encouraged in the implementation of the master plan.

Strategic Stock Management

Due to the inadequacy of strategic stock reserves of petroleum and refined products for the country, the National Strategic Stocks Programme shall cover both public and private depots but managed by an entity designated by Government.

Access to Petroleum Products

To increase the accessibility to petroleum products in all parts of the country and for export, institutional and market constraints that hamper access to petroleum products have to be addressed. Also, existing regulations that support increased access, particularly to rural areas, shall be enforced.

Competitive Pricing of Petroleum Products

To ensure competitive pricing of petroleum products in the country and the sub-region as a whole, measures to promote further investments in the supply chain at cost-recovery levels shall be in place and promoted.

Furthermore, steps to deregulate the transportation and distribution margins to deepen the competitiveness of the market will continue to be implemented.

Quality of Petroleum Products

The need to maintain or improve the quality of all refined petroleum products cannot be overemphasised. In this regard, steps shall be taken to eliminate the incidence of contamination along the downstream petroleum supply chain. The Petroleum Products Marking Scheme shall be sustained and strengthened to eliminate the incidence of adulteration in the supply chain.

Continuous improvement in the quality of products to meet international standards within the ECOWAS Specification for Harmonizing Fuels and the African Refiners and Distributors Association (ARDA) framework shall be sustained by consistently improving the standards for sulphur levels and other harmful components in refined petroleum products.

Ghanaian Content and Ghanaian Participation

To consolidate Ghanaian Content and Ghanaian Participation in the downstream petroleum industry, promotion of the local content and local participation legislation in the ownership, trading and other activities in the downstream value chain shall be ensured. Enhancing the capacity and skills development of indigenous PSPs will be sustained. Steps to attract and retain highly skilled and competent labour for the downstream industry shall also be explored, encouraged and promoted. Steps shall also be taken to reposition and strengthen the indigenous companies to take advantage of the market consolidation.

Broad Relationship among the Petroleum Service Providers

Steps shall be taken to ensure that there is a fair and level playing field in the industry.

Coordination and Cooperation with other Regulatory Agencies

Coordination between NPA and other agencies such as Environmental Protection Agency (EPA), Ghana Standards Authority (GSA), Ghana Revenue Authority (Customs Division), Ghana Maritime Authority (GMA), Ghana National Fire Service (GNFS), Ghana Ports and Harbour Authority (GPHA), MMDAs, Security Agencies, would be cardinal to help achieve national developmental goals and objectives, optimise revenue collection, maximise local value addition as well as environmental protection.

Government Participation in the Downstream Industry

It is envisaged that the Government may, in addition to directing the industry by policy, participate in some commercial aspects of the downstream petroleum industry (such as infrastructure development) to maximise national benefit and promote local value addition, considering the strategic importance of petroleum products to every nation.

Even though the implementation of the Petroleum Product Price Deregulation Policy would continue, there may be circumstances under which Government may intervene in the prices of petroleum products through the price stabilisation margins or other levies.

Carbon Footprint Reduction

Ghana, as a signatory to the Paris Agreement, is mainstreaming low-carbon development measures in her development agenda.

Therefore, alternative low-carbon fuels such as biofuel blends, CNG, LNG, etc., shall be encouraged as well as promoted in the country. Investments in research and development in cleaner fuels, technological and market innovations to reduce GHG emissions shall be encouraged.

Clean Cooking Solutions

A high percentage of the Ghanaian population still uses traditional biomass as cooking fuels and most often with inefficient end-use devices. The adoption of LPG as the preferred cooking fuel and the use of improved cookstoves would go a long way to reduce the negative impact on the environment, and health of women and children. The National LPG penetration rate increased from 6% in 2000 to 18% in 2010 and about 25% as of 2020²¹. Government aims to continuously increase the penetration of LPG to 50% by 2030.

4.4.6 Regulatory Framework

A robust fiscal and legal framework for the development and expansion of the downstream petroleum industry would address the following:

- a) Requirements for Licensing and Permits in the Downstream Industry.
- b) Downstream Petroleum Regulations across the value chain.

Requirements for Licensing and Permits in the Downstream Industry

To ensure the viability of the downstream industry, only financially sound companies with the needed resources shall be licensed to operate. Minimum financial caps would be instituted among the industry players.

Petroleum Downstream Regulations across the value chain

To enable the petroleum downstream industry to operate efficiently, there is the need to develop appropriate legislations to govern all activities across the value chain.

²¹ 2021 National Energy Statistics

<https://www.energycom.gov.gh/files/2021%20published%20Energy%20Statistics.pdf>

4.4.7 Petroleum Downstream sector Goals, Objectives, Issues and Policy Directions

Sub-Goal

The goal for the downstream industry is to ensure an effective and efficient functioning downstream petroleum industry.

Policy Objectives

- Expand the total petroleum refinery capacity of the country.
- Ensure effective and efficient transportation, storage and distribution of petroleum and refined products to all parts of the country.
- Ensure security of supply of petroleum and refined products.
- Increase access to LPG nationwide.
- Invest in gas pipelines to facilitate the distribution of natural gas throughout the country.
- Develop a competitive gas market through the operation of open access gas transmission system.
- Strengthen coordination and collaboration among the regulator, private sector and relevant MMDAs.
- Strengthen enforcement of existing laws governing private sector participation in the downstream operations.

Issue 1

Inadequate refinery and storage capacity.

Policy directions

- Mobilise public and private sector investment to expand national crude oil refining capacity, trading, storage and transportation to

neighbouring countries and land-locked nations in the ECOWAS region.

- Expand petroleum product storage capacity, and extend petroleum products bulk distribution infrastructure to all parts of the country.

Issue 2

No strategic stock crude oil and refined products.

Policy directions

- Encourage investment in strategic stock of crude oil and refined products
- Develop a well-structured and financially viable national Strategic Stock Programme.

Issue 3

Inadequate infrastructure for downstream operations.

Policy directions

- Develop and implement a national downstream infrastructure master plan.
- Develop a downstream infrastructure financing policy.
- Accelerate the implementation of the Petroleum Hub project.

Issue 4

Inefficient mode of transportation and distribution of petroleum products.

Policy Directions

- Develop and implement a multi-modal (pipeline, railway line, road and lake) transportation network for petroleum products.

- Enhance the regulatory environment for the private sector participation in the development of a transportation network.
- Develop and implement a petroleum transportation infrastructure network to link the West African regional markets.

Issue 5

Weak enforcement of existing laws governing Oil Marketing Companies (OMCs).

Policy directions

- Regularly monitor and evaluate the operations of OMCs to ensure they conform to the existing laws.
- Collaborate with industry associations to develop their own standards to improve peer corporate governance and regulatory compliance.

Issue 6

Inadequate laws to govern the gas industry.

Policy directions

- Develop legislation on natural gas development and pricing.
- Enforcement the implementation of existing laws.

Issue 7

Low access to Liquefied Petroleum Gas (LPG).

Policy directions

- Accelerate the full implementation of the LPG for Development (LPG4D) programme.
- Implement the Cylinder Recirculation Model (CRM).

Issue 8

High cost of Liquefied Petroleum Gas (LPG).

Policy direction

- Review the tax regime on LPG price build-up.
- Increase local LPG production capacity.

Issue 9

Huge capital investment requirements for natural gas infrastructure development.

Policy directions

- Use royalties and taxes from production and sale of gas to provide securitization along the gas value chain.
- Encourage Private sector involvement through PPP structures.
- Promote Concessionary Public Private Partnership and BOOT arrangements for projects such as LNG infrastructure and distribution network infrastructural development

4.5 ENERGY TRANSITION

4.5.1 Energy Transition Overview

Energy Transition refers to the shift of the global energy sector from fossil fuel-based systems of energy production and consumption to carbon-free energy sources. The need to reduce CO₂ emissions to limit climate change is a dominant theme in Energy Transition. The Energy sector (petroleum and power) is the biggest emitter of Greenhouse Gases (GHG) making it a key target for decarbonisation.

In 2015, world leaders met in Paris to address the negative impacts of climate change. Key decision from this summit include:

- a. To hold the rise in the global average temperature to well below 2°C above pre-industrial levels while pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;
- b. To enhance the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production; and
- c. To make finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.²²

Climate change concerns are key drivers of the global Energy Transition, nonetheless, it must be situated within the context of the Sustainable Development Goals (SDG), particularly SDG 7 which is to ensure access to affordable, reliable, sustainable and modern energy for all²³.

Energy Transition will be driven mainly by technology, policy frameworks and market instruments and investments.

Clean energy and energy storage technologies are poised to see significant growth and advancement over the coming years and will be instrumental in the move towards a Net Zero Emissions (NZE) world.

Policy frameworks which provide a clear long-term vision, encourage competition and reduce risks for investors will be influential in scaling up renewable and low-carbon energy portfolio share in the global energy mix.

²² Paris Agreement to the United Nations Framework Convention on Climate Change, Dec. 12, 2015, T.I.A.S. No. 16-1104.

²³ (United Nations General Assembly, 2015)

For the transition to successfully achieve the aims of the Paris Agreement, there must be decisive leadership action at national and international levels. Clearly defined national targets must align with policy frameworks that focus on providing economically viable and environmentally safe non-carbon energy use.

Achieving the targets of the Paris Agreement will require a rise in annual investment in clean energy projects and infrastructure to nearly USD 4 trillion by 2030.²⁴ It is envisaged that transition-related energy investment will need to be carried out by private developers and financiers responding to market signals and policies set by governments. Also, a strategy to adequately finance low-income countries will ensure that the Energy Transition is inclusive.

In the coming decades, African countries must address two fundamental energy challenges. First, how to achieve universal access to affordable, reliable, sustainable and modern energy services by 2030 (SDG 7) and secondly, how to harness the power of clean fuels that are technologically viable and economically attractive alternatives to fossil fuels to avoid sole dependency on fossil fuels.

The roadmap to a low-carbon economy is not simply a matter of replacing polluting energy resources with renewables, but also ensuring its sustainability through synergy in regional market economic collaborations.

The Africa Union (AU's) Agenda 2063, calls on African countries to harness their energy resources to provide modern, efficient, reliable, cost-effective and environmentally friendly energy to the continent.

²⁴ (International Energy Agency, 2021)

Further, the ECOWAS Renewable Energy Policy stipulates that member countries shall increase the share of renewable energy (including medium and large hydro), in their electricity mix to 35% by 2020 and 48% by 2030²⁵.

4.5.2 National Approach

Ghana is a signatory to several global protocols and agreements relating to clean and sustainable energy production and use. Prominent among these are the Sustainable Development Goals (SDGs), the Paris Agreement and Glasgow Climate Pact. These commitments feed into policy formulation towards the achievement of universal energy access to the citizens while meeting climate change mitigation requirements.

In compliance with the Paris Agreement, there is a commitment to reduce GHG emissions. Though Ghana's emissions per capita are far below the global average, the country has to consider a sustainable mix of adaptation and mitigation strategies in reducing its GHG emissions. The Paris Agreement has a target of reducing global carbon dioxide emissions by 45 per cent by 2030 relative to the 2010 level and to net zero around midcentury.

Significant reductions in other greenhouse gases are also expected. For instance, with the increasing proportion of fossil fuelled plants in the electricity generation mix, there would be the need for more energy efficiency and conservation activities as well as supporting afforestation programmes.

²⁵ ECOWAS Renewable Energy Policy (EREP), 2013. ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE)

To this end and in line with Article 4 of the Paris Agreement and UNFCCC decisions 1/CP.21 and 4/CMA.1, Ghana has updated its Nationally Determined Contribution under the Paris Agreement from 2020 to 2030 with 19 policy actions in 10 priority areas to achieve its goals in the next decade. The update affirms the country's resolve to address the impacts of climate change on the country's economy and its people²⁶.

The transition to low carbon economy also needs to take cognisance of Ghana's untapped significant oil and gas resources. The policy decision would seek to find a balance between exploitation of the oil and gas resources and the transition agenda. Ghana endorsed the African Mining Vision (AMV), a framework created by AU in 2009 to ensure that Africa utilises its extractive resources strategically for broad-based inclusive development.

The long-term goal is for Ghana to become an ECOWAS energy hub and contribute to the West Africa Power Pool (WAPP) while maintaining the current electricity supply agreements with her neighbouring countries.

4.5.3 Energy Transition Sector Goals, Objectives, Issues and Policy Directions

Sub-Goal

The goal is to develop low-carbon energy resources and infrastructure to deliver clean energy in an environmentally responsible manner for socio-economic growth.

²⁶ Updated Nationally Determined Contribution under the Paris Agreement (2020-2030)

Policy Objectives

- Develop a comprehensive national energy transition plan
- Achieve energy sector net-zero carbon emission
- Ensure the generation of electricity from cleaner sources
- Implement carbon pricing in the petroleum sector as a measure against environmental pollution

Issue 1

Threat to energy security

Policy directions

- Adopt natural gas as a transition fuel for power generation and transportation
- Integrate nuclear power into the national generation as baseload power
- Promote energy efficiency and energy conservation practices
- Promote and incentivise the use electric propulsion vehicles
- Establish the National Renewable Energy Authority and other relevant institutions to scale up renewable energy in the national energy mix
- Explore the production of bioenergy and green hydrogen as alternative fuels for transportation

Issue 2

Potential revenue losses

Policy directions

- Increase trade among African countries
- Refine petroleum products and use them locally

- Explore the opportunities for emissions trading and debt carbon swap as instrument

Issue 3

Potential stranded assets

Policy directions

- Fast track the sustainable exploration, development & production of oil & gas resources
- Accelerate the sustainable exploration, development and production of petroleum
- Accelerate the operationalisation of the Petroleum Hub Cooperation
- Develop a comprehensive national energy transition plan

Issue 4

Reduced funding for fossil related projects

Policy directions

- Cooperate with other governments in the ECOWAS region to establish a regional fund
- Capitalise the national oil company

Issue 5

Potential job losses

Policy directions

- Collaborate with academia to provide clean energy solutions educational certificate programmes in modules for energy sector workers.

Issue 6

Intermittency of electricity supply from modern renewable energy

Policy directions

- Ensure the hybridisation of mini-hydro power with intermittent renewable energy.
- Promote the sustainable production of biofuel for electricity and transport.
- Explore the option of hydrogen fuel and large battery storage systems.

Issue 7

Resistance to the adoption of new technologies

Policy directions

- Incentivise the use of cleaner fuel and cleaner technology

Issue 8

Impact of climate change interventions on petroleum activities.

Policy directions

- Aggressively accelerate exploration to discover and monetise petroleum reserves.
- Introduce Carbon Capture, Utilisation and Storage (CCUS) and sequestration technologies in petroleum activities.
- Promote the use of renewable energy in offshore petroleum infrastructure.
- Develop the petrochemical industry to utilise domestic petroleum resources for domestic and export markets.

4.6 ENERGY EFFICIENCY AND CONSERVATION

4.6.1 Energy Efficiency and Conservation Overview

The Government is committed to ensuring efficient production, transportation, as well as end-use efficiency and conservation of energy in the country.

Energy Efficiency refers to products or systems using less energy to do the same or better job than conventional products or systems.

Energy Conservation, on the other hand, is the practice of reducing consumption. Individuals and organisations that are direct consumers of energy may want to conserve energy in order to reduce energy costs and promote economic and environmental sustainability. On a larger scale, energy conservation can reduce fuel consumption and energy demand per capita, and thus offset the growth in energy supply needed to keep up with population growth. The reduced energy demand can provide more flexibility in choosing the most preferred methods of energy production.

Demand-side Management

There has been significant penetration of efficient electrical appliances in recent years which is due to efforts by the sector Ministry, Energy Commission and other agencies to promote energy efficiency and conservation in homes and industries.

Specially targeted interventions such as the introduction of Energy Performance Standards, the prohibition of importation and use of used appliances, labelling of electrical appliances and special promotion packages have been used in the past with very high success rates. These efforts have, however, not resulted in universally sustained adoption of energy efficiency and conservation in the country owing to a number of financial and institutional obstacles. To encourage and sustain energy

efficiency and conservation in the development of the sector would require new and innovative interventions to deal with the challenges.

Fuel Efficiency and Conservation

Increased petroleum use has direct and indirect implications for the total energy consumption and socio-economic growth potential of the country. The sector's existing challenge is how to ensure efficient use of petroleum products. This is determined by the quality of transport systems, the standard of vehicles used, fuel efficiency standards, and the mode of transport.

The shift from one mode of transport to a more efficient one is more fuel efficient. For instance, haulage by rail instead of road reduces fuel consumption by 15% on average whilst resorting to mass transport for public transportation tends to be more fuel-efficient than individual private transportation. Shifting to electric propulsion also has the potential to reduce the cost of fuel and the environmental effects of transportation. Fuel-efficient devices for vehicles capable of 15-20% savings on fuel, are also commercially available. These devices have however been found to work well only with vehicles with good maintenance records.

Promoting conservation practices, such as reliance on non-motorised systems, walking short distances, telecommunication and bicycle riding would save fuel and should be encouraged.

Improvement in the reliability of the grid electricity supply would also significantly reduce the industrial use of diesel as backup fuel.

Improved Cookstoves

The use of biomass for cooking and heating-related applications is still dominated by the use of inefficient conversion and end-use devices, leading to a lot of waste and loss along the wood fuel value chain.

The cookstove market is also dominated by artisans who produce simple stoves like the conventional 'coalpot' and aluminium stoves, which are inefficient.

Although there are a few improved technologies on the market, they are not widespread due to the limited skill and production capacity of the producers. Besides, the relatively high cost of improved cookstoves and low public awareness of their availability and benefits are some of the barriers to their patronage.

The improved biomass cookstoves save up to 40% of fuelwood over and above the traditional versions. Furthermore, an expenditure survey conducted among households indicated that it saved between 15-20% of the amount of money normally spent on fuelwood²⁷. Government has distributed about 800,000 improved biomass cookstoves have been distributed and are being used nationwide. The target is to distribute about three million by 2030.

The wood fuel and cookstove market in Ghana has a lot of economic, social and environmental prospects if well managed. The sector is currently largely unregulated and underdeveloped. In this regard, regulations are being developed to facilitate the formalisation and sustainable management of the wood fuel and cookstove market in the country.

The private sector should be support to facilitate the rapid development, sustainable harvest, processing and use of wood fuel resources and improved cookstoves in the country.

²⁷ Rapid Assessment Gap Analysis, 2012. SE4All (Ghana)

Charcoal Production

The earth-mound kiln continues to be the most popular carbonisation method used by charcoal producers in the country. It is estimated to have efficiency rates of 18-23% of dry weight. There are however, some limited number of charcoal producers in the country who use improved carbonization method with a higher efficiency rate and these are largely producers who produce for the export market.

The adoption and use of improved carbonization methods by charcoal producers will ensure the sustainable use of wood fuel resources in the country. Sensitization efforts through public education should be embarked upon to spread the benefits of using improved method of decarbonization in charcoal production.

4.6.2 Energy Efficiency Sector Goals, Objectives, Issues and Policy Directions

Sub-Goal

To ensure efficient production, transportation, distribution as well as end-use efficiency and conservation of fuel and energy across the economy.

Policy Objective

To apply demand-side management, fuel substitution, conservation and energy efficiency measures in the energy supply value chain.

Issue 1

Low level of Energy Efficiency practices.

Policy direction

- Promote standards and labels for appliances.
- Promote energy efficiency in buildings.

Issue 2

High cost of energy efficient products.

Policy direction

- Provide fiscal incentives for energy-efficient products.
- Provide incentives for the local manufacture/assembly of energy-efficient technologies

Issue 3

Inadequate financing for the promotion of energy conservation and efficient technologies.

Policy direction

- Encourage financial institutions to support energy conservation and energy efficiency initiatives.

Issue 4

Limited awareness of energy conservation and fuel substitution measures.

Policy direction

- Educate and create public awareness on energy conservation and fuel substitution measures.

Issue 5

Low level of implementation of identified demand-side management measures in industries.

Policy directions

- Develop and implement programmes on Productive Uses of Energy (PUE).
- Develop and implement programmes and measures to help consumers optimise their energy use.
- Promote Industrial Energy Efficiency and conservation in accordance with international standards and practices.

Issue 6

Inefficient use of fuel in the transport sector.

Policy directions

- Develop fuel efficiency standards and labels for vehicles.
- Develop emission standard and labels for vehicles.
- Educate motorists on methods for improving fuel efficiency in vehicles.
- Create awareness of the benefits of fuel efficiency for all stakeholders.
- Develop and implement measures to reduce petroleum product consumption in transportation.
- Encourage the use of proven fuel efficiency-enhancing additives.
- Encourage fuel substitution and the use of electric vehicles.

4.7 CROSS-CUTTING AREAS

A number of issues that cut across the energy value chain have been identified. Key among them are local content and local participation, health, safety, security and environment, gender mainstreaming, persons with disability and research and development.

4.7.1 Ghanaian Content and Ghanaian Participation

Local content involves setting minimum thresholds for the utilisation of Ghanaian goods and services and Ghanaian shareholding in enterprises operating in the energy sector. Ghana has been implementing Ghanaian Content and Ghanaian Participation Regulations in the energy sector. In 2013, comprehensive Regulations in the upstream oil and gas sector were introduced, as well as in the electricity supply industry in 2017.

4.7.2 Ghanaian Content and Ghanaian Participation Sector Goals, Objectives, Issues and Policy Directions

Sub-Goal

To maximise Ghanaian participation in the energy sector.

Policy Objective

To strengthen Ghanaian Content and Ghanaian Participation in the energy sector.

Issue 1

Low Ghanaian Content and Ghanaian Participation in the energy sector.

Policy direction

- Ensure enforcement of Ghanaian Content and Ghanaian Participation regulations.
- Promote the participation of local enterprises in the energy industry.
- Promote the utilisation of local goods and services in the energy industry.

- Develop the needed institutional and human resource capacity to meet the demands of the energy sector.

Issue 2

Limited capacities of local financial institutions in providing funds to support investment in the energy sector.

Policy direction

- Encourage local companies, especially financial institutions to form consortia and participate as a single entity in the energy industry.
- Expand local content fund
- Use local content fund to securitise private sector financing
- Develop the needed institutional and human resource capacity to meet the demands of the energy sector.

Issue 3

Limited capacities of small and medium-scale enterprises (SMEs) to meet the minimum technical and financial requirements.

Policy direction

- Create the enabling environment to enhance local fabrication, installation and manufacturing of components used in the energy industry.
- Sustain the accelerated oil and gas capacity development programme.

4.7.3 Health, Safety, Security and Environment

Health, Safety, Security & Environment (HSSE) describes the processes or activities that are carried out by companies in protecting the environment and maintaining a healthy, safe and secure workplace for employees. The energy sector players must be committed to providing a healthy, safe and secure workplace for employees and also ensure their activities do not adversely impact the environment. To achieve adequate HSSE implementations in the energy sector, there is the need to promote continuous safety education and training for all employees, assigning responsibility for all aspects of the HSSE Policy, ensuring thorough evaluation of all incidents and regularly review HSSE Policy for improvement.

4.7.4 Health, Safety, Security and Environment Sub-sector Goals, Objectives, Issues and Policy Directions

Sub-Goal

To ensure that energy sector activities do not negatively impact the security of energy infrastructure, the health and safety of people and the environment at large.

Policy Objectives

- To secure energy systems from physical and cyber-attacks.
- To protect the occupational health and safety of energy sector employees.
- To ensure environmental sustainability in the energy value chain.
- To protect the public from negative health and safety impacts in energy production, transportation and utilization.

Issue 1

Inadequate security for energy infrastructure

Policy directions

- Ensure the development and implementation of national security strategies including cyber security for the energy sector.
- Facilitate the implementation of the National Maritime Security Strategy (NMSS).

Issue 2

Threats posed by local communities in catchment areas of energy installations.

Policy directions

- Ensure community sensitization in the execution of energy projects.
- Promote the necessary social, environmental and economic interventions to minimize community agitation.
- Ensure the designation of all vital energy installations as security zones.

Issue 3

Inadequate skilled workforce to ensure the protection of cyber systems.

Policy direction

- Promote the training of ICT personnel to maintain the security of energy installations.

Issue 4

- Inadequate enforcement of occupational health and safety laws in the energy value chain.

Policy directions

- Ensure the implementation of the Health, Safety and Environment Manual for the energy sector
- Ensure that all energy facilities and associated infrastructure are constructed, operated and decommissioned in line with laid down national laws and regulations.

Issue 5

Inadequate implementation of disaster and emergency management plans in the energy sector

Policy directions

- Ensure the development of laws that require the energy sector industries to submit and update regulators with their emergency management plans.
- Enforce the development and timely updates of emergency management plans
- Enforce the development and timely updates of disaster management plans.

Issue 6

Limited technical capacity and expertise of SMEs on HSSE matters

Policy direction

- Build capacities of SMEs on HSSE matters
- Enforce HSSE requirements

Issue 7

Inadequate climate change interventions in the energy sector

Policy directions

- Integrate climate resilience considerations in energy sector planning.
- Support and actively participate in international efforts to improve climate adaptation and mitigation actions.
- Support the capacity-building efforts in the fight against climate change.
- Support efforts to meet Ghana's obligations in the Paris Agreement.

Issue 8

Low level of awareness and understanding on the part of the public on the impacts associated with energy production, transportation and utilisation.

Policy directions

- Promote environmental protection awareness programmes.
- Sensitise the public on the dangers associated with the energy sector and the necessary safety practices.
- Ensure adequate dialogue between industry and catchment communities of energy installations throughout the lifecycle of a project.

4.7.5 Gender Mainstreaming and Persons with Disabilities

Gender refers to the array of socially constructed roles and relationships, personality traits, attitudes, behaviours, values, relative power and influence that society ascribes to the two sexes (male and female) on a

differential basis. Lack of gender-disaggregated data or analysis hinders efforts to recognise the need for and design of specific gender-focused interventions within the energy sector. The energy sector should also recognise the potential role of people with disabilities.

4.7.6 Gender Mainstreaming and Persons with Disabilities Sector Goals, Objectives, Issues and Policy Directions

Sub-Goal

To mainstream gender and persons with disabilities in the energy sector.

Policy Objective

To promote gender equality and equity across the energy sector.

Issue 1

Low participation of women and persons with disabilities in managerial positions in the energy sector.

Policy directions

- Support the capacity development of women and persons with disabilities.
- Involve women in leadership and decision-making processes of the energy sector.
- Encourage female enrolment in STEM education and skills training programmes.
- Increase internship opportunities for females studying STEM programmes.

Issue 2

Low participation of women in the private sector throughout the energy value chain.

Policy directions

- Promote and support women's businesses in the energy sector.
- Enhance national awareness creation aimed at addressing cultural beliefs and practices hindering gender equality in the energy value chain.

Issue 3

Low awareness of gender issues in the energy sector among policymakers and the general public.

Policy directions

- Create awareness aimed at addressing issues hindering gender equality in the energy sector.
- Build the gender sensitivity of decision-makers and technical officers in all energy sector institutions, to facilitate gender mainstreaming into energy-related interventions.
- Institute a gender focal unit in all energy sector institutions.

Issue 4

Inadequate gender-disaggregated energy data, which creates difficulty for proper planning of gender issues in the energy sector.

Policy directions

- Enhance gender-disaggregated energy data collection, management and publication towards ensuring gender-

responsive analysis, planning, implementation, monitoring, and evaluation.

- Conduct regular participatory gender audits of the energy sector.
- Establish a Measurement, Reporting and Verification (MRV) system to monitor gender mainstreaming in the energy policy.

4.7.7 Research and Development

Research and Development (R&D) is an important public policy vehicle which helps in achieving a wide variety of societal and policy goals. Therefore, government should prioritise R&D and provide the needed funding for it.

4.7.8 Research and Development Sector Goals, Objectives, Issues and Policy Directions

Sub-Goal

To promote research into energy production, supply and utilisation to ensure sustainable development and use of energy resources.

Policy Objective

To promote local energy-related research, development, and innovative opportunities that address national priorities and integrate research findings into the economy.

Issue 1

Inadequate infrastructure and funding for research and development, and innovation.

Policy directions

- Establish the necessary infrastructure for research and development.
- Establish a research fund for the energy sector
- Enhance linkages among Government, industry, academia, vocational training institutions, non-governmental organisations, and other relevant actors to promote research and development, and innovation.

Issue 2

Non-systematic local support for research and development, and innovation.

Policy directions

- Support Ghanaian researchers and inventors to register their intellectual property.
- Enhance linkages among Government, industry, academia, vocational training institutions, non-governmental organisations, and other relevant actors to promote research and development, and innovation.

Issue 3

Limited research and development initiatives on energy-related issues.

Policy directions

- Enhance linkages among Government, industry, academia, vocational training institutions, non-governmental organisations, and other relevant actors to promote research, development, and innovation.

- Encourage and support Ghanaians to research into innovative energy solutions.
- Create avenues to incubate innovative ideas.
- Encourage innovation and research into energy products.

Issue 4

Low implementation of research recommendations.

Policy directions

- Collaborate with the private sector, researchers and inventors to implement research recommendations.
- Enhance linkages among Government, industry, academia, vocational training institutions, non-governmental organisations, and other relevant actors to promote research, development and innovation.
- Create the necessary support for the implementation of innovative research recommendations.

APPENDIX

List of participants at the nationwide stakeholder's engagement on the National Energy Policy.

1. Representatives of Energy Sector Institutions
2. Regional Coordinating Councils
3. Metropolitan, Municipal and District Assemblies (MMDAs)
4. Ministry of Works and Housing
5. Ministry of Planning
6. Ministry of Monitoring and Evaluation
7. Ministry of Finance
8. Ministry of Information
9. Ministry of Education
10. Ministry of Communication
11. Ministry of Lands and Natural Resources
12. Africa Centre for Economic Policy (ACEP)
13. Trade Union Congress Ghana (TUC-Gh)
14. Public Utilities Regulatory Commission (PURC)
15. Institute of Statistical, Social and Economic Research (ISSER)
16. Ghana Oil and Gas for Inclusive Growth (GOGIG)
17. United States Agency for International Development (USAID)
18. World Bank
19. Japan International Cooperation Agency (JICA)
20. Korean Embassy
21. Swiss Embassy
22. Kumasi Institute of Technology, Energy and Environment (KITE)
23. Natural Resource Governance Institute
24. Friends of the Nation
25. Wassa Association of Communities Affected by Mining Organisation (WACAM)

26. Publish What You Pay
27. Association of Ghana Industries (AGI)
28. Ghana Chamber of Bulk Oil Distributors (CBOD)
29. Ghana Institute of Management and Public Administration (GIMPA)
30. Ho Technical University
31. University of Ghana
32. University of Development Studies
33. University of Cape Coast
34. Kwame Nkrumah University of Science and Technology (KNUST)
35. National House of Chiefs
36. Public Interest and Accountability Committee (PIAC)
37. National Development Planning Commission (NDPC)
38. Tullow Ghana Limited
39. Springfield Group
40. Eni Ghana Exploration and Production Limited
41. Sunon Asogli Power Limited
42. CENIT Energy Limited

For any enquiries kindly contact
Ministry of Energy, Accra
Energy close: GL-063-5498
+233 (0)302 683 961-3
www.energymin.gov.gh

 Ministry of Energy

 [energyministryghana](https://www.instagram.com/energyministryghana)

 [energy_min](https://twitter.com/energy_min)