ENERGY COMMISSION, GHANA

NATIONAL ENERGY STATISTICS 2000 - 2019

STRATEGIC PLANNING AND POLICY DIRECTORATE

April, 2020

FOREWORD

The 2020 National Energy Statistics provides a time series data on Ghana's energy supply and use situation largely from 2000 to 2019. It contains a clearly presented data on energy production, import, export, and consumption in the country. Information on the country's progress towards achieving the Sustainable Development Goals (SDG 7) has been added to this publication

This publication was prepared with data from the main energy sector institutions, including the Ministry of Energy, Volta River Authority (VRA), Ghana Grid Company (GRIDCo), Ghana National Petroleum Corporation (GNPC), National Petroleum Authority (NPA), Ghana National Gas Company (GNGC), Tema Oil Refinery (TOR), Public Utilities Regulatory Commission (PURC), Electricity Company of Ghana, Northern Electricity Distribution Company (NEDCo), Enclave Power Company Ltd (EPC), West African Gas Pipeline Company (WAPCo), as well as data from the Bank of Ghana (BoG) and the Ghana Statistical Service (GSS). The cooperation and assistance of all these agencies and entities are gratefully acknowledged.

It is our expectation that, the statistics contained in this publication would be useful to a wide range of users including planners, policy makers, researchers and students.

We are very much appreciative for the feedback received from users. These have been used to update and improve the data provided in this year's publication. The 2020 National Energy Statistics therefore override those of previous years.

We would appreciate very much any feedback by way of comments and suggestions from readers.

This publication is also available on our website **www.energycom.gov.gh**

Ing. Oscar Amonoo-Neizer
Executive Secretary

Energy Commission
PMB, Ministries Post Office
Accra, **GHANA**
Tel: +233 302 813756/7/9
Fax: +233 302 813764/2
Email: statistics@energycom.gov.gh

Office location:
Ghana Airways Avenue
Airport Residential Area, Accra

Ghana Post GPS: GA-037-3212

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

GW	Gigawatt
GWh	Gigawatt-hour
KTOE	Kilotonnes of oil Equivalent
kWh	kilowatt-hour
MMBTU	Thousand thousand British Thermal Unit
MSCF	Thousand Standard Cubic Feet
MW	Megawatt
MWh	Megawatt-hour
W/kW	Watt/kilowatt
ATK/DPK	Aviation Turbine Kerosene/Dual Purpose Kerosene
ECG	Electricity Company of Ghana
EPC	Enclave Power Company
GNGC	Ghana National Gas Company
GNPC	Ghana National Petroleum Corporation
LCO	Light Crude Oil
LPG	Liquefied Petroleum Gas
NEDCo	Northern Electricity Distribution Company
RFO	Residual Fuel Oil
TAPCO	Takoradi Power Company Ltd
TICO	Takoradi International Company
TOE	Tonnes of Oil Equivalent
TOR	Tema Oil Refinery
VALCO	Volta Aluminium Company
VRA	Volta River Authority
WAGP	West African Gas Pipeline
WAGPA	West African Gas Pipeline Authority

CONVERSION FACTORS

Ghana Standard Figures

Petroleum

Crude Oil	1 Tonne	1.01- 1.02 TOE
Gasoline:	1 Tonne	1.05 TOE
Kerosene:	1 Tonne	1.03 TOE
Jet Fuel:	1 Tonne	1.03 TOE
Diesel /Gas Oil:	1 Tonne	1.02 TOE
Residual Fuel Oil:	1 Tonne	0.97 TOE
LPG:	1 Tonne	1.08 TOE
7 barrels of crude Oil	1 Tonne of crude oil	
1 cubic metre of crude oil	6.29 barrels	
1 barrel	36 imperial gallons	163.66 Litres
1 GJ of Natural Gas	1.05 MMBtu	1.07 MSCF
1 MMBtu of Natural Gas	27.096 cubic metres (m^3)	
1 MMBtu of Natural Gas	5.82 bbl of crude oil equivalent	
1,000 m^3 of Natural Gas	36.906 MMBtu	

Ghana Standard Figures

Electricity

1000 W	1 kW
1000 kW	1 MW
1000 MW	1 GW
1000 kWh	1 MWh
1000 MWh	1 GWh
1 GWh	86 TOE
1 GWh	3600 GJ
1 TOE	41.86 GJ

Woodfuel

Firewood/fuelwood	1 Tonne	0.30 - 0.36 TOE
Charcoal	1 Tonne	0.68 - 0.88 TOE
Sawdust/sawmill residues/wood chips	1 Tonne	0.20 - 0.30 TOE

Low side reflecting average dry wood and corresponding Charcoal in the forest zones and the high side reflecting average dry wood and corresponding charcoal in the savannah zones of the country.

Between 4 – 5 mass units of wood are used to produce one mass unit of charcoal in the country

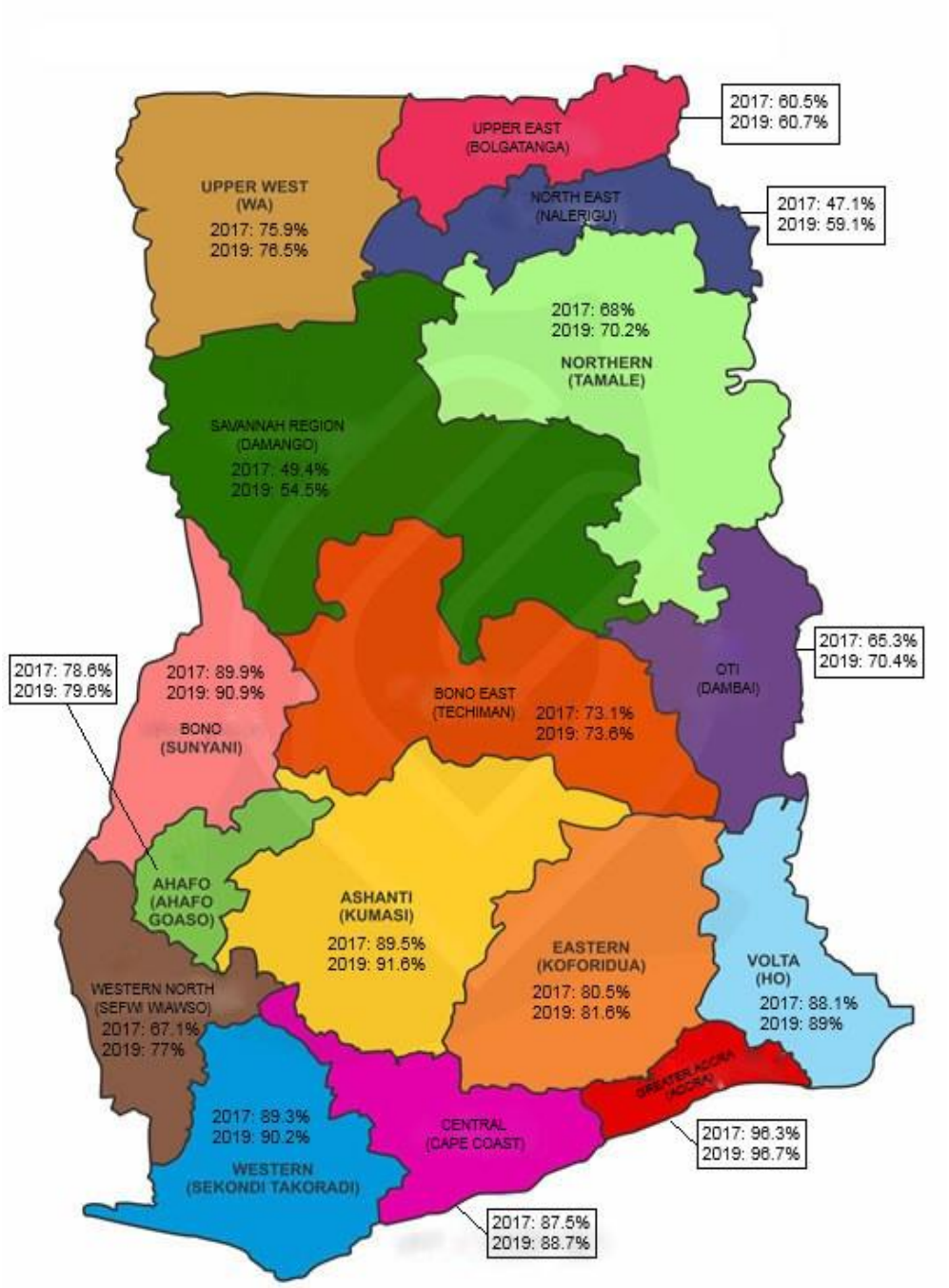
Charcoal Source	Average Weight (kg) of Charcoal		
	Mini Bag	Maxi Bag	Moisture Content
Sawmill residue	21 – 22	44 - 45	Up to 40%
Savannah wood	30 – 32	55 - 60	Up to 20%
Acacia plant	31 – 32	57 - 63	Up to 20%
All other woods	25 – 27	50 - 55	Up to 25%

GLOSSARY

Average	It is a measure of central tendency. It could be mean, median or mode depending upon the distribution of the data. For a normal distribution set, the mean, median and mode are the same.
Electricity Plants	Refer to power generation plants which are designed to produce electricity only. The electricity captured in this report does not cover off-grid and individual private embedded generation.
Energy Balance	Shows in a consistent accounting framework, the production, transformation and final consumption of all forms of energy for a given country in a given period of time, with quantities expressed in terms of a single accounting unit for purposes of comparison and aggregation. The Energy balance presents an overview of the energy produced and consumed in a system, matching input and output for a specific period of time, usually one year.
Final Energy Consumption	Energy utilised by final user.
Import and export	Import and export comprise quantities having crossed the national territorial boundaries of the country
International Aviation Bunkers	Covers quantities delivered to airplanes that are engaged in international aviation
International Marine Bunkers	Covers those quantities delivered to ships that are engaged in international navigation
Own Use	It is the primary and secondary energy consumed by transformation industries for heating, pumping, lighting and other purposes
Production	It is the production of primary energy, i.e. crude oil, natural gas, hydro, renewable etc. that is extracted.
Statistical differences	It includes the sum of the unexplained differences for individual fuels as they appear in the energy statistics
Stock changes	Reflect the differences between opening stock levels on the first day of the year and closing levels on the last day of the year of stocks on national territory held by producers, importers, energy transformation industries and large consumers. A stock build is shown as negative number and a stock draw as a positive.
Total Energy Supply	It is made up of production + import - export + stock changes
Total Primary Energy Supply	It is made up of production + imports – export +/- stock changes *(excluding electricity trade)*

SECTION ONE: ELECTRICITY ACCESS MAPS OF GHANA

Figure 1.1: Proportion of Population with Access to Electricity

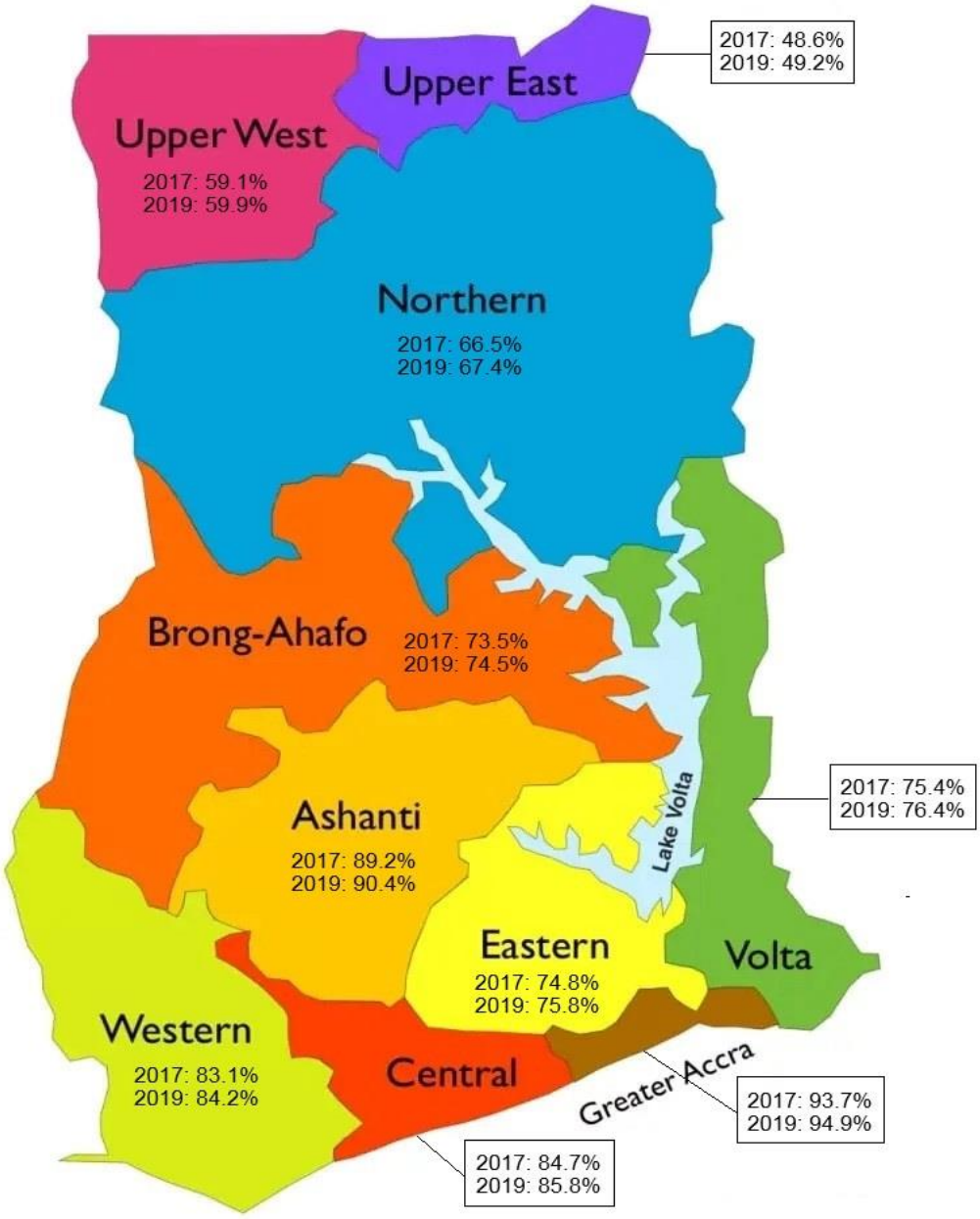


2017 *National Population Electricity Access Rate*: 84.1%

2019 *National Population Electricity Access Rate*: 85%

$$Regional\ Population\ Access = \frac{Total\ Population\ of\ communities\ connected\ to\ the\ grid\ in\ the\ region}{Total\ Population\ of\ Region} \times 100$$

Figure 1.2: Proportion of Household with Access to Electricity



2017 $National\ Household\ Electricity\ Access\ Rate$: 81.4%

2019 $National\ Household\ Electricity\ Access\ Rate$: 82.5%

$$Regional\ Household\ Electricity\ Access = \frac{Total\ number\ of\ households\ connected\ to\ the\ grid\ in\ the\ region}{Total\ number\ of\ households\ in\ the\ region} \times 100$$

SECTION TWO: ENERGY BALANCES AND INDICATORS

AN OVERVIEW

2.1 Energy Balance

An energy balance is an accounting framework that present data on all energy products entering, exiting and used within a national territory of a given country during a reference period, usually one year. Tables 1.1 and 1.2 present the Energy Balance for Ghana for the years 2018 and 2019. In order to compare the energy content of the different fuels, a common accounting unit, known as tonne of oil equivalent (toe) is used. The conversion factors are given on pages ix and x.

The total amount of energy supplied into the Ghanaian economy increased by 2.3%, from 10,800.3 Ktoe in 2018 to 11,052.8 Ktoe in 2019. Final energy consumption increased from 7,642.7 Ktoe in 2018 to 7,974.5 Ktoe in 2019 representing an annual increase of 4.3%. The residential and industrial sectors consumed 41.8% and 13.0% of total final energy consumed in the country in 2019 respectively. Petroleum products *(including natural gas use in industry)*, biomass *(firewood and charcoal)* and electricity constitute 47.6%, 37.4% and 15% of final energy consumed in 2019 respectively (Tables 1.1 and 1.2).

2.1.1 Energy Imports & Imports Dependency

Total energy import in 2019 was 5,129.3 Ktoe reducing by 4.6% from 5,377.7 Ktoe in 2018 (Tables 1.1 and 1.2). Petroleum products are the main energy products imported into the country. In 2019, petroleum products made up 71.9% of total amount of energy imported into the country whilst in 2018, it constituted 84.2% of total energy products imported. This indicates that the country depends heavily on imported petroleum products to meet its energy demand.

Import dependency is defined as the ratio of total net import (imports minus export) of natural gas, solid fuels and oil (including petroleum products) to the total energy supply, usually expressed as a percentage. A negative dependency rate indicates that the country is a net exporter of energy whilst a rate in excess of 100% indicates that energy has been stocked. The import dependency for the country increased from -35.9% in 2018 to -50.9% in 2019, indicating that Ghana is a net exporter of energy.

2.1.2 Energy Export

Total energy exports increased from 9,260 Ktoe in 2018 to 10,758.8 Ktoe in 2019, representing an annual growth of 16.2%.

Crude oil export constituted 97.6% of the total energy exported in 2018, reducing marginally to 96.1% in 2019. Also, electricity export contributed 0.7% of the total energy exported in 2018, increasing to 1.1% in 2019 (Tables 1.1 and 1.2).

2.2 Energy Indicators

An indicator is a specific, observable and measurable characteristic that can be used to show changes or progress a programme is making to achieve a specific outcome[1]. Energy indicators are used to monitor targets set at the national and international levels, evaluate policies and programmes such as energy efficiency programmes, plan for future actions, and feed into energy demand forecasting models as well as improve the quality of forecasts. It is also used to do a cross-country comparison. Statistical indicators with respect to relative importance of energy is presented in Table 1.3.

The total energy consumed per capita increased marginally from 0.258 Ktoe/capita in 2018 to 0.264 Ktoe/capita in 2019 representing an increase of 2.3%. Total electricity consumed per capita increased from 445.2 kWh/capita in 2018 to 461.7 kWh/capita in 2019 representing a 3.7% increase. Between 2000 and 2019, total electricity consumption per capita has been increasing at annual average growth rate of 1.3%. Similarly, the total petroleum products consumption per capita has been increasing at an average annual growth rate of 2.6% from 0.08 Ktoe/capita in 2000 to 0.13 Ktoe/capita in 2019. The total primary energy supplied per capita increased at an annual average growth rate of 0.6%, from 0.33 Ktoe/capita in 2000 to 0.37 Ktoe/capita in 2019 (Table 1.3).

2.2.1 Sustainable Development Goal 7 (SDG7) indicators

The Sustainable Development Goals (SDGs), also known as Agenda 2030, are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030. Adopted by 193 countries, including Ghana, the SDGs came into effect in January 2016, and aim to foster economic growth, ensure social inclusion and protect the environment. Agenda 2030 has five overarching themes, known as the five Ps: people, planet, prosperity, peace and partnerships, which span across the 17 SDGs. SDG 7, specifically dedicated to energy, is to ensure access to affordable, reliable, sustainable and modern energy for all by 2030. The country's progress in achieving SDG 7 is presented in Table 1.4.

2.2.2 Energy Intensity

Energy intensity is an indication of how much energy is used to produce one unit of economic output. It is a proxy of the efficiency with which an economy is able to use energy to produce economic output. A lower ratio indicates that less energy is used to produce one unit of output.

[1] http://www.endvawnow.org/en/articles/336-indicators.html

It is measured as a ratio of total primary energy supply and GDP *(PPP, constant 2011 international dollars)* or final energy consumption and GDP *(PPP, constant 2011 international dollars)*. Both ratios are presented in Table 1.4. In terms of primary energy supply, the energy intensity of the economy decreased from 86.6 toe/million US$ in 2018 to 84.0 toe/million US$ in 2019 representing a reduction of 3% slightly above its historical trend (-2.9%/year on average between 2000 and 2019). This shows that, less amount of energy is used to produce a unit of output an indication of the efficiency with which energy is used in the economy.

Table 2.1: Energy Balance, 2019 (Ktoe)

	Crude Oil	Natural Gas	Petroleum Products	Wood	Charcoal	Solar	Hydro	Electricity	Total
Production	10,506.8	1,452.6	71.0	4,218.5	-	4.5	623.6	-	16,876.9
Imports	846.6	583.0	3,688.7	-	0.0	-	-	11.0	5,129.3
Exports	-10,343.5	-	-298.4	-	-0.4	-	-	-116.4	-10,758.8
International Marine Bunkers	-	-	-7.4	-	-	-	-	-	-7.4
International Aviation Bunkers	-	-	-212.7	-	-	-	-	-	-212.7
Stock changes	-14.0	-	39.5	-	-	-	-	-	25.5
Total energy supply	995.9	2,035.6	3,280.6	4,218.5	-0.4	4.5	623.6	-105.5	11,052.8
Statistical differences	133.5	86.9	-4.5	-	-	-	-	10.0	225.9
Electricity plants	-133.1	-1,874.9	-118.3	-	-	-4.5	-623.6	1,570.9	-1,183.5
Oil refineries	-660.5	-	629.5	-	-	-	-	-	-31.1
Other transformation	-	-	-	-2,677.2	1,440.4	-	-	-	-1,236.8
Energy industry own use	-23.3	-	-75.9	-	-	-	-	-43.6	-142.8
Losses	-45.5	-	-	-	-	-	-	-212.7	-258.2
Final energy consumption	-	73.8	3,720.2	1,541.3	1,440.0	-	-	1,199.1	7,974.5
Residential	-	-	217.3	1,234.6	1,336.3	-	-	546.7	3,334.9
Industry	-	73.8	392.6	275.9	10.1	-	-	364.8	1,037.7
Commerce & Service	-	-	20.4	30.8	93.6	-	-	285.3	509.6
Agriculture & Fisheries	-	-	125.0	-	-	-	-	1.3	126.3
Transport	-	-	2,950.7	-	-	-	-	1.0	2,951.8
Non Energy Use	-	-	14.2	-	-	-	-	-	14.2

NB: Final electricity consumption include commercial losses

Table 2.2: Energy Balance, 2018 (Ktoe)*

	Crude Oil	Natural Gas	Petroleum Products	Wood	Charcoal	Solar	Hydro	Electricity	Total
Production	9,054.0	820.8	86.0	4,192.1	-	2.8	517.5	-	14,673.2
Imports	200.9	638.0	4,526.7	-	0.0	-	-	12.0	5,377.7
Exports	-9,037.2	-	-158.8	-	-0.3	-	-	-63.6	-9,260.0
International Marine Bunkers	-	-	-10.5	-	-	-	-	-	-10.5
International Aviation Bunkers	-	-	-178.3	-	-	-	-	-	-178.3
Stock changes	198.1	-	-	-	-	-	-	-	198.1
Total energy supply	415.8	1,458.8	4,265.1	4,192.1	-0.3	2.8	517.5	-51.6	10,800.3
Statistical differences	-70.1	60.0	86.7	-	-	-	-	0.6	77.3
Electricity plants	-1.4	-1,334.0	-918.0	-	-	-2.8	-517.5	1,397.1	-1,376.6
Oil refineries	-412.7	-	312.5	-	-	-	-	-	-100.2
Other transformation	-	-	-	-2,664.2	1,433.3	-	-	-	-1,230.9
Energy industry own use	-23.0	-	-89.9	-	-	-	-	-4.3	-117.3
Losses	-48.7	-	-	-	-	-	-	-206.7	-255.4
Final energy consumption	-	64.8	3,483.0	1,528.0	1,433.0	-	-	1,133.9	7,642.7
Residential	-	-	209.8	1,236.1	1,318.4	-	-	542.5	3,306.7
Industry	-	64.8	357.0	261.3	7.2	-	-	322.4	1,012.7
Commerce & Service	-	-	19.0	30.6	107.5	-	-	266.9	423.9
Agriculture & Fisheries	-	-	98.8	-	-	-	-	1.2	100.0
Transport	-	-	2,785.1	-	-	-	-	1.0	2,785.8
Non-Energy Use	-	-	13.4	-	-	-	-	-	13.4

*Revised

NB: Final electricity consumption include commercial losses

Table 2.3: Energy Indicators

Energy Indicator	Unit	2000	2010	2011	2012	2013	2014	2015	2016	2017*	2018*	2019
Total Primary Energy Supply	Ktoe	6,268	6,947	7,610	8,363	8,565	9,148	9,551	9,520	9,622	10,852	11,159
Total Final Energy Consumed	Ktoe	5,560	5,629	6,174	6,613	6,887	6,983	7,170	6,649	7,065	7,643	7,974
Total Electricity Generated	GWh	7,224	10,166	11,200	12,024	12,870	12,963	11,491	13,023	14,067	16,246	18,267
Total Electricity Consumed	GWh	6,889	8,317	9,187	9,258	10,583	10,695	9,780	11,518	12,246	13,185	13,943
Total Petroleum Products Consumed	Ktoe	1,437	2,491	2,827	3,318	3,422	3,377	3,545	3,274	3,115	3,483	3,794
Total Biomass Consumed	Ktoe	3,432	2,464	2,576	2,589	2,676	2,792	2,785	2,783	2,829	2,961	2,981
Population	million	18.9	24.7	25.3	25.9	26.5	27.0	27.7	28.3	29.0	29.6	30.2
GDP current	million US$	4,983	32,186	39,517	41,656	64,401	52,950	47,767	54,858	58,920	65,556	66,984
GDP, PPP (constant 2011 international $)	million $	42,784	74,992	85,526	93,474	100,309	103,216	105,464	109,100	117,985	125,374	132,772
Energy Intensity (TPES/GDP current million US$)	toe/million US$	1,257.9	215.8	192.6	200.8	133.0	172.8	199.9	173.5	163.3	165.5	166.6
Energy Intensity in PPP (TPES/ GDP in PPP)	toe/million US$	146.5	92.6	89.0	89.5	85.4	88.6	90.6	87.3	81.5	86.6	84.0
Energy Intensity in PPP (FEC/ GDP in PPP)	toe/million US$	130.0	75.1	72.2	70.7	68.7	67.7	68.0	60.9	59.9	61.0	60.1
Total Energy Consumed/capita	toe/capita	0.29	0.23	0.24	0.26	0.26	0.26	0.26	0.23	0.24	0.26	0.26
Total Electricity Generated/capita	kWh/capita	382.2	411.6	442.7	464.2	485.7	480.1	414.8	460.2	485.8	548.6	604.9
Total Electricity Consumed/capita	kWh/capita	364.5	336.7	363.1	357.4	399.4	396.1	353.1	407.0	422.8	445.2	461.7
Total Petroleum Products Consumed/capita	toe/capita	0.08	0.10	0.11	0.13	0.13	0.13	0.13	0.12	0.11	0.12	0.13
Total Biomass Consumed/capita	toe/capita	0.18	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Total Electricity Consumed/GDP	kWh/US$ 1,000 of GDP	1,382.5	258.4	232.5	222.2	164.3	202.0	204.8	210.0	207.8	201.1	208.2
Total Primary Energy Supply/GDP	toe/US$ 1,000 of GDP	1,257.9	215.8	192.6	200.8	133.0	172.8	199.9	173.5	163.3	165.5	166.6
Total Petroleum Products Consumed/GDP	toe/US$ 1,000 of GDP	288.5	77.4	71.5	79.6	53.1	63.8	74.2	59.7	52.9	53.1	56.6
Total Primary Energy Supply/capita	toe/capita	0.33	0.28	0.30	0.32	0.32	0.34	0.34	0.34	0.33	0.37	0.37
Grid Emission Factor (wind/solar projects)	tCO2/MWh	-	0.35	0.32	0.35	0.35	0.32	0.28	0.39	0.43	0.46	-
Grid Emission Factor (all other projects)	tCO2/MWh	-	0.51	0.44	0.48	0.46	0.36	0.31	0.43	0.47	0.53	-

*Revised

Grid emission factor is the amount of CO_2 emitted per unit of electricity generated and supplied into the national electricity grid. In simple terms, its measures the carbon intensity of the national electricity grid. Project activities displacing electricity from the grid can use this emission factor to estimate the CO2 emissions impacts of the project.

NB: Total Electricity Consumed include commercial losses

Source: GDP in current prices and Population data from Ghana Statistical Service; GDP in PPP (constant 2011 international $) from Worldbank database. 2019 GDP in PPP estimated.

Table 2.4: Sustainable Development Goals (SDG7) Indicators

Target	Indicator	Indicator Definition	Disaggregation	Unit	2010	2013	2014	2015	2016	2017	2018	2019
7.1. Ensure universal access to affordable, reliable and modern energy services.	7.1.1 Proportion of population with access to electricity	Proportion of population with access to electricity	National	%	64.4	70.8	80.5	83.2	83.6	84.1	84.3	85.0
			Urban	%	83.9	88.7	91.0	93.6	96.6	100	100	100
			Rural	%	39.7	48.6	52.5	56.9	61.7	67.0	68.3	70.5
		Proportion of household with access to electricity	National	%	64.2	70.6	73.1	75.7	78.5	81.4	81.6	82.5
			Urban	%	83.8	88.6	89.8	90.7	91.4	92.0	92.2	92.6
			Rural	%	39.5	48.3	52.2	56.6	61.5	66.9	68.1	70.4
	7.1.2 Proportion of population with primary reliance on clean fuels and technology	Proportion of population using Electricity as primary source for cooking	National	%	0.5	0.3	0.3	0.3	0.3	0.3	0.3	0.3
			Urban	%	0.8	0.5	0.4	0.4	0.4	0.4	0.4	0.4
			Rural	%	0.3	0.1	0.1	0.1	0.1	0.2	0.2	0.3
		Proportion of population using LPG as primary source for cooking	National	%	18.2	22.3	23.2	23.9	24.3	24.5	24.8	25.1
			Urban	%	28.9	35.8	35.6	35.3	35.1	34.8	34.6	34.3
			Rural	%	4.8	5.5	6.1	6.8	7.7	8.7	9.9	11.3
7.2. Increase substantially the share of renewable energy in the global energy mix.	7.2.1 Renewable energy share in the total final energy consumption		National[1]	%	53.0	47.4	48.5	44.8	39.5	47.3	44.3	43.4
			National[2]	%	8.4	8.5	8.5	5.9	6.8	5.7	5.5	6.0
7.3. Double the global rate of improvement in energy efficiency.	Energy intensity measured in terms of primary energy supply and GDP, PPP (constant 2011 international $)		National	TOE/million US$	92.6	85.4	88.6	90.6	87.3	81.5	86.6	84.0
	Energy intensity measured in terms of final energy consumption and GDP, PPP (constant 2011 international $)		National	TOE/million US$	75.1	68.7	67.7	68.0	60.9	59.5	61.0	60.1

[1] include woodfuels

[2]Exclude woodfuels (electricity consumed from solar, biogas and hydro only)

Data Source: Ghana Statistical Service 2010 Population and Housing Census, Ghana Living Standard Survey (GLSS 6 & 7), Ministry of Energy and Energy Commission

SECTION THREE: PRIMARY AND FINAL ENERGY SUPPLY AND CONSUMPTION

AN OVERVIEW

3.1 Total Primary Energy Supply

The total primary energy supplied was 11,149 Ktoe in 2019 increasing by 2.7% from 10,852 Ktoe in 2018. Oil, biomass and natural gas constitute 38.3%, 37.8% and 18.2% of total primary energy supplied in 2019 respectively. Between the year 2000 and 2011, biomass constituted the largest share of primary energy supply in the country. Oil became the dominant primary energy supplied into the economy from 2012 to 2019 (Table 2.1). The annual average growth rate of total primary energy supplied between 2000 and 2019 was 3.1%.

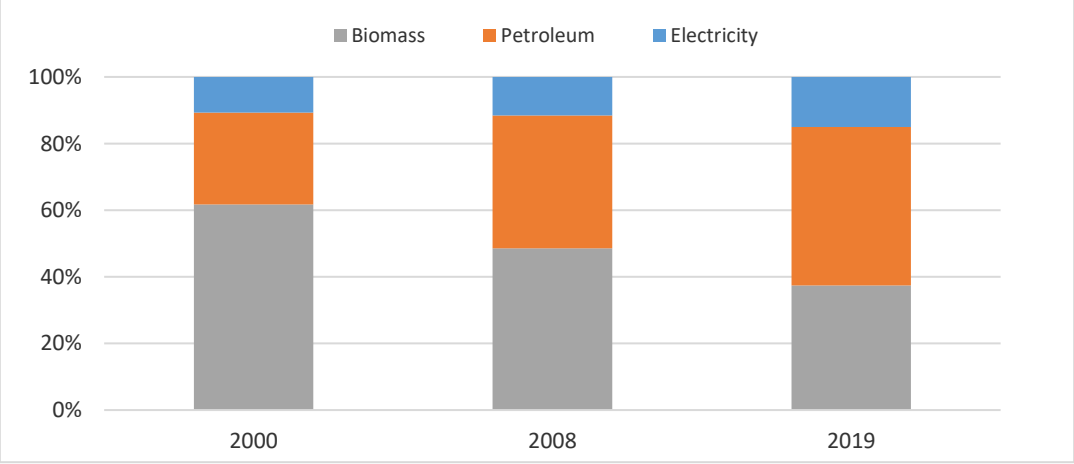
3.2 Final Energy Consumption

The final energy consumption increased at an average annual growth rate of 1.9% between 2000 (5,560.1 Ktoe) and 2019 (7,974.5 Ktoe). Between 2018 and 2019, the final energy consumption increased by 331.8 Ktoe, from 7,642.7 Ktoe in 2018 to 7,974.5 Ktoe in 2019 representing an annual increase of 4.3% (Table 2.2).

3.2.1 Final Energy Consumption by Fuels

From 2000 to 2008, biomass constituted the largest share of the final energy consumed in the country. The share of biomass in total final energy consumed decreased from 61.7% in 2000 to 48.5% in 2008 representing an annual average reduction of 3.1%. Petroleum became the dominant fuel in the final energy mix from 2009 to 2019. Its share in the final energy consumption mix increased from 2,597.7 Ktoe (45.5%) in 2009 to 3,794 Ktoe (47.6%) in 2019. Table 2.2 presents the final energy consumption by fuels from 2000 to 2019.

Figure 3.1: Final Energy Consumption by Fuels 2000, 2008 & 2019



3.2.2 Final Energy Consumption by Sectors

The final energy consumed by the residential sector in 2000 was 3,473 Ktoe representing 62.5% of the total final energy consumed. In 2019, however, the final energy consumed by the residential sector reduced to 3,423 Ktoe representing 42.9% of the total final energy consumed by all sectors of the economy. The final energy consumed by the transport sector on the other hand increased from 1,169 Ktoe in 2000, representing 21.0% of the total energy consumed to 2,952 Ktoe in 2019, representing 37% of the total energy consumed by all sectors of the economy. The final energy consumed by the transport sector has been increasing at an annual average growth rate of 5% between 2000 and 2019. The final energy consumed by the service sector has also increased at an annual average growth rate of 7.3%, from 121 Ktoe in 2000 to 461 Ktoe in 2019. The share of the services sector in the final energy consumption increased from 2.2% in 2000 to 5.8% in 2019 (Table 2.3).

Figure 3.2: Final Energy Consumption by Sectors, 2000 & 2019

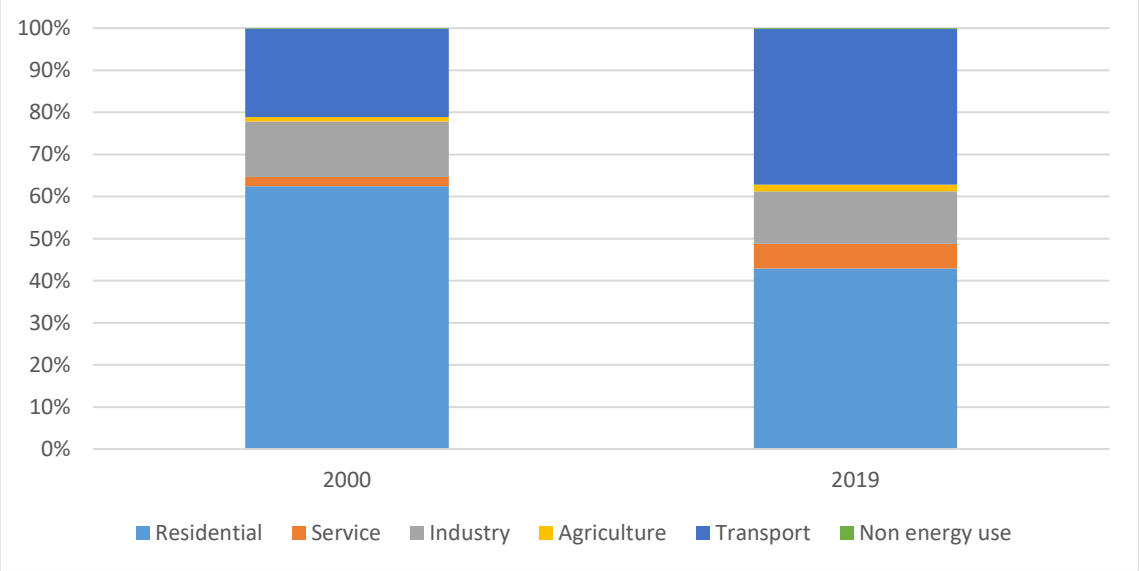


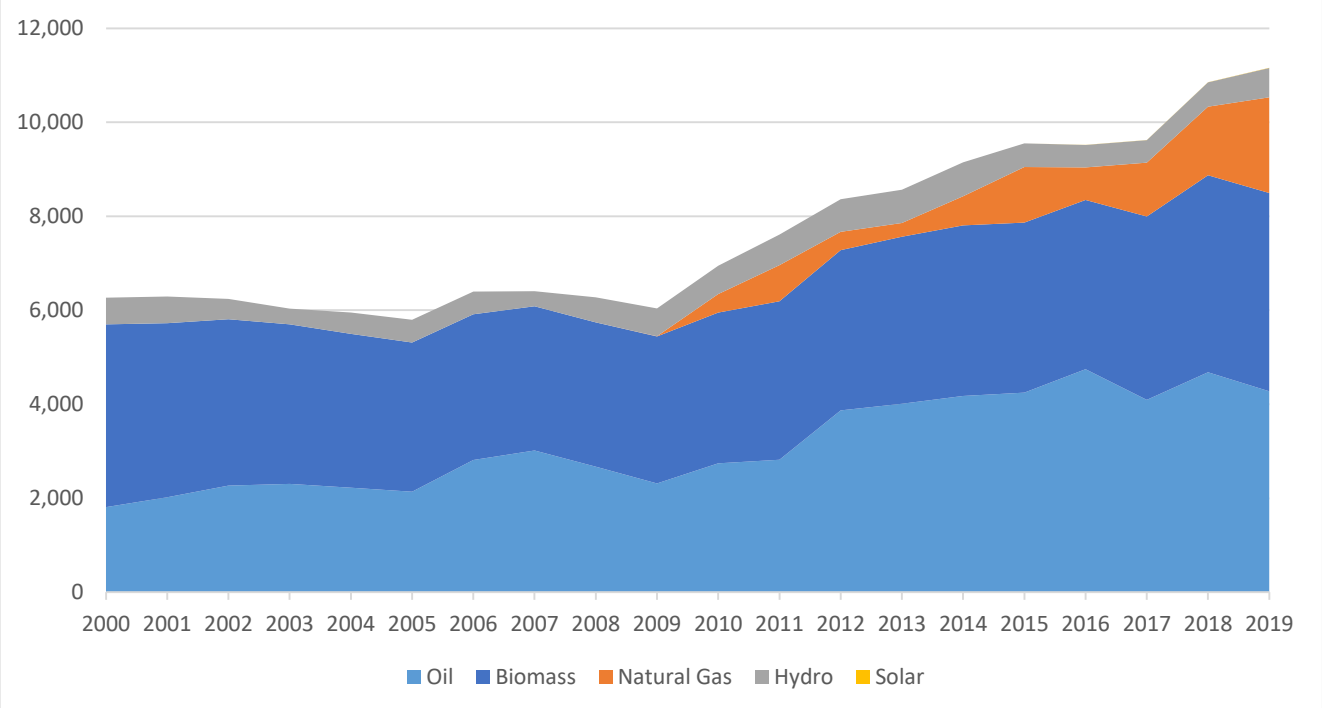
Table 3.1: Primary Energy Supply

Year	Oil		Natural Gas		Hydro		Solar		Biomass		Total	
	Ktoe	%	Ktoe	%	Ktoe	%	Ktoe	%	Ktoe	%	Ktoe	%
2000	1,812	*28.9*	-	-	568	*9.1*	-	-	3,888	*62.0*	6,268	*100*
2001	2,022	*32.1*	-	-	568	*9.0*	-	-	3,703	*58.8*	6,293	*100*
2002	2,270	*36.4*	-	-	433	*6.9*	-	-	3,539	*56.7*	6,242	*100*
2003	2,306	*38.2*	-	-	334	*5.5*	-	-	3,395	*56.3*	6,035	*100*
2004	2,225	*37.4*	-	-	454	*7.6*	-	-	3,273	*55.0*	5,952	*100*
2005	2,140	*36.9*	-	-	484	*8.3*	-	-	3,174	*54.7*	5,798	*100*
2006	2,815	*44.0*	-	-	483	*7.5*	-	-	3,100	*48.5*	6,398	*100*
2007	3,017	*47.1*	-	-	321	*5.0*	-	-	3,068	*47.9*	6,406	*100*
2008	2,672	*42.6*	-	-	533	*8.5*	-	-	3,070	*48.9*	6,275	*100*
2009	2,316	*38.4*	5	*0.1*	591	*9.8*	-	-	3,127	*51.8*	6,039	*100*
2010	2,744	*39.5*	394	*5.7*	602	*8.7*	-	-	3,207	*46.2*	6,947	*100*
2011	2,820	*37.1*	769	*10.1*	650	*8.5*	-	-	3,371	*44.3*	7,610	*100*
2012	3,870	*46.3*	390	*4.7*	694	*8.3*	-	-	3,409	*40.8*	8,363	*100*
2013	4,011	*46.8*	292	*3.4*	708	*8.3*	0	*0.0*	3,554	*41.5*	8,565	*100*
2014	4,177	*45.7*	621	*6.8*	721	*7.9*	0	*0.0*	3,629	*39.7*	9,148	*100*
2015	4,248	*44.5*	1,182	*12.4*	503	*5.3*	0	*0.0*	3,618	*37.9*	9,551	*100*
2016	4,746	*49.9*	692	*7.3*	478	*5.0*	2	*0.0*	3,601	*37.8*	9,520	*100*
2017	4,094	*42.5*	1,146	*11.9*	478	*5.0*	2	*0.0*	3,902	*40.5*	9,622	*100*
2018*	4,681	*43.1*	1,459	*13.4*	517	*4.8*	3	*0.0*	4,192	*38.6*	10,852	*100*
2019	4,276	*38.3*	2,036	*18.2*	624	*5.6*	4	*0.0*	4,218	*37.8*	11,159	*100*

*Revised, - means Not Available

NB.: There is no information or data on solar (sunlight) used for drying of cash crops, commercial wood and clothing

Figure 3.3: Trend in Primary Energy Supply



NB: Solar is not showing because it is negligible

Table 3.2: Final Energy Consumption by Fuel

Year	Electricity		Petroleum		Biomass		Total	
	Ktoe	%	Ktoe	%	Ktoe	%	Ktoe	%
2000	592.3	*10.7*	1,535.3	*27.6*	3,432.4	*61.7*	5,560.1	*100*
2001	612.9	*11.4*	1,537.0	*28.5*	3,237.8	*60.1*	5,387.6	*100*
2002	582.3	*11.0*	1,633.6	*30.8*	3,081.8	*58.2*	5,297.7	*100*
2003	446.0	*9.0*	1,573.5	*31.8*	2,924.7	*59.2*	4,944.2	*100*
2004	455.6	*8.9*	1,800.0	*35.3*	2,839.0	*55.7*	5,094.6	*100*
2005	510.1	*10.1*	1,817.6	*35.8*	2,745.2	*54.1*	5,072.9	*100*
2006	621.3	*12.0*	1,872.6	*36.3*	2,671.3	*51.7*	5,165.2	*100*
2007	539.2	*10.3*	2,126.6	*40.4*	2,593.7	*49.3*	5,259.5	*100*
2008	597.7	*11.5*	2,071.3	*39.9*	2,517.8	*48.5*	5,186.8	*100*
2009	615.4	*10.8*	2,597.7	*45.5*	2,493.3	*43.7*	5,706.3	*100*
2010	674.2	*12.0*	2,491.1	*44.3*	2,463.9	*43.8*	5,629.2	*100*
2011	772.1	*12.5*	2,826.6	*45.8*	2,575.6	*41.7*	6,174.3	*100*
2012	851.9	*12.9*	3,172.1	*48.0*	2,588.8	*39.1*	6,612.8	*100*
2013	908.4	*13.2*	3,303.0	*48.0*	2,676.0	*38.9*	6,887.4	*100*
2014	919.8	*13.2*	3,271.7	*46.9*	2,791.7	*40.0*	6,983.2	*100*
2015	841.0	*11.7*	3,544.6	*49.4*	2,784.7	*38.8*	7,170.3	*100*
2016	990.9	*14.1*	3,274.2	*46.5*	2,783.4	*39.5*	7,048.6	*100*
2017	1,042.3	*14.8*	3,052.5	*43.2*	2,970.4	*42.0*	7,065.2	*100*
2018*	1,133.9	*14.8*	3,547.8	*46.4*	2,961.0	*38.7*	7,642.7	*100*
2019	1,199.1	*15.0*	3,794.0	*47.6*	2,981.3	*37.4*	7,974.5	*100*

*Revised

NB: Electricity consumption include commercial losses. There is also no information or data on solar (sunlight) used for drying of cash crops, commercial wood and clothing.

NB: Petroleum products consumed in 2016, 2017 and 2018, include natural gas used in industry

Figure 3.4: Final Energy Consumption

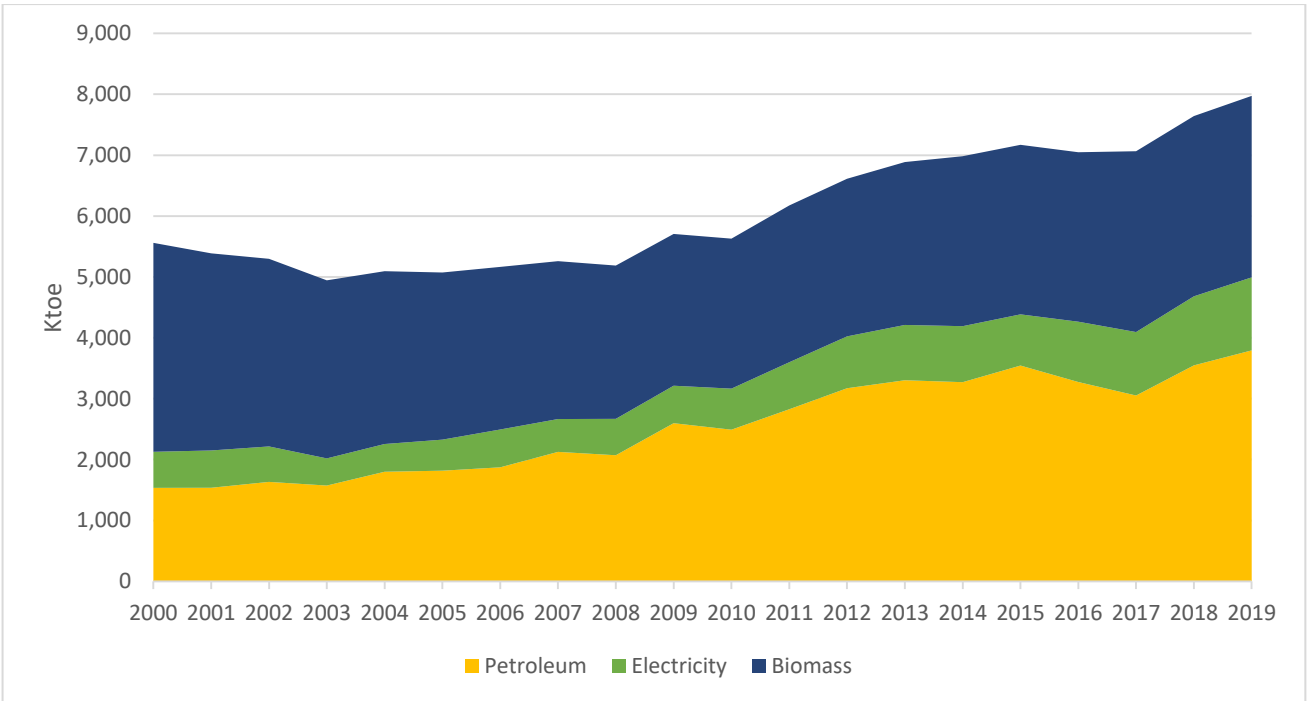
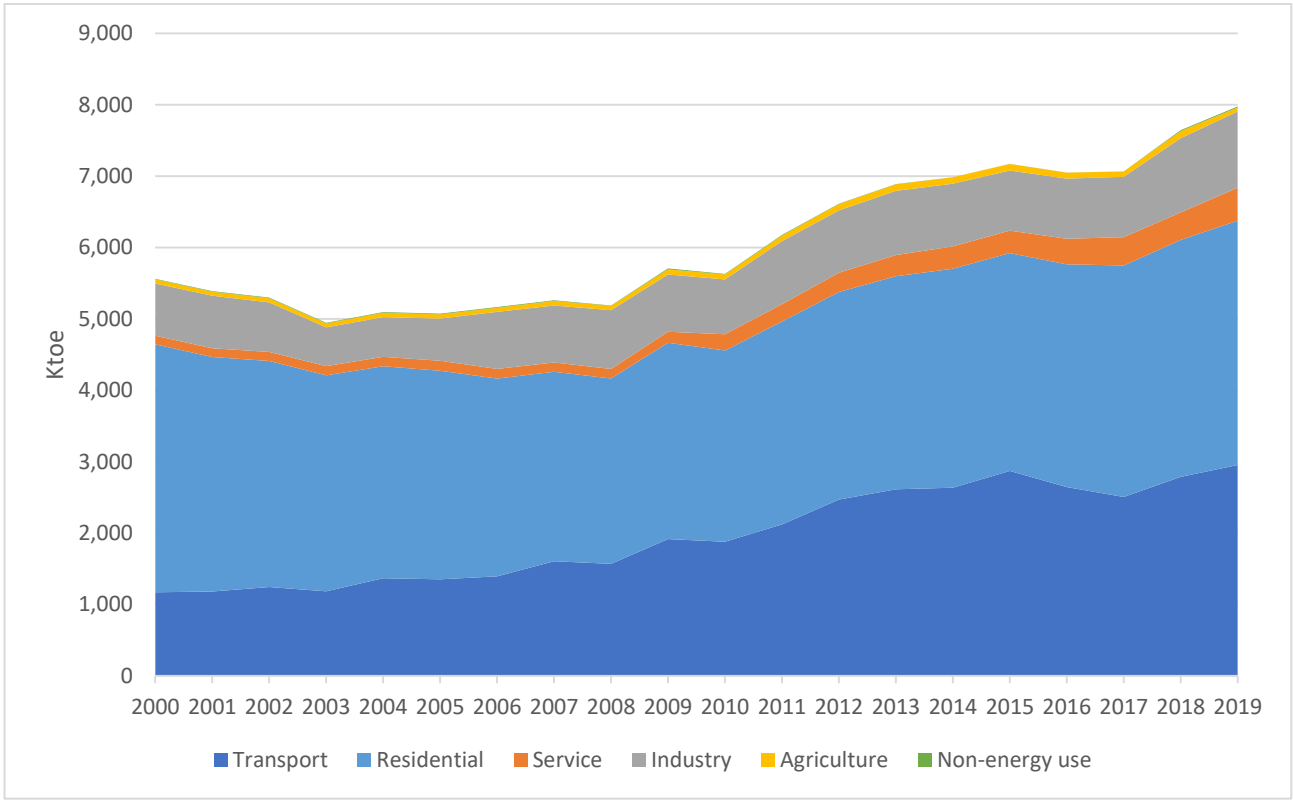


Table 3.3: Final Energy Consumption by Sectors (Ktoe)

Year	Residential	Service	Industry	Agriculture	Transport	Non-energy use	Total
2000	3,473.2	121.3	730.3	59.0	1,169.1	7.3	5,560.1
2001	3,284.9	122.5	736.7	55.8	1,179.8	8.0	5,387.6
2002	3,166.8	126.2	694.2	59.1	1,242.6	8.9	5,297.7
2003	3,026.0	128.6	543.1	55.4	1,182.6	8.5	4,944.2
2004	2,969.7	131.8	556.4	61.5	1,365.8	9.4	5,094.6
2005	2,921.7	140.2	590.8	59.6	1,350.6	9.9	5,072.9
2006	2,770.8	134.7	799.7	57.3	1,392.4	10.3	5,165.2
2007	2,654.2	130.6	797.8	64.2	1,603.8	8.8	5,259.5
2008	2,596.2	133.5	823.8	60.8	1,567.5	4.9	5,186.8
2009	2,750.2	154.4	802.8	71.8	1,914.1	13.1	5,706.3
2010	2,679.3	227.1	767.8	70.4	1,877.3	7.4	5,629.2
2011	2,841.9	243.2	883.2	76.9	2,119.4	9.7	6,174.3
2012	2,908.3	269.8	873.4	88.1	2,467.6	5.5	6,612.8
2013	2,984.8	296.7	899.6	90.9	2,611.7	3.7	6,887.4
2014	3,067.6	312.9	878.4	89.4	2,633.8	1.1	6,983.2
2015	3,052.0	314.7	841.7	92.5	2,868.5	0.9	7,170.3
2016	3,120.7	358.1	842.5	83.0	2,642.9	1.4	7,048.6
2017	3,242.9	396.7	845.8	74.6	2,504.2	1.0	7,065.2
2018	3,319.2	385.6	1,039.6	99.1	2,785.8	13.4	7,642.7
2019	3,422.6	461.3	1,068.6	55.8	2,951.9	14.2	7,974.5

Figure 3.5: Trend in Final Energy Consumption by Sector



SECTION FOUR: ELECTRICITY

AN OVERVIEW

4.1 Installed Electricity Generation Capacity

The installed electricity generation capacity increased from 1,652 MW in 2000 to 5,172 MW in 2019 representing an annual average growth rate of 6.2%, whilst dependable capacity increased from 1,358 MW in 2000 to 4,695 MW in 2019 (Table 3.1).

Between 2012 and 2019, there was a significant increase in the installed capacity, from 2,280 MW in 2012 to 5,172 MW in 2019, representing an annual average increase of 12.4%. Also, the installed grid connected renewable capacity increased form 2.5 MW in 2013 to 42.6 MW as at the end of 2019, whilst the total installed renewable capacity (including off-grid and mini-grid) increased from 2,995 kW in 2013 to 78,614 kW in 2019. The annual installed renewable generation capacity is presented in Table 3.2.

The thermal generation capacity increased from 580 MW in 2000 to 3,549 MW in 2019 whilst the hydro generation capacity increased from 1,072 MW in 2000 to 1,580 MW as at the end of 2019. The installed thermal generation capacity registered a significant increase of 2,301 MW between 2014 and 2019 representing an annual average growth of 23.2% (Table 3.1).

4.2 Electricity Generation

The total electricity generation increased more than two-fold, from 7,224 GWh in 2000 to 18,189 GWh in 2019, representing an average annual increase of 5% (Table 3.4). The share of hydro in the total electricity generation decreased from 91.5% in 2000 to 39.9% in 2019 whilst that of thermal increased from 8.5% in 2000 to 59.8% in 2019. This represent an annual average growth rate of 0.5% and 16.3% for the hydro and thermal plants respectively.

The electricity generation from the renewable sources commenced with the construction of a 2.5 MW solar plant in Navrongo in the Upper East Region, the first grid connected solar plant in the country by the Volta River Authority in 2013. The electricity generated by the VRA solar plant in that year was 3 GWh. The generation of electricity from renewable sources increased to 52 GWh by the end of 2019 with the coming online of an additional 40 MW solar plant and a 100kW biogas plant. As at the end of 2019, electricity generated from renewable sources constituted 0.3% of the total electricity generated in the country (Table 3.4).

4.3 Electricity Import & Export

The total electricity imported in 2000 was 864 GWh (Table 3.5) representing 13.7% of the total electricity generated that year. In 2019, however, 127 GWh of electricity was imported representing 0.7% of total electricity generated.

As shown in Table 3.5, with regards to export, 392 GWh (representing 5.9% of the total generation) of electricity was exported in 2000 increasing to 1,430 GWh in 2019 (7.8% of the electricity generated).

4.4 Peak Load

Table 3.6 presents the Ghana load at peak and the system peak from 2000 to 2019. The Ghana load at peak (maximum demand for Ghana i.e. (ECG +NEDCo +Mines + Direct Customers of VRA)) increased at an annual average growth rate of 6.3% from 820 MW in 2000 to 2,613 MW in 2019. Between 2018 and 2019, there was a 10.2% increase in the Ghana peak load, from 2,371 MW in 2018 to 2,613 MW in 2019. The system peak (Ghana Load at Peak + VALCO load + export load) also increased from 1,161 MW in 2000 to 2,804 MW in 2019 representing an annual average increase of 4.8%. The system peak increased from 2,525 MW in 2018 to 2,804 MW in 2019 representing an annual increase of 11%.

4.5 Electricity Transmitted and Transmission Losses

The total electricity transmitted increased from 8,067 GWh in 2000 to 17,887 GWh in 2019 as shown in Table 3.8. This represent an annual average increase of 4.3% between the period. The total electricity transmitted between 2018 and 2019 increased from 15,960 GWh in 2018 to 17,887 GWh in 2019 representing a growth of 12.1% over the quantity transmitted in 2018. In terms of transmission losses incurred over the period, its value increased from 229 GWh (2.8% of the total electricity transmitted) in 2000 to 844 GWh (4.7% of the total electricity transmitted) in 2019. Over the period of 2000 and 2019, 4% of electricity on the average is lost during transmission.

4.6 Electricity Purchases & Sales by Distribution Utilities

Electricity distribution utilities' electricity purchases and sales is presented in Table 3.11. In 2000, distribution utilities (ECG and NEDCo) purchased a total of 4,319 GWh of electricity for distribution to their various customer classes. The total sales to customers were 3,142 GWh resulting in a distribution loss[2] of 1,176 GWh, representing 27.2% of the electricity purchased. The total purchases by the distribution utilities' (ECG, NEDCo, & EPC) increased to 13,183 GWh in 2019. Out of this, 3,260 GWh representing 24.7% of electricity purchased for distribution was lost.

4.7 Electricity Sales by Customer Class

The electricity sales by the utilities to their various customer classes is presented in Table 3.13. The table shows that the electricity sales to Special Load Tariff[3] (SLT) customers constituted 67.9% (4,305 GWh) of the total electricity sold to the various customer classes in 2000.

[2] Technical and commercial losses

[3] Include other direct customers of VRA such as mines, VALCO etc.

This is followed by the residential sector, constituting 23.1% (1,464 GWh) of the total electricity sold in that year. The structure of electricity sales by utilities remained relatively the same in 2019 with sales to the SLT taking the largest share of electricity sales to the various customer classes. The SLT customers consumed 5,282 GWh of the total electricity sales representing 42.9% with the residential sector taking 4,755 GWh representing 38.6% of total sales. The electricity used for street lighting increased from 15 GWh in 2000 to 755 GWh in 2019, representing an annual average growth rate of 22.9%.

4.8 Electricity Consumption by Sector

The final electricity consumed by the various sectors of the economy is presented in Table 3.7 and illustrated in Figure 3.14. In 2000, the industrial and residential sectors consumed 4,380 GWh and 2,026 GWh of electricity respectively representing 63.6% and 29.4% of the total final electricity consumed respectively. In 2019, however, the residential share of the final electricity consumed increased to 45.6%, representing 6,357 GWh of the total final electricity consumed followed by the industrial sector with a share of 30.4% representing 4,242 GWh of the total final electricity consumed.

Figure 4.1: Electricity Consumption by Sectors, 2000 & 2019

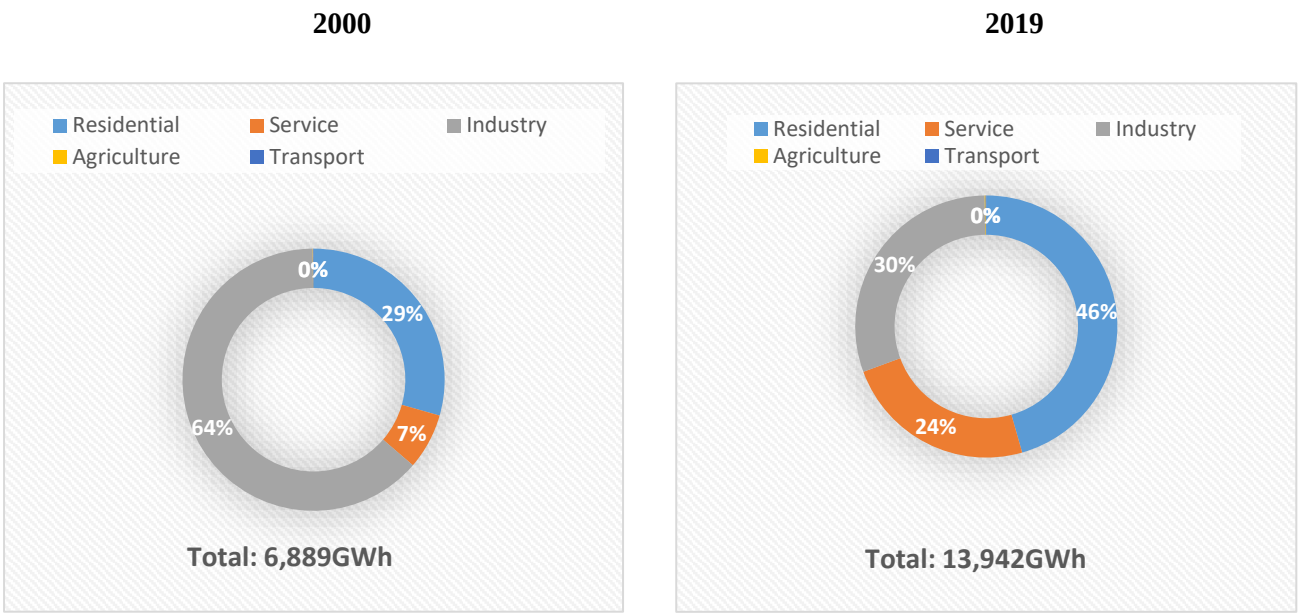


Table 4.1: Installed Generation Capacity (MW)

Year	Installed Capacity				Dependable Capacity			
	Hydro	Thermal	Renewable	Total	Hydro	Thermal	Renewable	Total
2000	1,072	580	-	1,652	928	430	-	1,358
2001	1,072	580	-	1,652	951	530	-	1,481
2002	1,072	580	-	1,652	974	530	-	1,504
2003	1,072	580	-	1,652	982	530	-	1,512
2004	1,180	550	-	1,730	1,040	500	-	1,540
2005	1,180	550	-	1,730	1,040	500	-	1,540
2006	1,180	550	-	1,730	1,040	500	-	1,540
2007	1,180	755	-	1,935	1,040	670	-	1,710
2008	1,180	801	-	1,981	1,040	695	-	1,735
2009	1,180	790	-	1,970	1,040	725	-	1,765
2010	1,180	985	-	2,165	1,040	900	-	1,940
2011	1,180	990	-	2,170	1,040	905	-	1,945
2012	1,180	1,100	-	2,280	1,040	1,005	-	2,045
2013	1,580	1,248	2.5	2,831	1,380	1,105	2	2,487
2014	1,580	1,248	2.5	2,831	1,380	1,187	2	2,569
2015	1,580	2,053	22.5	3,656	1,380	1,957	22	3,359
2016	1,580	2,192	22.6	3,795	1,380	2,119	22	3,521
2017	1,580	2,785	22.6	4,388	1,380	2,568	18	3,966
2018	1,580	3,266	42.6	4,889	1,380	3,058	34	4,472
2019	1,580	3,549	42.6	5,172	1,365	3,296	34	4,695

Figure 4.2: Trend in Installed Electricity Generation Capacity

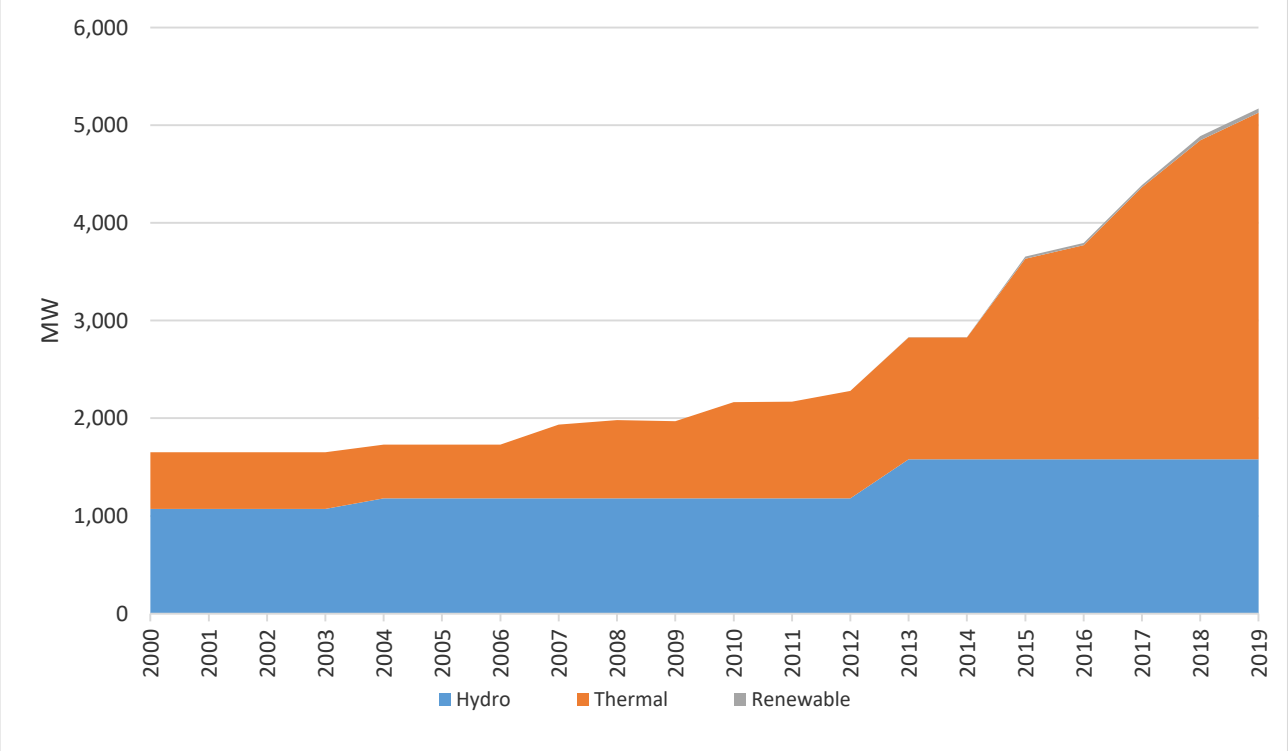


Table 4.2: Installed Renewable Generation Capacity (kW)

Year	Off-grid		On-grid				Mini-Grid		Installed
	Solar	Wind	Dist. SPV	Utility Solar	W2E	Hydro	Solar	Wind	
2013	-	-	495	2,500	-	-	-	-	2,995
2014	1,350	-	443	-	-	-	-	-	1,793
2015	4,003	20	700	20,000	100	4,000	256	11	29,090
2016	1,238	-	2,626	-	-	-	-	-	3,865
2017	678	-	4,266	-	-	-	58	-	5,002
2018	4	-	9,441	20,000	-	-	-	-	29,445
2019	-	-	6,426	-	-	-	-	-	6,426
TOTAL	**7,273**	**20**	**24,396**	**42,500**	**100**	**4,000**	**314**	**11**	**78,614**

NB: Dist. SPV = Distributed Solar PV; W2E = Waste – to – Energy
Source: Ministry of Energy & Energy Commission

Figure 4.3: Trend in Installed Electricity Generation Capacity

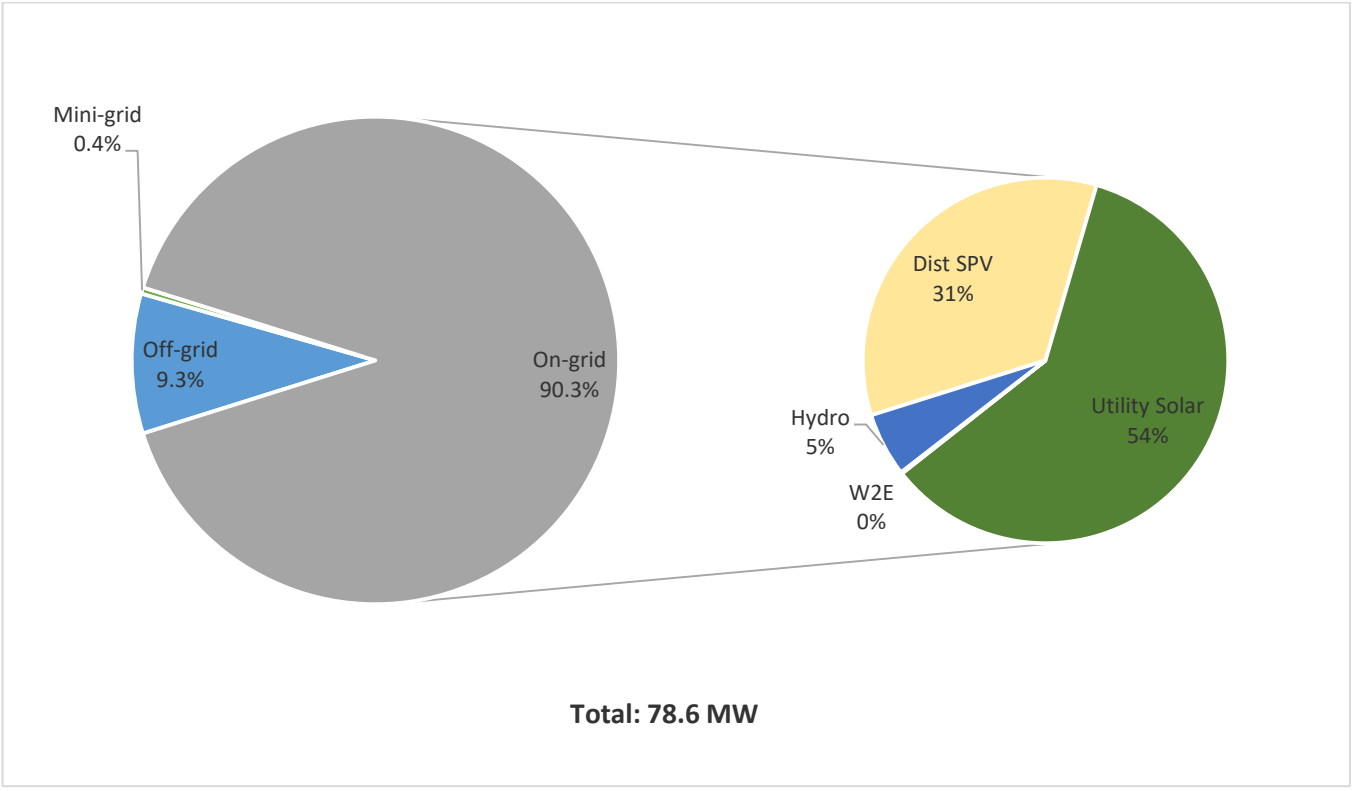


Table 4.3: Total Installed Generation Capacity as at end of December 2019

Plant	Installed Capacity (MW)	Dependable Capacity (MW)
Hydro		
Akosombo	1,020	900
Kpong	160	105
Bui	400	360
Total	**1,580**	**1,365**
Thermal		
Takoradi Power Company (TAPCO)	330	300
Takoradi International Company (TICO)	340	320
Tema Thermal 1 Power Plant (TT1PP)	110	100
Cenit Energy Ltd	110	100
Sunon Asogli Power (Ghana) Limited	560	520
Tema Thermal 2 Power Plant (TT2PP)	87	71.5
Kpone Thermal Power Plant	220	200
Karpowership	470	450
Ameri Plant	250	230
Trojan*	44	39.6
Genser*	95	85
Amandi	203	190
AKSA	370	350
Cenpower	360	340
Total	**3,549**	**3,296.1**
Renewables		
Safisana Biogas*	0.1	0.1
VRA Solar*	2.5	2
BXC Solar*	20	16
Meinergy*	20	16
Total	**42.6**	**34.1**
Grand Total	**5,171.6**	**4,695.2**

*Connected at the sub-transmission level

Table 4.4: Grid Electricity Generation

Year	Generation (GWh)				Share (%)			
	Hydro	Thermal	Renewables	Total	Hydro	Thermal	Renewables	Total
2000	6,610	614	-	7,224	91.5	8.5	-	100
2001	6,609	1,250	-	7,859	84.1	15.9	-	100
2002	5,036	2,237	-	7,273	69.2	30.8	-	100
2003	3,885	1,996	-	5,881	66.1	33.9	-	100
2004	5,280	758	-	6,038	87.4	12.6	-	100
2005	5,629	1,159	-	6,788	82.9	17.1	-	100
2006	5,619	2,811	-	8,430	66.7	33.3	-	100
2007	3,727	3,251	-	6,978	53.4	46.6	-	100
2008	6,196	2,129	-	8,325	74.4	25.6	-	100
2009	6,877	2,081	-	8,958	76.8	23.2	-	100
2010	6,995	3,171	-	10,166	68.8	31.2	-	100
2011	7,561	3,639	-	11,200	67.5	32.5	-	100
2012	8,071	3,953	-	12,024	67.1	32.9	-	100
2013	8,233	4,635	3	12,870	64.0	36.0	0.0	100
2014	8,387	4,572	4	12,963	64.7	35.3	0.0	100
2015	5,844	5,644	3	11,491	50.9	49.1	0.0	100
2016	5,561	7,435	27	13,023	42.7	57.1	0.2	100
2017	5,616	8,424	28	14,067	39.9	59.9	0.2	100
2018	6,017	10,195	33	16,246	37.0	62.8	0.2	100
2019	7,252	10,885	52	18,189	39.9	59.8	0.3	100

Source: GRIDCo and ECG/PDS

Figure 4.4: Trend in Grid Electricity Generation

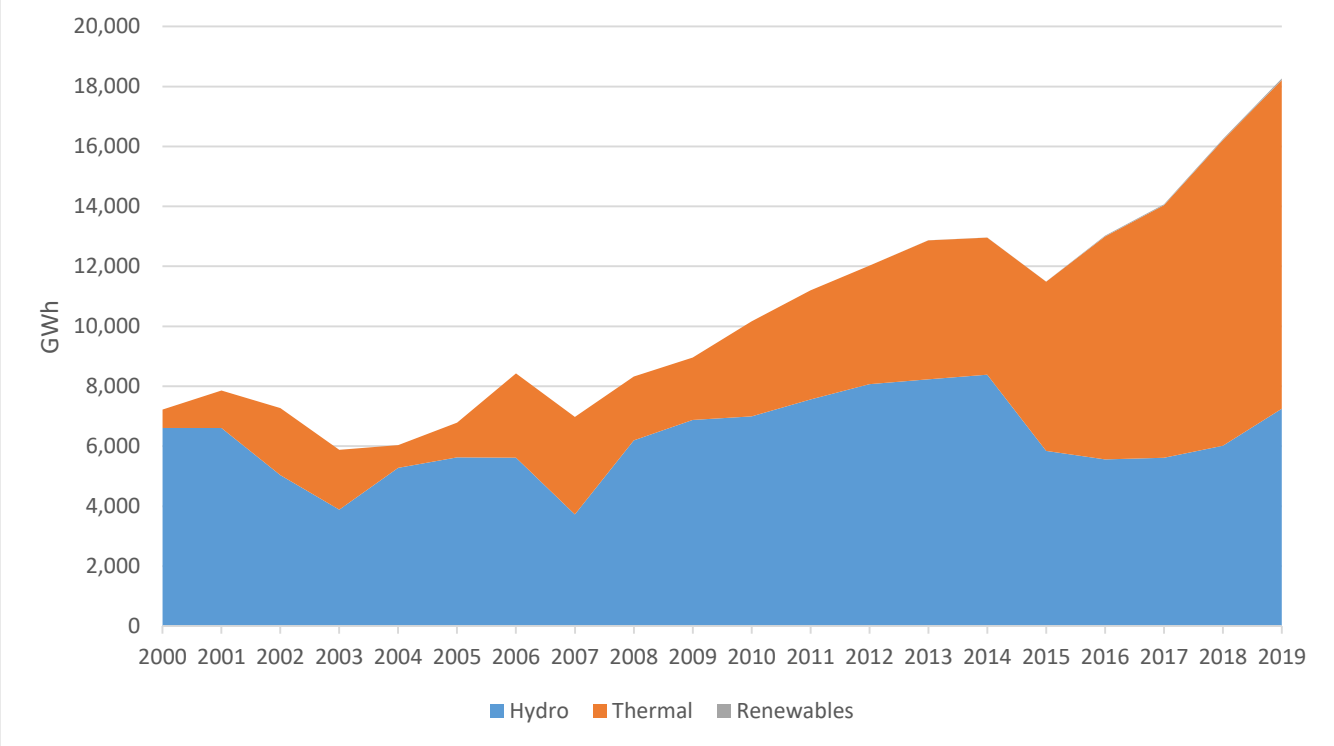


Table 4.5: Electricity Import and Export (GWh)

Year	Import	Export	Net Import
2000	864	392	472
2001	462	302	160
2002	1,146	612	534
2003	940	535	405
2004	878	667	211
2005	815	639	176
2006	629	755	-126
2007	435	249	186
2008	275	538	-263
2009	198	752	-554
2010	106	1,036	-930
2011	81	691	-610
2012	128	667	-539
2013	27	530	-503
2014	51	522	-471
2015	223	587	-364
2016	745	187	558
2017	320	268	52
2018	140	740	-600
2019	127	1,430	-1,227

NB: 'Negative net import' means net export
Source: GRIDCo

Figure 4.5: Trend in Electricity Import and Export

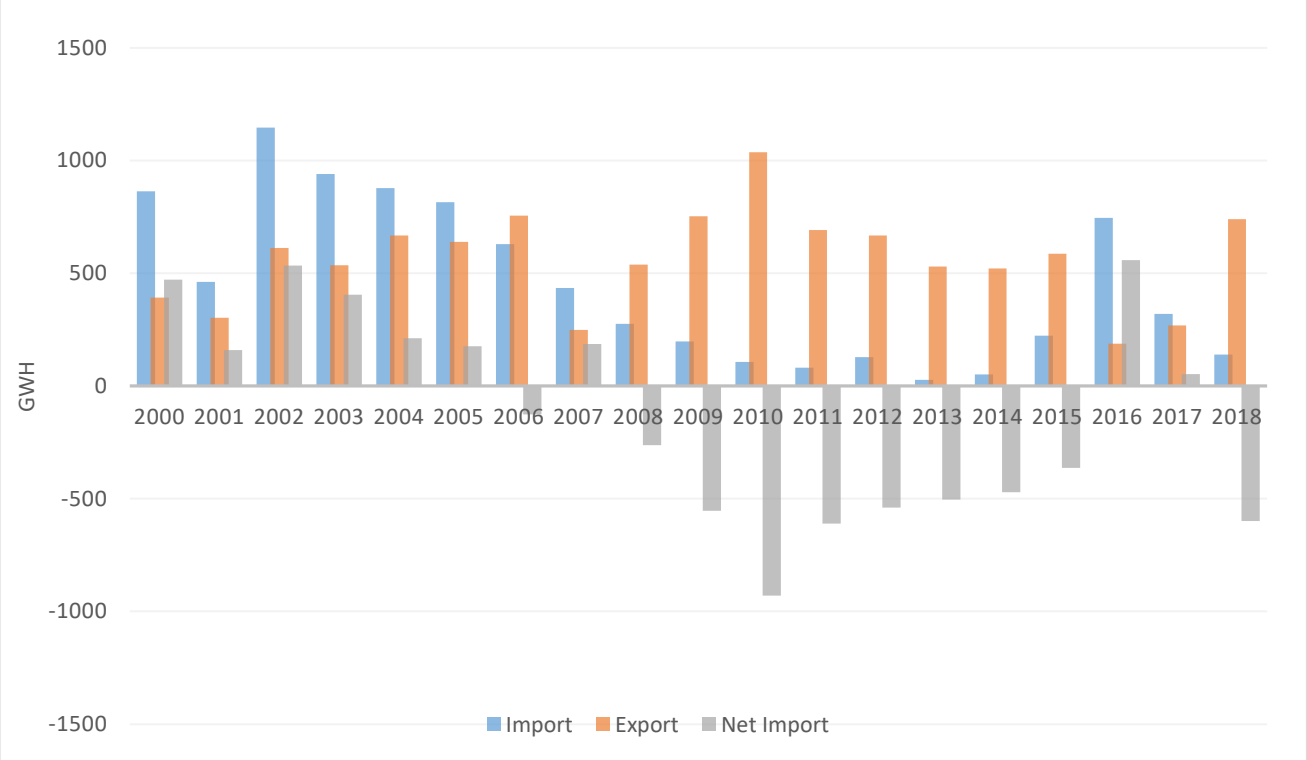


Table 4.6: Peak Load (MW)

Year	System Peak	Ghana Load at Peak
2000	1,161	820
2001	1,190	854
2002	1,227	879
2003	1,135	925
2004	1,049	985
2005	1,325	1,064
2006	1,393	1,104
2007	1,274	1,158
2008	1,367	1,208
2009	1,423	1,263
2010	1,506	1,391
2011	1,665	1,520
2012	1,729	1,658
2013	1,943	1,791
2014	1,970	1,853
2015	1,933	1,757
2016	2,078	1,997
2017	2,192	2,077
2018	2,525	2,371
2019	2,804	2,613

NB: System Peak = Ghana Load at Peak + VALCO Load + Export Load;
Ghana Load at Peak = Maximum Demand for Ghana (ECG +NEDCo + Direct Customers of VRA + Mines)
Source: VRA & GRIDCo

Figure 4.6: Trend in Peak Load

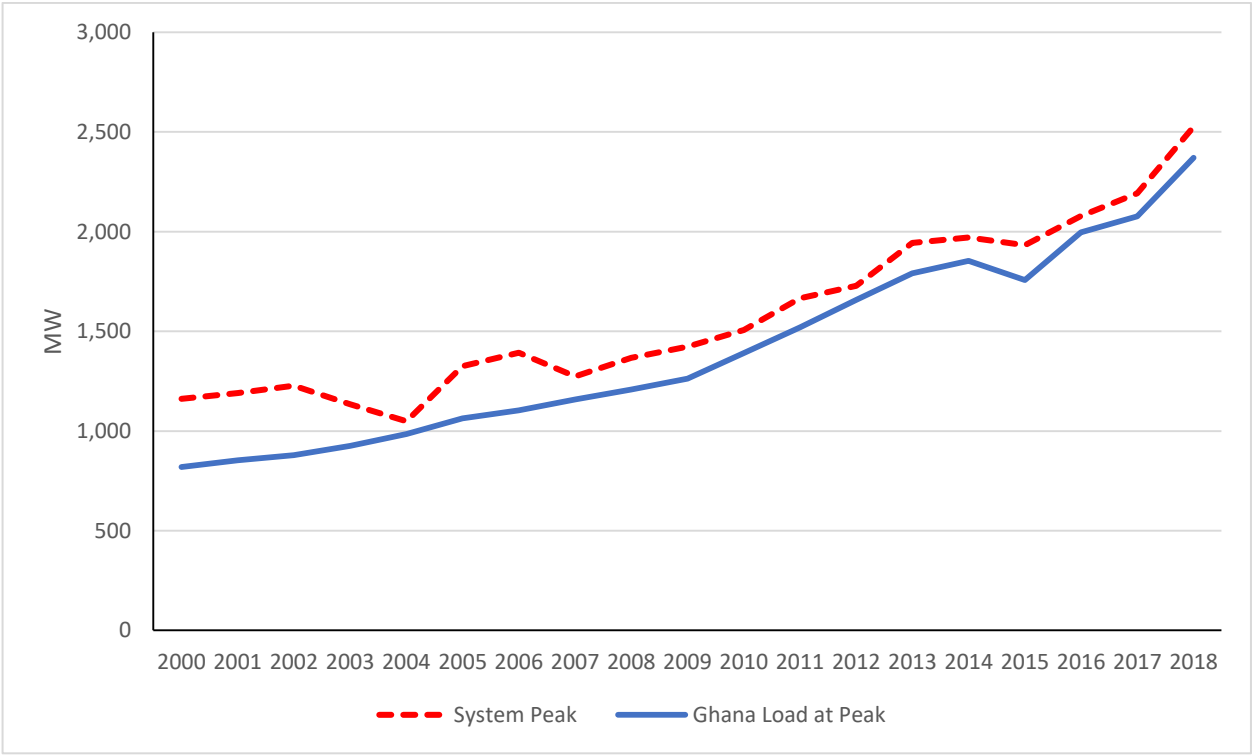


Table 4.7: Installed Capacity, Dependable Capacity and Peak Load (MW)

Year	Installed Capacity	Dependable Capacity	Peak Load
2000	1,652	1,358	1,161
2001	1,652	1,481	1,190
2002	1,652	1,504	1,227
2003	1,652	1,512	1,135
2004	1,730	1,540	1,049
2005	1,730	1,540	1,325
2006	1,730	1,540	1,393
2007	1,935	1,710	1,274
2008	1,981	1,735	1,367
2009	1,970	1,765	1,423
2010	2,165	1,940	1,506
2011	2,170	1,945	1,665
2012	2,280	2,045	1,729
2013	2,831	2,487	1,943
2014	2,831	2,569	1,970
2015	3,656	3,359	1,933
2016	3,795	3,521	2,078
2017	4,388	3,966	2,192
2018	4,889	4,472	2,525
2019	5,172	4,695	2,881

Figure 4.7: Trend in Installed Capacity, Dependable Capacity and Peak Load

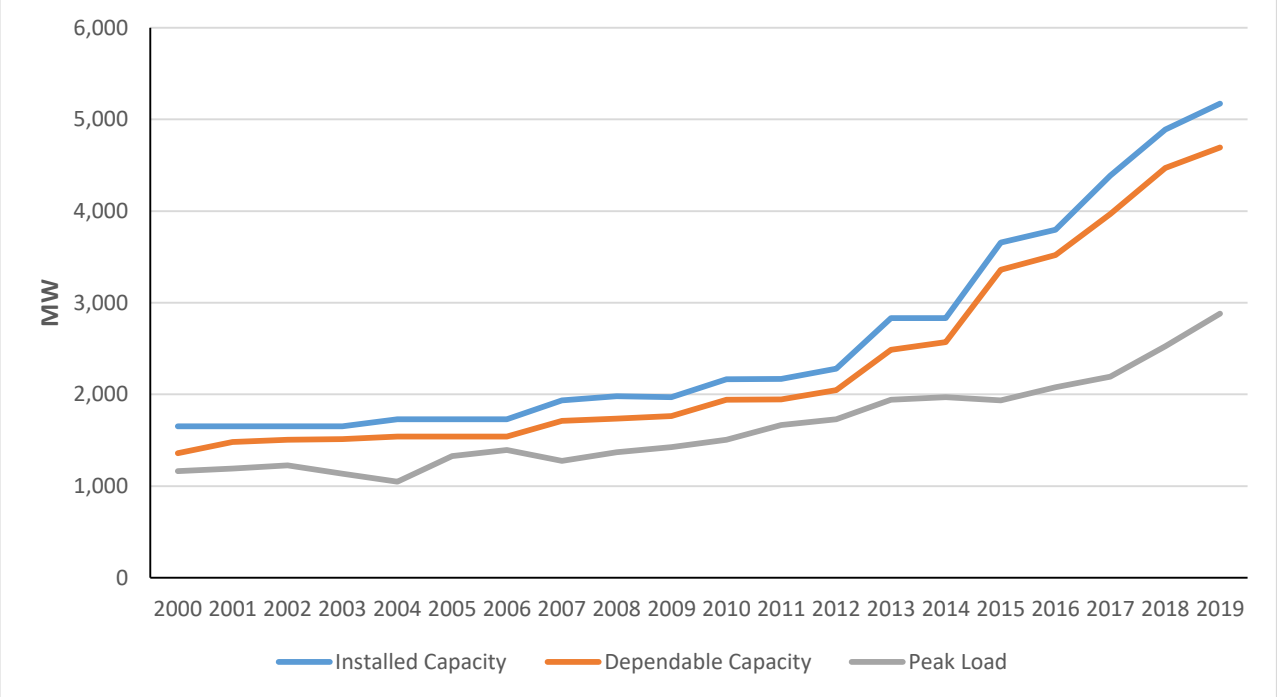


Table 4.8: Electricity Transmitted and Transmission Losses

Year	Electricity Transmitted (GWh)	Transmission Losses (GWh)	Transmission losses as % of electricity transmitted
2000	8,067	229	2.8
2001	8,293	259	3.1
2002	8,402	368	4.4
2003	6,800	402	5.9
2004	6,891	205	3.0
2005	7,565	249	3.3
2006	9,013	318	3.5
2007	7,123	256	3.6
2008	8,423	303	3.6
2009	9,131	343	3.8
2010	10,232	380	3.7
2011	11,174	531	4.8
2012	12,116	522	4.3
2013	12,927	570	4.4
2014	13,069	565	4.3
2015	11,692	402	3.4
2016	13,700	607	4.4
2017	14,308	540	3.8
2018	15,960	707	4.4
2019	17,887	844	4.7

Source: GRIDCo

Figure 4.8: Trend in Electricity Transmitted and Transmission Losses

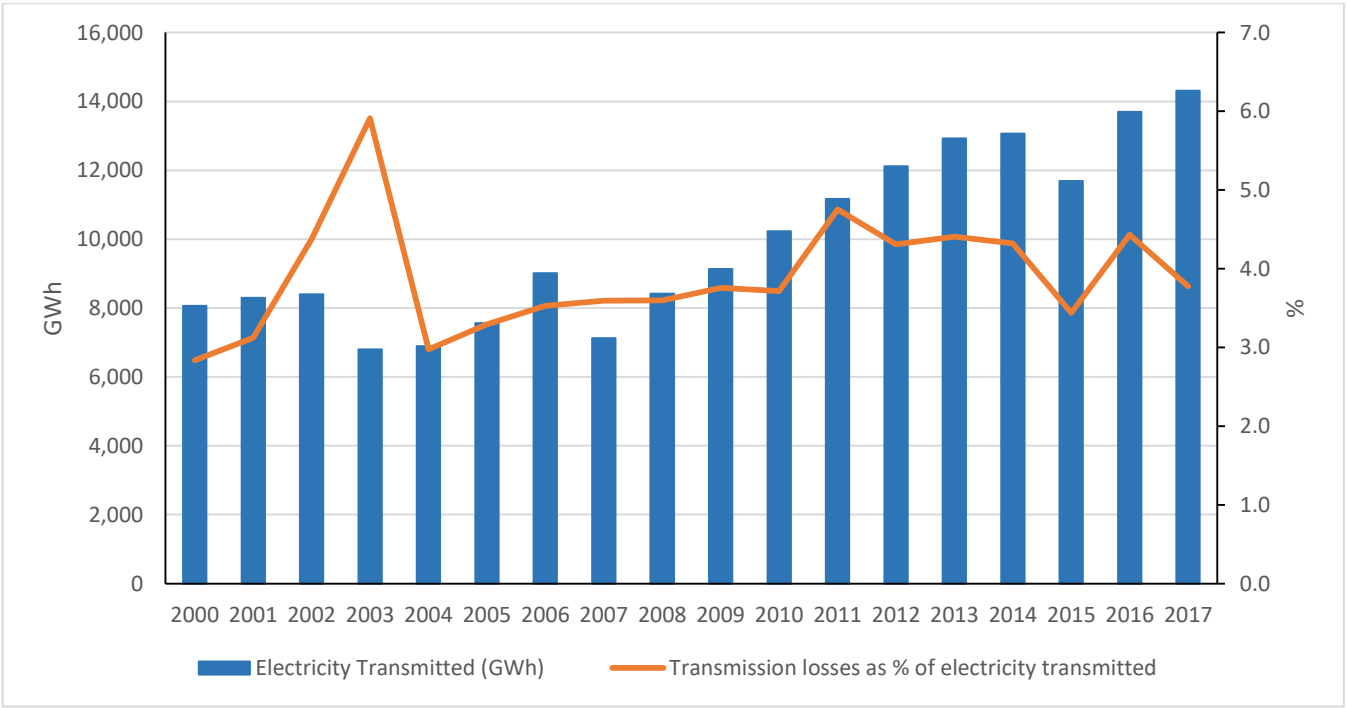


Table 4.9: Akosombo Dam Month End Elevation (feet)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	260.1	258.3	256.5	254.9	253.2	252.3	252.4	254.9	260.0	263.2	261.6	259.5
2001	257.4	255.4	253.1	251.3	249.6	247.9	246.8	246.3	250.3	251.5	249.4	247.5
2002	245.5	243.5	241.6	239.9	238.7	237.6	237.6	239.7	244.3	246.7	245.9	244.0
2003	242.4	240.7	239.0	237.9	236.6	237.0	238.4	241.1	249.6	255.7	255.6	254.3
2004	252.9	251.3	249.5	248.1	246.9	245.6	245.5	248.7	254.6	256.7	255.9	254.2
2005	252.3	250.4	248.7	247.0	245.3	244.4	244.7	246.2	250.0	253.4	252.1	250.1
2006	248.0	246.1	243.8	241.5	239.8	238.5	237.0	236.7	240.9	246.0	245.7	243.8
2007	241.5	239.4	237.4	236.3	235.9	235.5	235.2	239.5	252.5	256.4	255.8	254.7
2008	253.1	251.4	249.2	247.5	246.0	245.0	246.4	252.9	261.4	266.4	265.1	263.6
2009	261.7	259.9	258.1	256.9	255.0	254.0	254.1	258.8	266.3	270.4	270.3	268.2
2010	266.1	264.5	262.6	260.7	259.0	258.0	257.7	259.7	269.8	277.0	276.7	275.4
2011	273.8	272.4	270.8	269.1	267.4	266.4	266.7	267.6	271.7	274.7	273.7	271.9
2012	269.8	268.0	265.9	264.1	262.6	261.4	263.2	264.0	267.6	270.8	270.0	268.4
2013	266.3	264.3	262.2	260.3	258.7	257.0	256.2	255.1	258.1	260.8	259.4	257.7
2014	256.1	254.1	251.8	249.5	247.6	245.5	244.5	243.3	247.7	250.5	249.1	247.1
2015	245.4	244.0	242.3	240.8	239.2	238.4	237.5	238.1	241.8	244.8	244.0	242.7
2016	241.4	240.2	238.9	237.6	236.5	235.5	235.9	240.2	247.5	253.0	252.0	250.5
2017	248.8	246.9	244.5	242.3	240.7	240.4	242.8	249.5	252.3	253.2	253.1	252.8
2018	249.8	248.2	247.1	245.8	244.3	243.0	244.9	249.5	252.3	253.2	252.5	251.3
2019	260.1	258.2	256.1	254.3	252.7	252.3	252.5	254.4	259.0	256.2	266.0	264.8

Source: GRIDCo and VRA

Figure 4.9: Trend in Akosombo Dam Month End Elevation

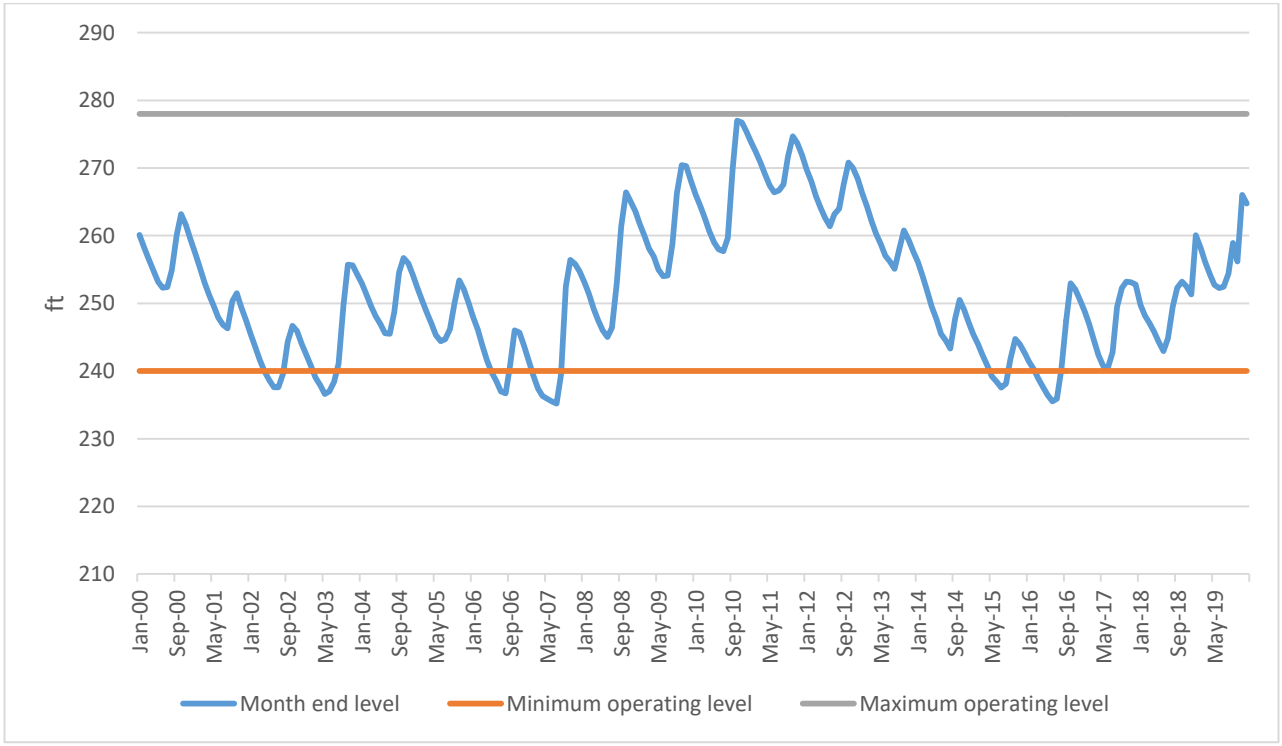


Table 4.10: Bui Dam Month End Elevation (feet)

Month	2014	2015	2016	2017	2018	2019
Jan	576.2	581.5	585.8	576.9	576.9	573.1
Feb	570.5	578.3	580.1	572.8	572.8	565.7
Mar	565.0	574.4	574.0	565.2	565.2	560.8
Apr	558.8	571.4	565.0	561.5	561.5	556.8
May	553.6	567.0	554.4	559.0	559.0	554.3
Jun	550.9	562.6	552.2	556.8	556.8	553.8
Jul	551.7	557.5	552.3	556.7	556.7	557.5
Aug	554.3	555.4	554.0	559.2	559.2	564.5
Sep	559.4	560.6	563.2	564.1	564.1	585.6
Oct	572.1	574.8	580.7	575.6	575.6	600.4
Nov	584.0	591.6	585.2	578.8	578.8	596.9
Dec	583.6	590.6	581.0	576.3	576.3	591.9

Figure 4.10: Trend in Bui Dam Month End Elevation

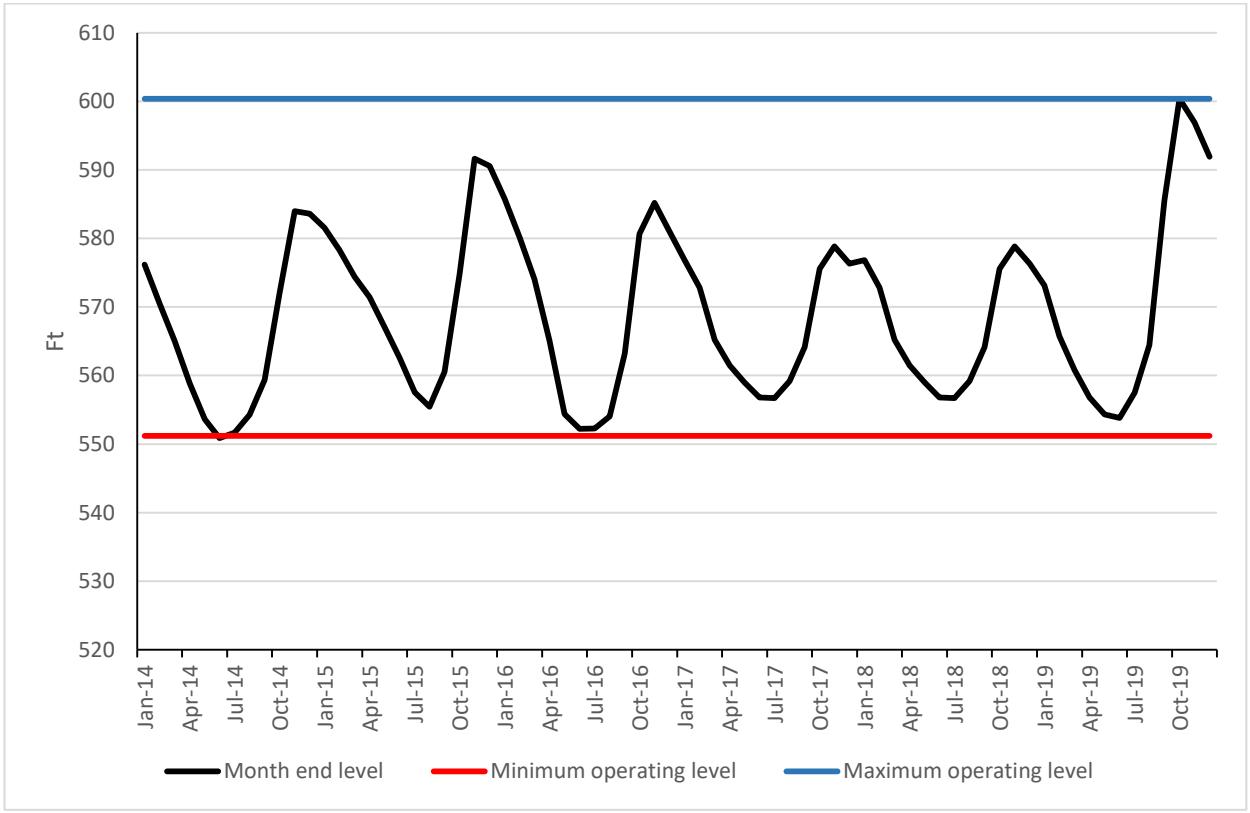


Table 4.11: Electricity Purchases, Sales and Losses by Distribution Utilities

Year	Purchases (GWh)				Sales (GWh)				Distribution Losses (GWh)				Distribution Losses (%)			
	ECG	NEDCo	EPC	TOTAL	ECG	NEDCo	EPC	TOTAL	ECG	NEDCo	EPC	TOTAL	ECG	NEDCo	EPC	TOTAL
2000	3,989	330	-	4,319	2,910	232	-	3,142	1,078	98	-	1,176	27.0	29.7	-	27.2
2001	4,175	355	-	4,530	3,080	251	-	3,331	1,095	104	-	1,199	26.2	29.4	-	26.5
2002	4,326	383	-	4,709	3,200	265	-	3,466	1,126	118	-	1,243	26.0	30.7	-	26.4
2003	4,496	426	-	4,922	3,343	283	-	3,625	1,153	143	-	1,297	25.7	33.7	-	26.3
2004	4,818	473	-	5,291	3,539	323	-	3,862	1,279	150	-	1,429	26.6	31.7	-	27.0
2005	5,045	501	-	5,546	3,760	312	-	4,072	1,285	189	-	1,474	25.5	37.7	-	26.6
2006	5,253	507	-	5,760	3,978	356	-	4,334	1,275	151	-	1,426	24.3	29.7	-	24.8
2007	5,146	494	-	5,640	3,909	366	-	4,275	1,237	128	-	1,366	24.0	26.0	-	24.2
2008	5,799	529	-	6,328	4,317	392	-	4,709	1,482	137	-	1,619	25.6	25.8	-	25.6
2009	6,052	566	-	6,618	4,482	413	-	4,894	1,570	153	-	1,724	25.9	27.1	-	26.0
2010	6,771	635	-	7,406	4,756	511	-	5,266	2,015	124	-	2,140	29.8	19.6	-	28.9
2011	7,259	719	-	7,978	5,050	581	-	5,631	2,209	138	-	2,347	30.4	19.2	-	29.4
2012	7,944	822	-	8,766	5,823	658	-	6,481	2,121	165	-	2,285	26.7	20.0	-	26.1
2013	8,479	937	-	9,416	6,496	737	-	7,233	1,983	200	-	2,183	23.4	21.3	-	23.2
2014	8,370	998	-	9,368	6,262	759	-	7,020	2,108	239	-	2,348	25.2	24.0	-	25.1
2015	7,544	1,013	102	8,659	5,831	719	96	6,645	1,713	294	7	2,014	22.7	29.0	6.4	23.3
2016	9,316	1,140	108	10,564	7,115	763	100	7,978	2,201	377	8	2,586	23.6	33.1	7.2	24.5
2017	9,783	1,224	157	11,164	7,575	889	155	8,618	2,208	335	3	2,546	22.6	27.4	1.8	22.8
2018	10,901	1,318	161	12,379	8,251	910	156	9,318	2,649	408	4	3,062	24.3	31.0	2.7	24.7
2019	11,535	1,413	235	13,183	8,685	1,010	229	9,923	2,850	403	7	3,260	24.7	28.5	2.8	24.7

NB: Distribution losses is both commercial & technical losses
Source: GRIDCo, NEDCo, Enclave Power, VRA and ECG/PDS

Figure 4.11: Trend in Electricity Purchases, Sales and Losses by Distribution Utilities

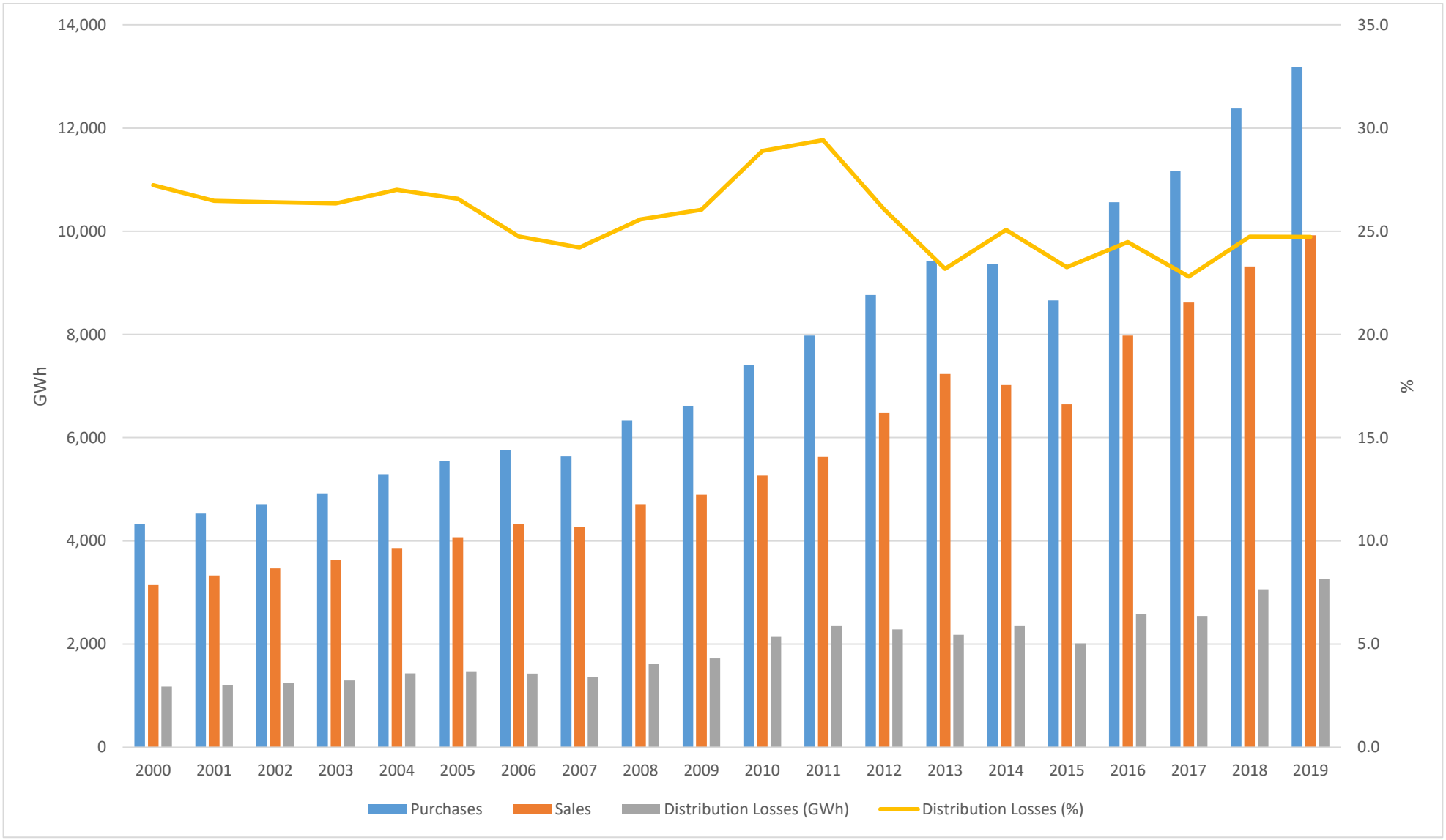


Table 4.12: Distribution Utilities Customer Population

Year	Residential	Non-residential	Special Load tariff	Total
2000	758,558	173,245	795	932,598
2001	832,212	189,807	828	1,022,847
2002	902,815	205,687	855	1,109,357
2003	1,014,404	230,651	880	1,245,935
2004	1,146,016	253,340	902	1,400,258
2005	1,253,330	272,442	964	1,526,736
2006	1,347,067	295,703	1,016	1,643,786
2007	1,463,679	328,511	1,055	1,793,245
2008	1,634,407	365,844	1,157	2,001,408
2009	1,856,962	413,634	1,233	2,271,829
2010	2,006,972	454,430	1,369	2,462,771
2011	2,209,957	505,447	1,481	2,716,885
2012	2,511,208	514,492	1,647	3,027,347
2013	2,582,294	545,665	1,882	3,129,841
2014	2,789,913	779,780	2,034	3,571,727
2015	3,445,423	630,518	2,115	4,078,055
2016	3,600,185	568,473	1,438	4,170,096
2017	3,477,300	619,255	1,494	4,098,049
2018	3,753,138	652,716	1,544	4,407,398
2019	4,046,358	692,046	1,744	4,740,148

Source: ECG/PDS, ENCLAVE POWER & NEDCo

Figure 4.12: Trend in Distribution Utilities Customer Population

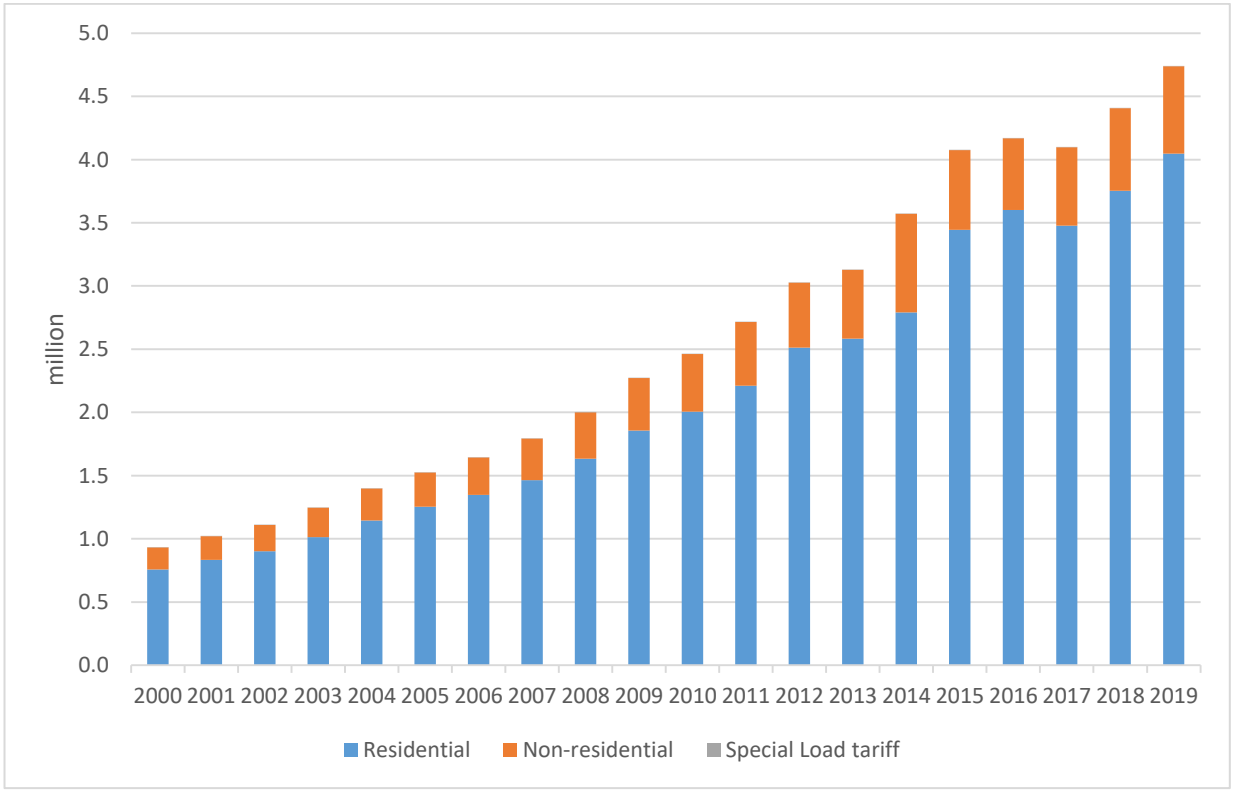


Table 4.13: Utilities Electricity Sales by Customer Class

Year	Residential	Non-residential	Special Load Tariff	Street Lighting	Total
2000	1,464	551	4,305	15	6,336
2001	1,594	580	4,337	18	6,528
2002	1,648	602	3,903	23	6,177
2003	1,696	620	2,206	31	4,552
2004	1,798	660	2,086	41	4,584
2005	1,905	676	2,559	50	5,190
2006	2,022	790	3,592	108	6,512
2007	1,996	802	2,687	101	5,586
2008	2,168	876	2,963	132	6,139
2009	2,275	924	2,951	144	6,294
2010	2,483	966	3,174	254	6,877
2011	2,527	1,199	3,901	296	7,923
2012	2,819	1,549	4,153	370	8,891
2013	3,060	1,532	4,435	445	9,471
2014	2,772	1,529	4,680	540	9,520
2015	2,436	1,531	4,274	536	8,776
2016	3,932	1,068	4,626	603	10,230
2017	3,931	1,356	4,880	679	10,847
2018	4,824	1,103	5,046	683	11,656
2019	4,755	1,523	5,282	755	12,314

Source: ECG/PDS, ENCLAVE POWER & NEDCo

Figure 4.13: Trend in Electricity Sales by Customer Class

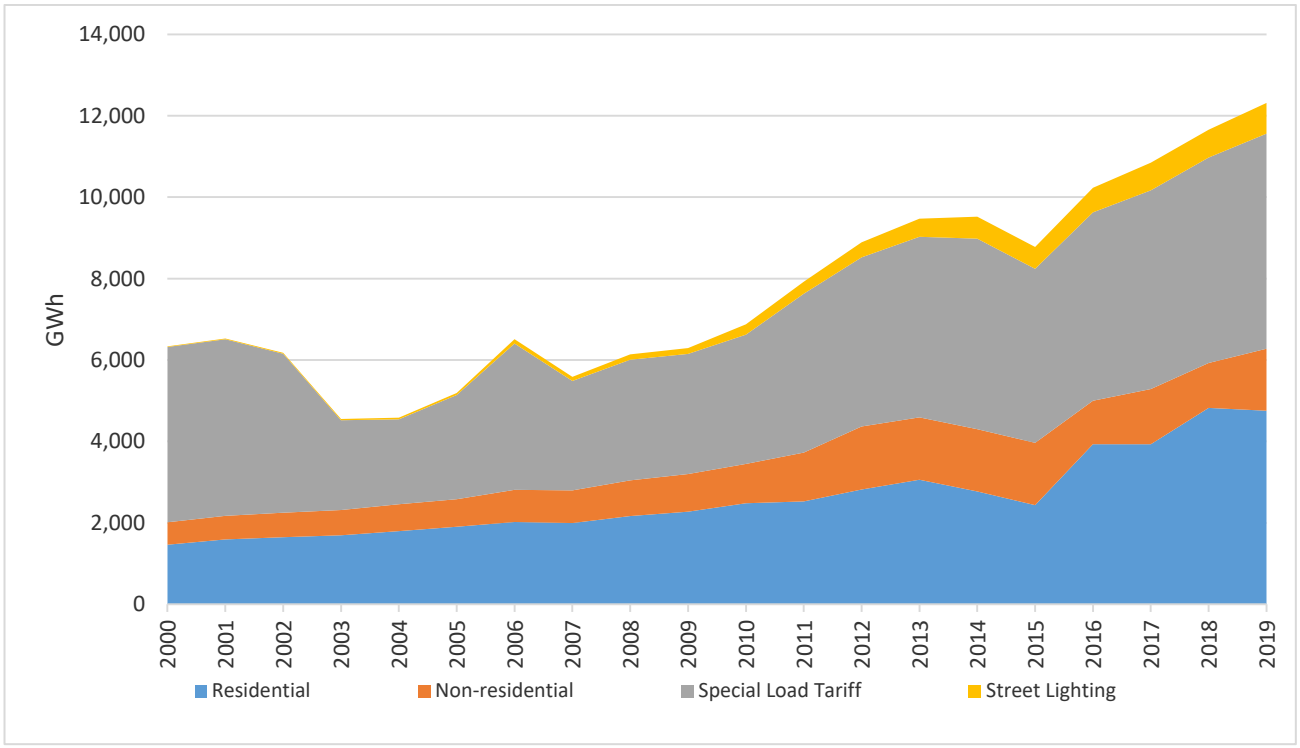
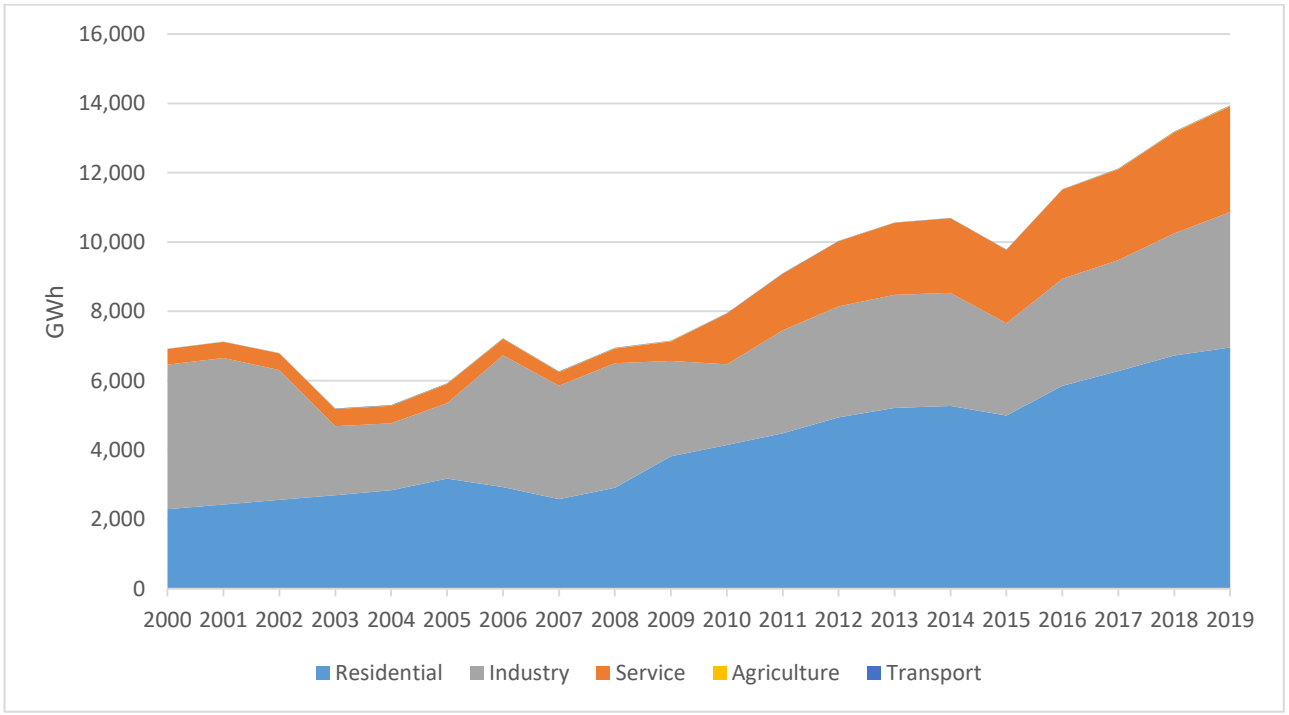


Table 4.14: Electricity Consumption by Sectors (GWh)

Year	Residential	Service	Industry	Agriculture	Transport	Total
2000	2,026	476	4,380	2	4	6,889
2001	2,174	491	4,455	4	4	7,128
2002	2,249	513	4,001	5	4	6,773
2003	2,360	558	2,249	6	14	5,187
2004	2,528	571	2,177	8	16	5,299
2005	2,699	655	2,558	10	11	5,932
2006	2,705	500	4,001	9	9	7,224
2007	2,604	392	3,254	8	12	6,270
2008	3,019	439	3,740	9	11	7,219
2009	3,384	688	3,357	16	9	7,454
2010	3,786	1,745	2,775	2	10	8,317
2011	3,822	1,897	3,454	2	13	9,187
2012	3,729	2,040	3,478	2	9	9,258
2013	4,230	2,470	3,876	2	5	10,583
2014	4,043	2,640	4,003	3	7	10,695
2015	3,618	2,723	3,425	3	12	9,780
2016	5,090	2,917	3,501	4	7	11,518
2017	5,325	3,103	3,792	14	11	12,246
2018	6,308	3,103	3,749	14	11	13,185
2019	6,357	3,318	4,242	15	12	13,943

NB: includes commercial losses

Figure 4.14: Trend in Electricity Consumption by Sectors



SECTION FIVE: PETROLEUM

AN OVERVIEW

5.1 Crude Oil Production

Table 4.1 shows the crude oil produced from the production fields in the country. In 2002, 0.06 million barrels of crude oil was produced from the Saltpond field, the only existing production field at that time. The crude oil production increased significantly in 2010 following the commencement of commercial production from the Jubilee field. In 2010, 1.37 million barrels of crude oil was produced from the Saltpond and Jubilee fields with 93% coming from the Jubilee field. The production increased to 32.3 million barrels with commencement of production from the TEN field in 2016. In 2017, however, production (Jubilee, TEN, OCTP) increased to 58.66 million barrels representing a 81.6% growth rate over the 2016 production level. In 2019, 72.11 million barrels of crude oil was produced representing an increase of 10.0 million barrels over the production level in 2018. Between 2017 and 2019, production from the three fields has been increasing at an annual average growth rate of 10.9%.

5.2 Crude Oil Import

In 2000, 1,284.9 kilotonnes of crude oil was imported (Table 4.2). Of the quantity imported, 88.1% was used for the production of petroleum products with the remainder used for electricity generation. Crude oil import increased to 1,976.9 kilotonnes in 2014 with 91.7% of the quantity being used in the refinery for the production of petroleum products. In 2018, the oil refineries in the country imported 71.4% of the total crude oil imported (196.9 kilotonnes) with their share increasing to 84.4% of the total import (830 kilotonnes) in 2019.

5.3 Crude oil Export

Crude oil export has increased significantly with the commencement of commercial production of crude oil in the country in 2011. The crude oil export has been increasing at an annual average growth rate of 14.1%, from 24.73 million barrels in 2011 to 70.98 barrels in 2019. The quantities of crude oil export increased by 90.6% in 2017 following the commencement of production from the TEN fields in 2016. The export of crude oil increased from 62.02 million barrels in 2018 to 70.98 million barrels in 2019 registering an annual increase of 14.4% (Table 4.3). Between 2017 and 2019 an average of 63.33 million barrels of crude oil is exported annually by the country.

5.4 Natural Gas Production

The production[4] of natural gas in the country started in 2014 with 2 tBtu produced in that year (Table 4.4). The production since then has increased from 2 tBtu in 2014 to 59 tBtu (including non-associated gas produced from OCTP) in 2019. Between 2018 and 2019, there was an annual increase of 81% in the production of natural gas from 32.6 tBtu in 2018 to 59 tBtu in 2019.

5.5 Natural Gas Import

The import of natural gas from Nigeria began in 2009 following the completion of the West African Gas Pipeline in 2009. In that year, 0.2 tBtu of natural gas was imported and subsequently increased to 20.6 tBtu in 2015 (Table 4.4). The import levels reduced significantly to 4 tBtu in 2016 representing a reduction of 80.6% over the import levels in 2015. It further increased to 25.3 tBtu in 2018 before reducing by 8.7% to 23.1 tBtu in 2019.

5.6 Production of Petroleum Products

The production of petroleum products reduced from 1,028.4 kt in 2000 to 688.7 kt in 2019 representing an almost two-fold reduction. Between 2000 and 2010 an average of 1,121 kt of petroleum products were produced in the country whilst an average of 444.5 kt were produced between 2010 and 2019. The year 2015 registered the lowest level of production of petroleum products in the country with a production level of 89.1 kt. However, the production of petroleum products increased the following year to 739 kt. It then decreased to 388.7 kt in 2018 before increasing by 77.2% to 688.7 kt at the end of 2019 (Table 4.5).

5.7 Petroleum Products Import

The import of petroleum products increased at an annual average rate of 9.2% from 816.3 kt in 2000 to 1,387.4 kt in 2006. It later increased at an annual average growth rate of 11.4% to 2,945.6 kt in 2013. Between 2013 and 2019, the imports of petroleum products have increased at an annual average growth rate of 2.7% (Table 4.6). Nonetheless, the import of petroleum products declined by 6.6% from 3,708.9 kt in 2018 to 3,462.5 kt in 2019.

5.8 Petroleum Products Export

In the year 2000, 389.1 kt of petroleum products were exported with RFO constituting 49.1% of total products exported (Table 4.7). The export of petroleum products later increased to 683.1 kt in 2011 with gasoil being the major product exported contributing to 52.2% of the total petroleum product exported in that year. The export of petroleum products then decreased to 122.1 kt in 2015 before increasing to 501.2 kt in 2019.

[4] From the Gas Processing Plant, Atuabo, Western Region, Ghana

5.9 Final Consumption of Petroleum Products

Table 4.8 presents petroleum product consumed by the final user from 2000 to 2019. In 2000, 1,437.5 Ktoe of petroleum products were consumed as final energy, increasing at an annual average growth rate of 5.2% to 3,794 Ktoe in 2019. Gasoil is the petroleum product mostly consumed by final users in the country. Its share of the final product consumption average about 52.9% of the total petroleum products from 2000 to 2019. The LPG share of the final petroleum product consumed increased from 3.4% in 2000 to 8.5% in 2019. Natural gas became fuel for industrial processing in 2016. Its share in the final energy consumption increased from 0.1% in 2016 to 1.9% in 2019. Between 2018 and 2019, the final consumption of petroleum products increased from 3,483 Ktoe to 3794 Ktoe representing an annual growth of 8.9%.

5.10 Final Consumption of Petroleum Products by Sector

In 2000, 1,148.2 Ktoe of petroleum products were consumed by the transport sector representing 79.9% of the total petroleum products consumed in the economy. This later increased to 2,950.7 Ktoe in 2019, representing 77.2% of the total petroleum product consumed. The industrial sector is the next highest consumer of petroleum products with 9.1% of the total petroleum products consumed in 2000, and later increasing to 466.4 Ktoe in 2019 representing 12.1% (Table 4.9). The annual average growth rate of petroleum products consumed by the transport sector is 5.1% whilst that of the industrial sector is 6.9%. The consumption of petroleum products in the residential sector largely LPG, increased from 88.3 Ktoe (6.1% of total consumption) in 2000 to 217.3 Ktoe (5.7% of total consumption) in 2019 representing an annual average growth rate of 4.9%.

Figure 5.1: Petroleum Product Consumption by Sector, 2000 & 2019

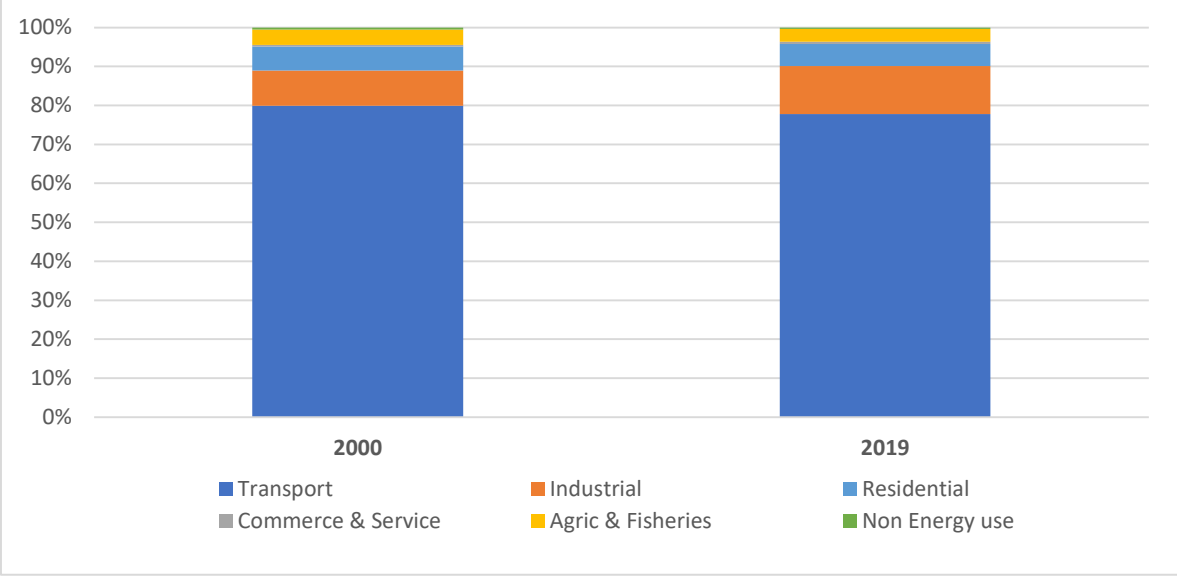


Table 5.1: Crude oil Production (million barrels)

Year	Production
2002	0.06
2003	0.07
2004	0.16
2005	0.08
2006	0.16
2007	0.19
2008	0.21
2009	0.17
2010	1.37
2011	23.83
2012	28.94
2013	36.86
2014	37.30
2015	37.46
2016	32.30
2017	58.66
2018	62.14
2019	72.11

Source: Petroleum Commission & Ghana National Petroleum Corporation

Figure 5.2: Trend in Crude Oil Production

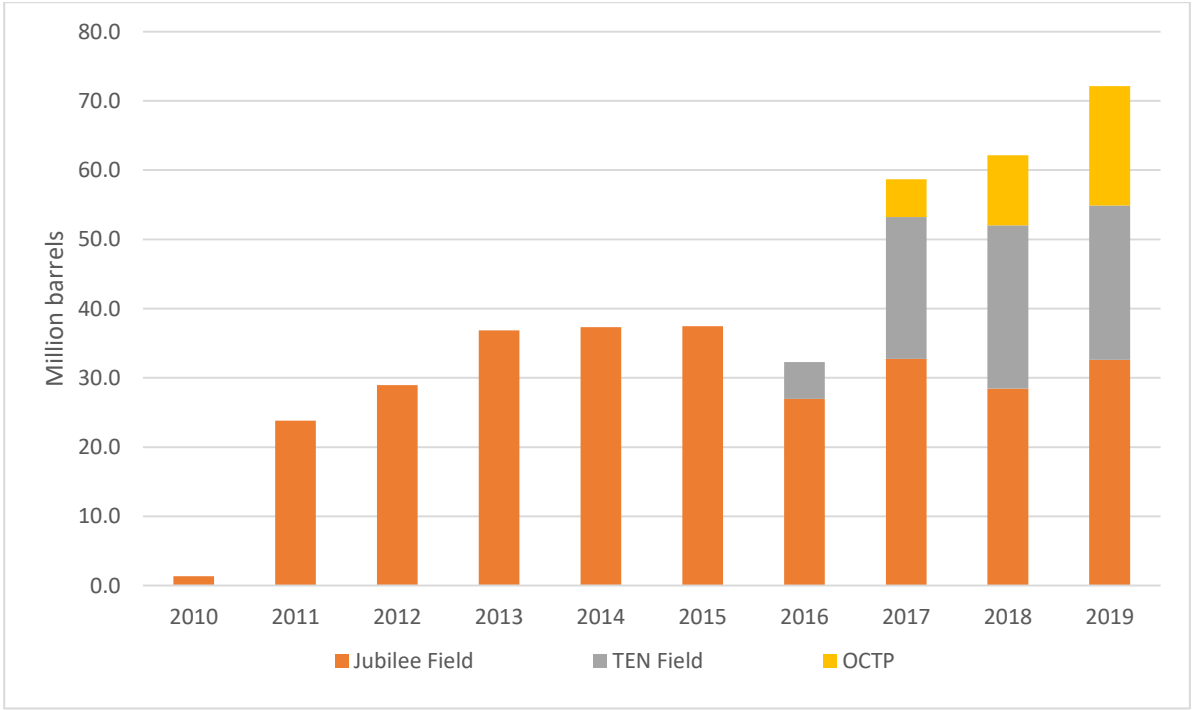


Table 5.2: Crude Oil Import (kilotonnes)

Year	For Refinery	For Electricity Generation	Total
2000	1,131.8	153.1	1,284.9
2001	1,262.9	275.9	1,538.8
2002	1,179.4	601.6	1,781.0
2003	1,406.2	527.6	1,933.8
2004	1,813.5	163.4	1,976.9
2005	1,645.5	322.0	1,967.5
2006	962.2	750.6	1,712.8
2007	1,242.5	811.2	2,053.7
2008	1,396.7	579.5	1,976.2
2009	441.4	541.0	982.4
2010	961.1	701.5	1,662.6
2011	1,274.2	257.4	1,531.6
2012	505.8	703.7	1,209.5
2013	374.5	927.9	1,302.4
2014	70.1	623.1	693.2
2015	61.8	248.7	310.5
2016	988.6	456.9	1,445.6
2017	55.0	178.2	233.2
2018	140.6	56.4	196.9
2019	700.2	129.9	830.0

Source: VRA, TOR & NPA

Figure 5.3: Trend in Crude Oil Import

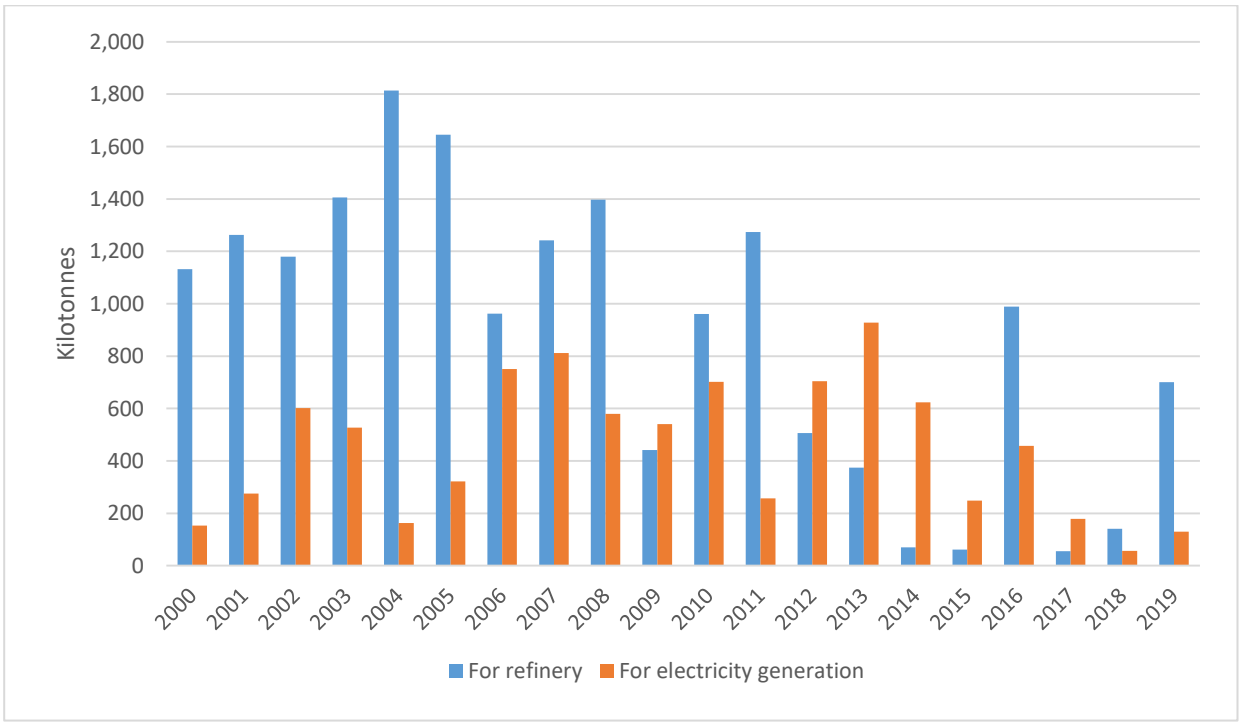


Table 5.3: Crude Oil Export (Million barrels)

Year	Crude Export
2002	0.06
2003	0.07
2004	0.16
2005	0.08
2006	0.16
2007	0.19
2008	0.21
2009	0.17
2010	0.10
2011	24.73
2012	26.43
2013	36.05
2014	37.70
2015	36.46
2016	29.90
2017	56.99
2018	62.02
2019	70.98

Source: Bank of Ghana & Petroleum Commission

Figure 5.4: Trend in Crude Oil Export

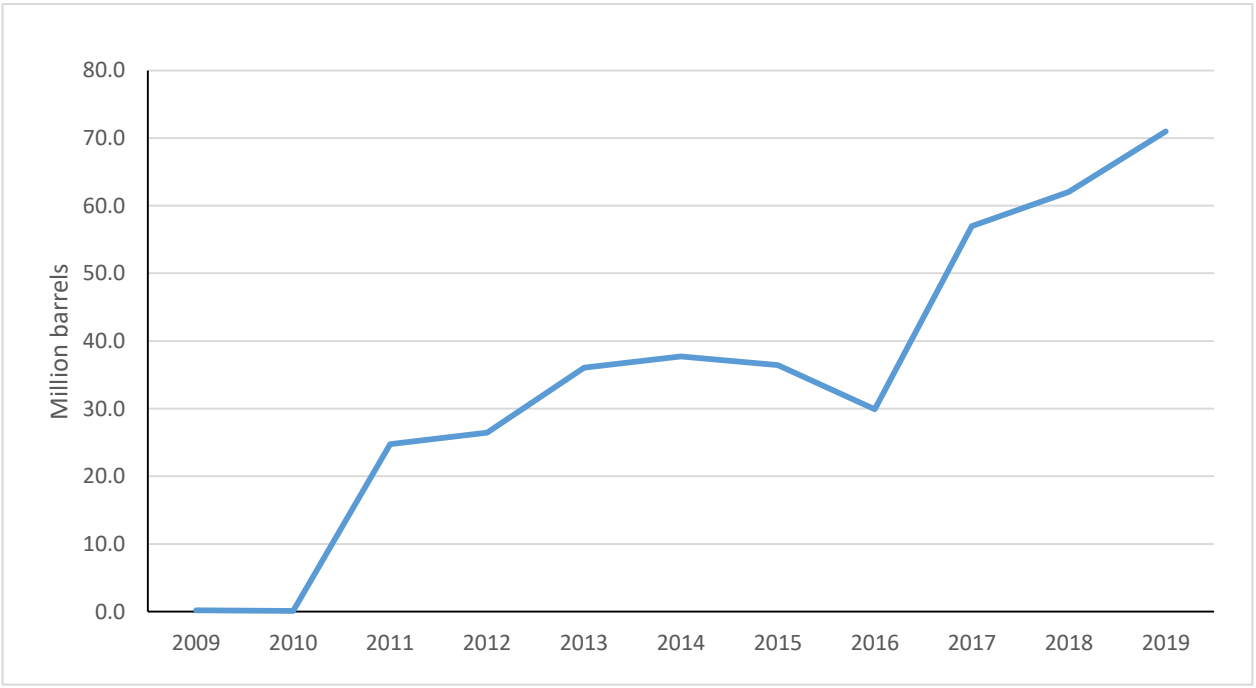


Table 5.4: Natural Gas Production and Import (tBtu)

Year	Import	Production
2009	0.2	-
2010	15.6	-
2011	30.5	-
2012	15.4	-
2013	11.6	-
2014	22.5	2.0
2015	20.6	26.4
2016	4.0	23.5
2017	11.7	33.7
2018	25.3	32.6
2019	23.1	59.0

NB: Import is Natural Gas delivered through the WAGP whilst production is natural gas from GNGC
Source: WAGPCo, GNGC & VRA

Figure 5.5: Trend in Natural Gas Production and Import

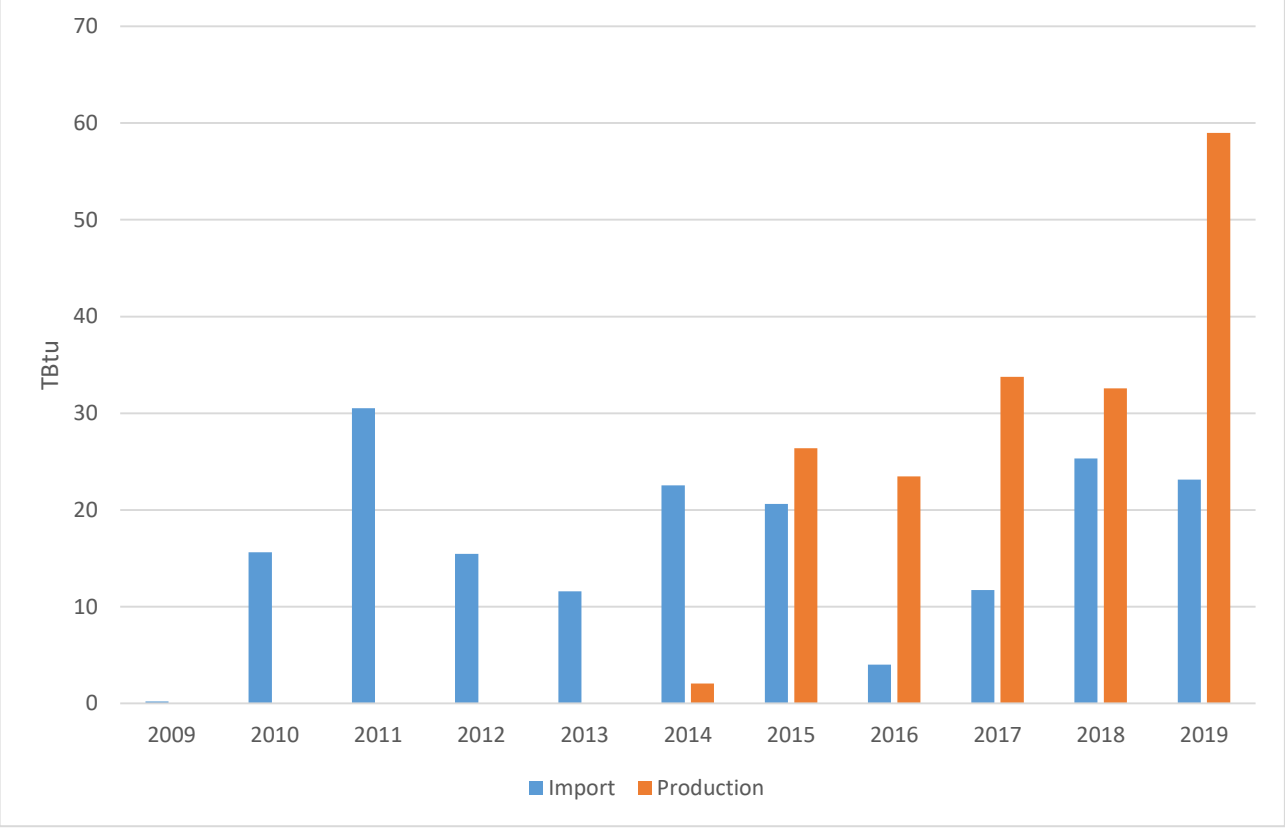


Table 5.5: Production of Petroleum Products (kilotonnes)

Year	LPG	Gasolines	Kerosene	ATK	Gas Oil	Fuel Oils	Total
2000	9.7	238.6	51.8	108.3	358.1	261.9	1,028.4
2001	7.0	286.3	98.1	64.0	353.5	261.1	1,069.9
2002	24.4	346.2	61.1	81.6	446.5	195.7	1,155.4
2003	52.6	433.8	109.6	85.6	506.6	163.5	1,351.8
2004	65.5	553.1	111.1	106.9	568.4	199.1	1,604.0
2005	75.3	567.1	87.7	119.0	486.3	205.4	1,540.8
2006	35.8	294.4	65.1	46.2	294.2	155.5	891.3
2007	67.3	493.0	122.0	65.8	398.2	48.7	1,194.9
2008	54.6	391.2	168.6	21.3	360.5	225.4	1,221.5
2009	14.0	135.0	48.7	1.3	102.8	25.3	327.1
2010	31.6	337.7	71.0	116.7	292.6	96.8	946.4
2011	44.6	344.3	52.6	116.1	309.8	90.6	958.0
2012	26.8	157.7	21.1	47.6	121.5	79.2	454.0
2013	25.6	167.3	14.6	59.8	113.3	43.5	424.2
2014	3.3	40.4	4.5	9.4	27.8	43.7	129.2
2015	2.0	31.8	0.2	18.2	28.0	8.9	89.1
2016	114.2	244.0	24.5	37.6	254.7	64.0	739.0
2017	114.0	6.5	2.0	0.1	6.1	1.3	129.9
2018	87.9	101.6	33.1	21.5	113.0	31.5	388.7
2019	70.2	125.0	12.1	79.7	198.1	203.8	688.7

Source: Tema Oil Refinery, Ghana National Gas Company & National Petroleum Authority

Figure 5.6: Trend in Production of Petroleum Products

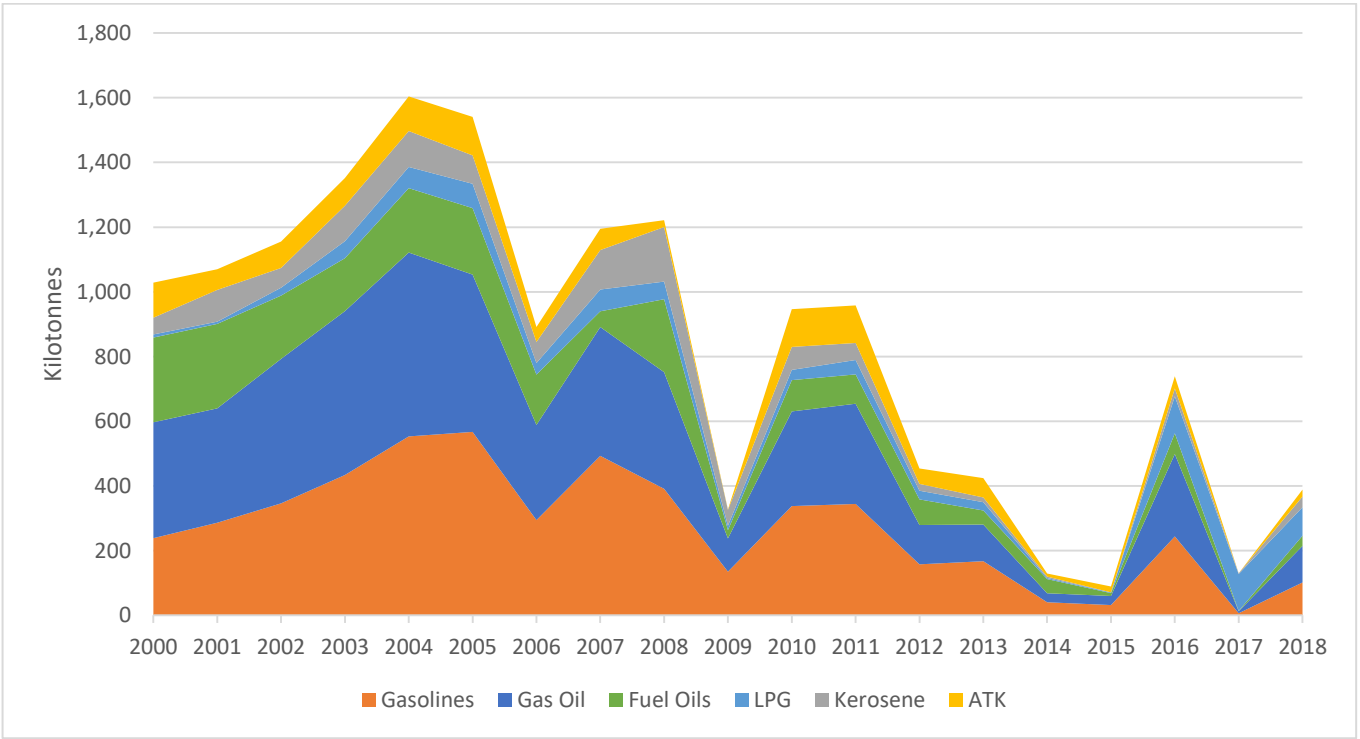


Table 5.6: Import of Petroleum Products (kilotonnes)

Year	LPG	Gasolines	Kerosene	Gasoil	Fuel Oil	DPK	ATK	Total
2000	35.4	387.0	30.4	363.2	0.3	0.0	0.0	816.3
2001	35.6	389.4	21.5	354.3	0.1	0.0	0.0	800.9
2002	32.0	370.8	48.8	298.0	0.1	0.0	0.0	749.7
2003	16.7	232.1	34.6	285.7	0.0	0.0	0.0	569.0
2004	11.0	255.4	0.0	313.1	0.0	0.0	0.0	579.5
2005	7.1	167.5	0.0	403.7	0.0	0.0	0.0	578.3
2006	67.8	360.5	99.9	780.0	0.0	0.0	79.3	1,387.4
2007	47.2	274.9	66.7	806.9	0.0	0.0	42.6	1,238.3
2008	67.8	254.5	136.4	579.0	0.0	0.0	156.2	1,194.0
2009	150.6	563.4	77.7	969.5	0.0	0.0	83.5	1,844.6
2010	148.0	570.1	0.0	871.7	0.0	0.0	0.0	1,589.9
2011	177.8	712.8	0.0	1,200.6	0.0	17.5	0.0	2,108.7
2012	241.6	811.5	0.0	1,309.4	0.0	115.0	95.7	2,573.2
2013	203.9	1,017.4	0.0	1,638.7	44.3	0.0	41.4	2,945.6
2014	236.4	1,254.3	0.0	1,742.1	48.6	0.0	112.4	3,393.8
2015	197.7	1,182.1	0.0	2,161.0	0.0	0.0	109.1	3,649.9
2016	177.9	1,235.7	0.0	1,719.8	20.6	0.0	112.7	3,266.7
2017	202.4	1,304.1	0.0	1,780.9	248.8	0.0	181.4	3,717.6
2018	335.1	1,325.5	0.0	1,752.8	111.6	0.0	183.9	3,708.9
2019	275.2	1,265.0	0.0	1,741.6	0.0	0.0	180.7	3,462.5

Source: National Petroleum Authority

Figure 5.7: Trend in the Import of Petroleum Products

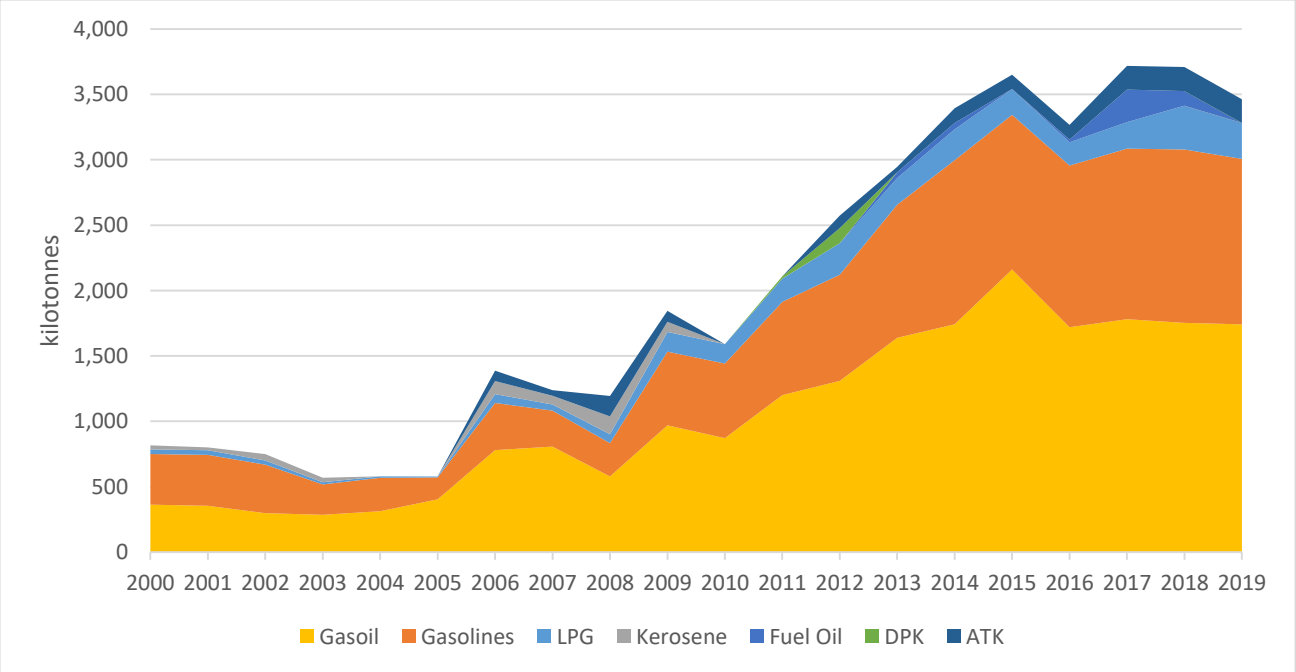


Table 5.7: Export of Petroleum Products (kilotonnes)

Year	LPG	Gas Oil	Fuel Oil	Heavy Gasoline	ATK	Premium Gasoline	Total
2000	6.2	0.6	190.7	97.1	94.5	0.0	389.1
2001	1.2	1.0	215.7	126.7	74.5	0.0	419.0
2002	4.5	1.9	151.7	129.2	85.3	0.0	372.6
2003	11.2	12.0	89.4	103.0	84.3	0.0	299.8
2004	6.0	42.4	168.9	146.5	101.3	0.0	465.0
2005	12.5	37.7	162.8	161.9	108.7	0.0	483.5
2006	10.4	66.1	45.9	99.8	104.0	0.0	326.2
2007	9.6	52.7	26.2	133.7	113.5	0.0	335.7
2008	5.0	88.4	148.4	73.0	107.8	5.1	427.8
2009	1.1	381.9	30.2	20.5	114.3	20.6	568.6
2010	0.0	290.9	40.6	93.6	103.0	9.9	538.0
2011	0.0	356.5	43.5	141.1	128.5	13.4	683.1
2012	0.0	80.8	44.5	54.3	131.0	0.0	310.6
2013	0.0	51.8	3.7	36.0	122.3	0.0	213.8
2014	0.0	10.8	0.0	10.2	105.6	0.0	126.6
2015	0.0	10.3	0.0	9.9	101.9	0.0	122.1
2016	25.1	170.1	69.8	112.8	115.0	158.8	651.6
2017	40.3	190.2	53.0	11.1	150.0	173.3	618.0
2018	4.8	45.4	41.5	63.2	184.8	4.2	343.8
2019	0.8	117.4	66.2	75.0	208.6	33.2	501.2

NB: GasOil export includes sales to international marine bunkers
Source: National Petroleum Authority

Figure 5.8: Trend in the Export of Petroleum Products

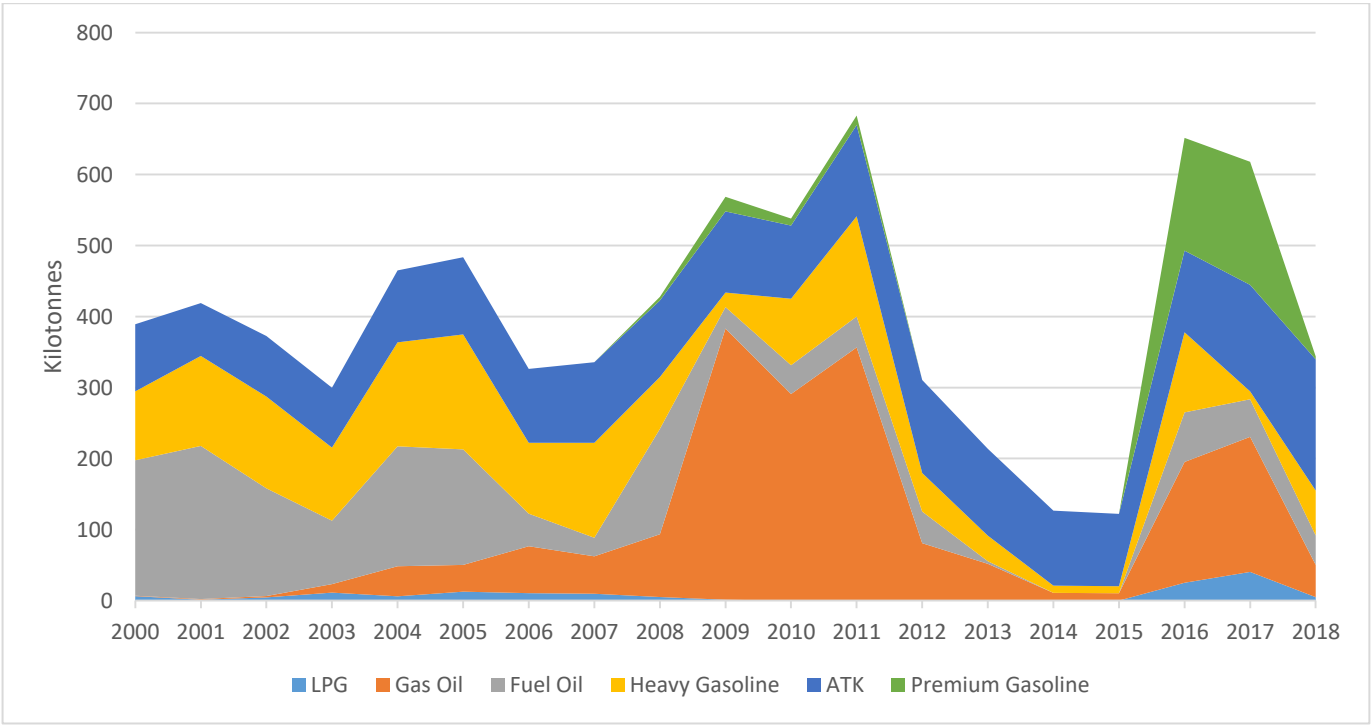


Table 5.8: Petroleum Products Consumption by Fuel Type (Ktoe)

Year	LPG	Gasoline/Premix	Kerosene/ATK	Gas Oil	RFO	Natural gas	Total
2000	48.6	582.8	71.6	679.1	55.4	-	1,437.5
2001	45.9	590.0	74.3	702.2	50.4	-	1,463.0
2002	54.0	624.1	79.3	732.6	50.3	-	1,540.3
2003	61.3	535.7	77.2	768.9	44.3	-	1,487.3
2004	70.9	633.2	84.1	866.1	43.8	-	1,698.1
2005	76.1	594.8	86.4	898.2	46.4	-	1,701.8
2006	95.0	572.9	88.4	1,061.6	55.1	-	1,873.0
2007	100.7	614.4	76.8	1,284.8	49.8	-	2,126.6
2008	127.0	625.5	48.7	1,223.7	46.5	-	2,071.3
2009	238.3	794.4	106.0	1,420.0	39.1	-	2,597.7
2010	192.7	808.7	63.1	1,396.7	30.0	-	2,491.1
2011	231.6	895.2	80.4	1,583.0	36.4	-	2,826.6
2012	303.3	1,154.8	67.7	1,757.7	34.0	-	3,317.5
2013	281.7	1,233.8	47.5	1,819.8	39.5	-	3,422.3
2014	269.3	1,255.8	26.0	1,799.6	26.8	-	3,377.5
2015	301.3	1,270.9	23.0	1,936.4	13.0	-	3,544.6
2016	304.0	1,181.4	30.2	1,741.2	12.6	4.8	3,274.2
2017	297.2	1,149.2	23.4	1,587.3	10.7	47.3	3,115.0
2018	305.5	1,353.1	30.7	1,715.2	15.0	63.5	3,483.0
2019	323.5	1,470.0	27.5	1,858.9	40.2	73.8	3,794.0

Figure 5.9: Trend in Petroleum Products Consumption by Fuel

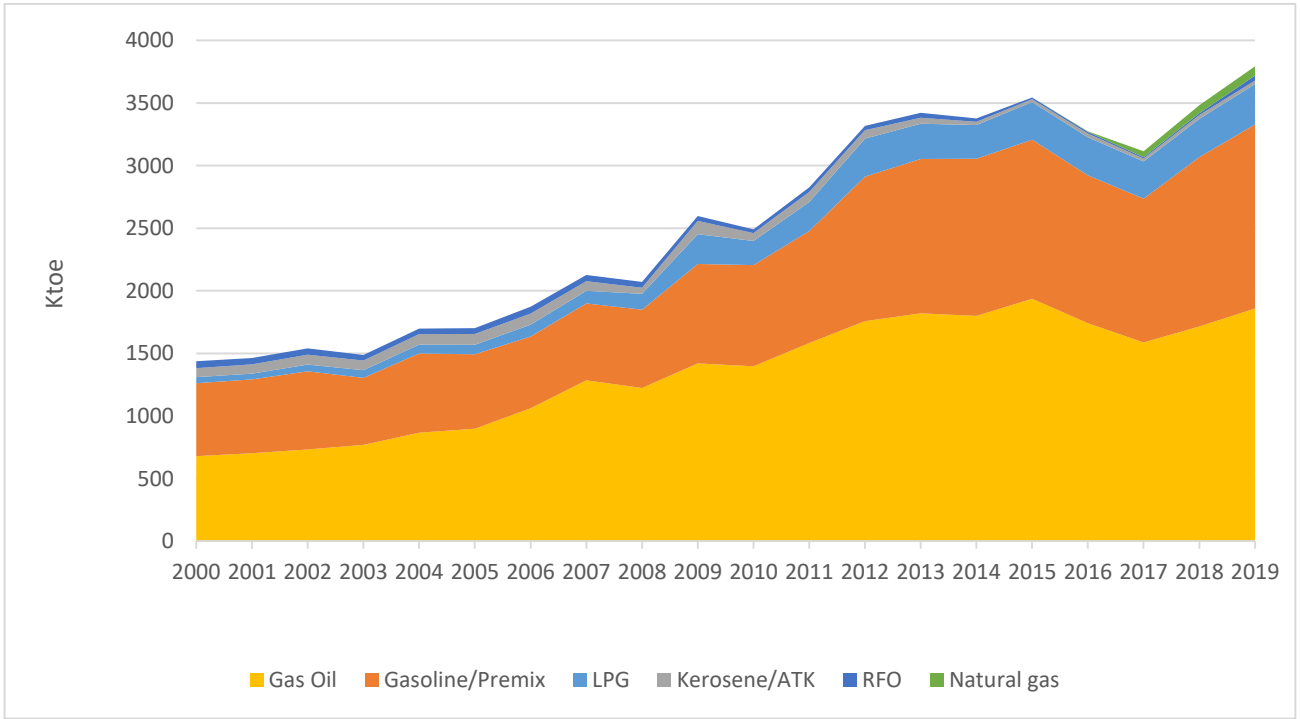
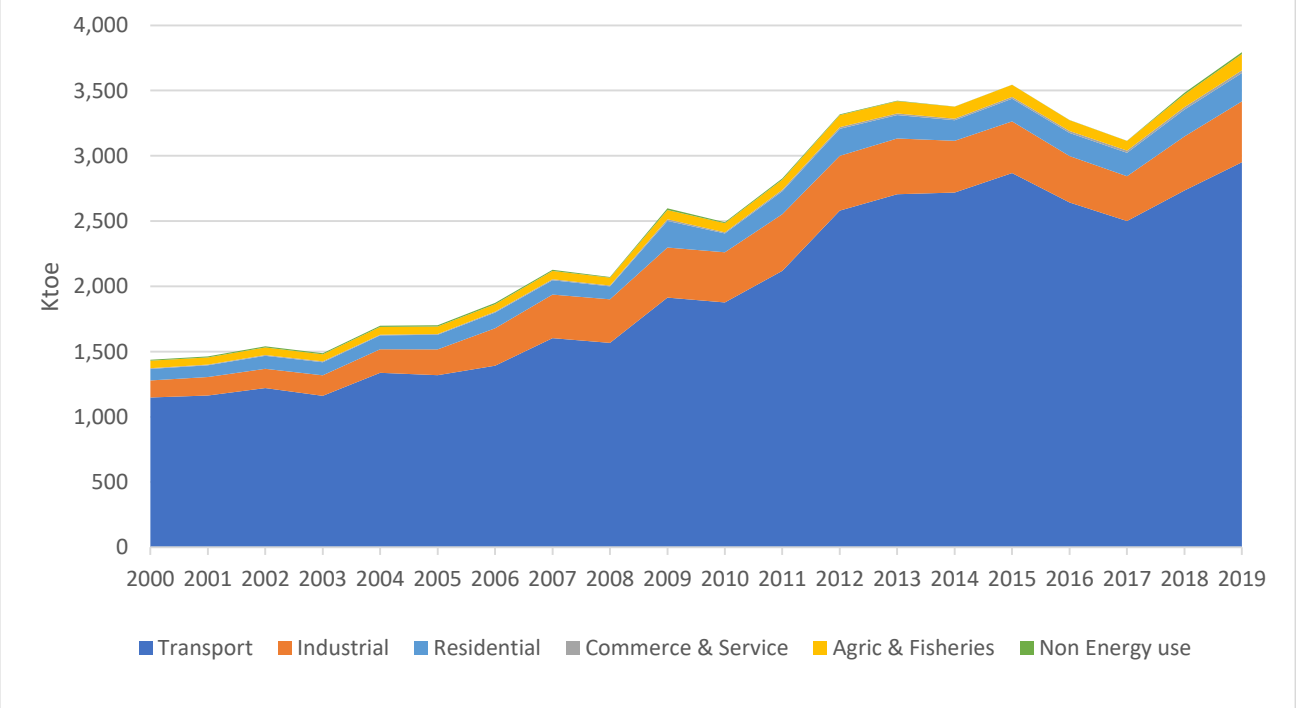


Table 5.9: Petroleum Product Consumption by Sector (Ktoe)

Year	Residential	Industrial	Commerce & Service	Agric & Fisheries	Transport	Non Energy use	Total
2000	88.3	130.7	5.4	57.7	1,148.2	7.2	1,437.5
2001	90.0	141.6	5.4	54.7	1,163.3	7.8	1,463.0
2002	99.5	147.6	6.3	57.7	1,220.4	8.7	1,540.3
2003	99.9	157.2	6.9	54.0	1,160.9	8.4	1,487.3
2004	106.3	180.5	5.2	59.7	1,337.3	9.2	1,698.1
2005	111.8	197.8	5.8	57.5	1,319.0	9.7	1,701.8
2006	120.6	286.7	7.1	56.6	1,391.7	10.3	1,873.0
2007	109.8	333.9	7.7	63.6	1,602.8	8.8	2,126.6
2008	99.0	333.8	7.0	60.1	1,566.6	4.9	2,071.3
2009	204.1	383.6	12.8	70.7	1,913.5	13.1	2,597.7
2010	144.3	384.2	8.3	70.3	1,876.6	7.4	2,491.1
2011	176.0	434.3	11.5	76.7	2,118.5	9.7	2,826.6
2012	206.7	420.1	13.1	92.0	2,580.0	5.8	3,317.5
2013	179.5	427.2	12.2	94.0	2,705.7	3.9	3,422.3
2014	157.7	396.6	11.6	92.1	2,718.4	1.1	3,377.5
2015	174.1	395.8	13.8	92.3	2,867.8	0.9	3,544.6
2016	177.1	355.8	14.9	82.7	2,642.4	1.4	3,274.2
2017	179.4	343.2	16.8	74.2	2,500.4	1.0	3,115.0
2018	205.9	414.1	18.6	97.0	2,734.2	13.1	3,483.0
2019	217.3	466.4	20.4	125.0	2,950.7	14.2	3,794.0

Figure 5.10: Trend in Petroleum Products Consumption by Sector



SECTION SIX: BIOMASS

AN OVERVIEW

6.1 Biomass Production

In 2000, wood extracted for use directly as fuel (firewood) and for the production of charcoal is estimated to be 2,741.8 Ktoe and 1,094 Ktoe respectively. The quantity of wood for firewood has been estimated to reducing at an average rate of 3.1% to 1,511.9 Ktoe in 2019. The wood extracted for the production of charcoal on the other hand has been increasing at an annual average growth rate of 4.8% to 2,677.2 Ktoe in 2019. In 2000, 28.1% of the wood produced is used for charcoal production whilst about 70.5% is used directly as fuelwood mainly for cooking in the residential sector. The share of wood used for charcoal production increased to 63.5% as at end of 2019 whereas 35.8% is used as firewood. The production of other biomass (mainly crop residue) is also estimated to be 54.8 Ktoe in 2000 reducing to an estimated value of 29.4 Ktoe in 2019 (Table 5.1).

6.2 Charcoal Import and Export

As shown in Table 5.2, charcoal import increased at an annual average growth rate of 23.5% from 0.004 kt (4.2 tonnes) in 2010 to 0.03 kt (28 tonnes) in 2019. The year with the highest import of charcoal was 2016 registering an import value of 0.083 kt (82.6 tonnes).

With regards to Charcoal export, between the period 2000 to 2019 has registered an annual reduction of about 8.5%, from 3 kt (3,000 tonnes) in 2000 to 0.55 kt (552.8 tonnes) in 2019.

6.3 Woodfuel Consumption

Biomass consumption is estimated to have reduced at an average annual rate of 0.7%, from 3,432.4 Ktoe in 2000 to 2,981.3 Ktoe in 2019. The residential sector has undoubtedly been the largest consumer of biomass in the country followed by the industrial sector (Table 5.3). In 2000, the residential sector consumed 3,127.4 Ktoe of biomass constituting 91.1% of the total biomass consumed in the country. This is followed by the industrial sector which consumed 230 Ktoe of biomass constituting 6.7% of the total consumption. In 2019, however, the share of the residential sector in the total biomass consumption reduced to 86.2% representing 2,570.9 Ktoe whilst the share of the industrial sector increased to 9.6% representing 286 Ktoe of biomass. Over the period 2000 to 2019, the biomass consumption in the residential sector has been reducing at an annual average rate of 1% whereas that of the industrial sector has been increasing at an annual average rate of 1.2%

Table 6.1: Biomass Production (Ktoe)

Year	Wood for charcoal	Wood for firewood	Other	Total Wood Supply
2000	1,094.0	2,741.8	54.8	3,890.6
2001	1,115.9	2,538.5	50.8	3,705.2
2002	1,143.8	2,350.5	47.0	3,541.2
2003	1,178.1	2,176.4	43.5	3,398.0
2004	1,219.3	2,017.0	40.3	3,276.7
2005	1,268.1	1,872.8	37.5	3,178.4
2006	1,325.2	1,742.5	34.8	3,102.5
2007	1,391.4	1,643.8	32.9	3,068.1
2008	1,473.5	1,565.6	31.3	3,070.4
2009	1,576.7	1,520.0	30.4	3,127.0
2010	1,687.1	1,490.2	29.8	3,207.0
2011	1,805.2	1,534.9	30.7	3,370.7
2012	1,859.3	1,519.5	30.4	3,409.2
2013	1,989.5	1,534.7	29.7	3,553.9
2014	2,049.0	1,550.0	30.0	3,629.0
2015	2,043.0	1,545.0	30.0	3,618.0
2016	2,033.0	1,540.0	29.4	3,602.4
2017	2,323.9	1,550.0	29.4	3,903.3
2018	2,664.2	1,500.0	28.0	4,192.1
2019	2,677.2	1,511.9	29.4	4,218.5

NB: 2007-2009 figures extrapolated from 2003 field survey data; 2011-2019 figures extrapolated from 2010 field survey data and include saw dust, sawmill residue etc

Figure 6.1: Trend in Biomass Production

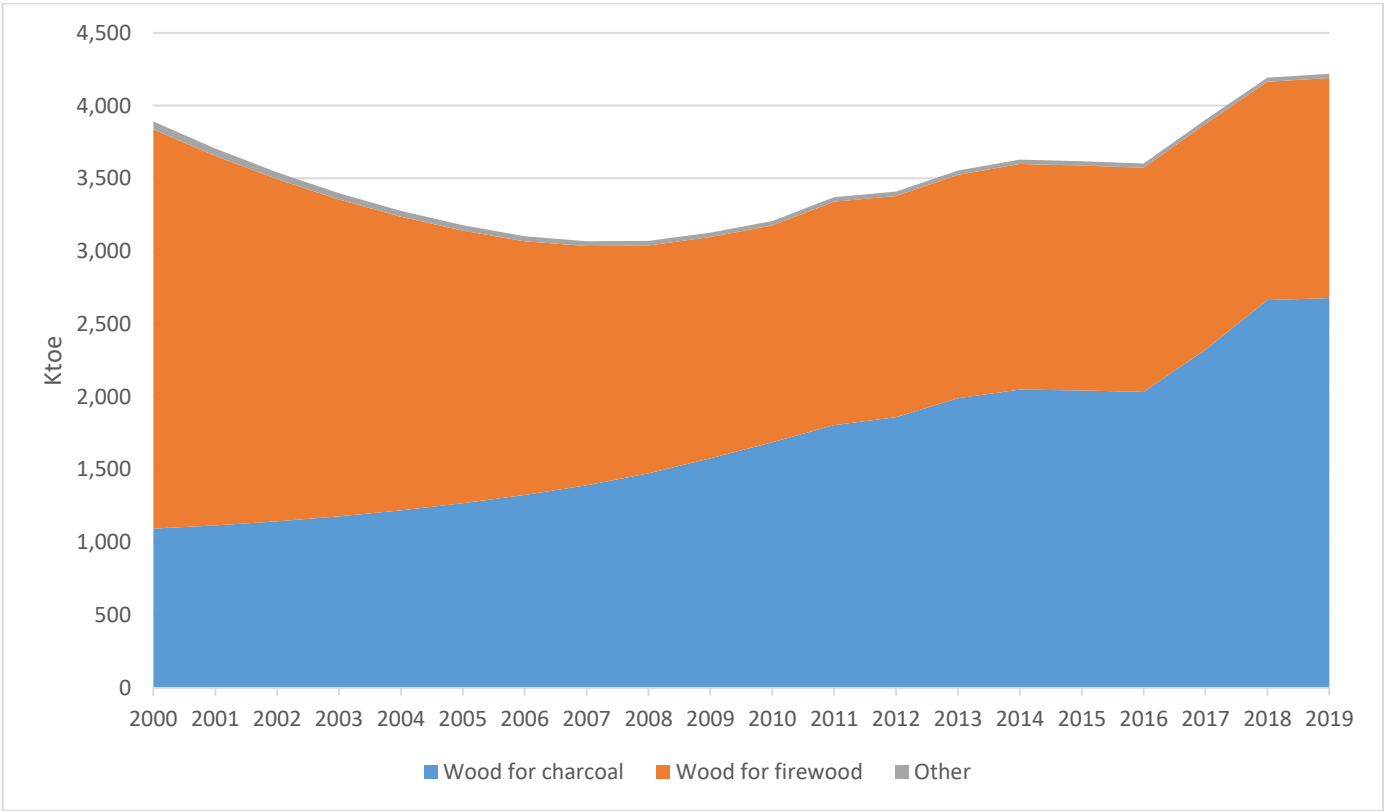


Table 6.2: Charcoal Import & Export (kilotonnes)

Year	Import	Export
2000	-	3.00
2001	-	2.80
2002	-	3.50
2003	-	4.60
2004	-	4.60
2005	-	5.70
2006	-	2.90
2007	-	3.60
2008	-	2.90
2009	-	4.30
2010	0.00	1.40
2011	0.00	0.80
2012	0.00	2.00
2013	0.01	0.77
2014	0.01	0.50
2015	0.01	0.40
2016	0.08	0.80
2017	0.04	0.36
2018	0.02	0.37
2019	0.03	0.55

Figure 6.2: Trend in Charcoal Import & Export

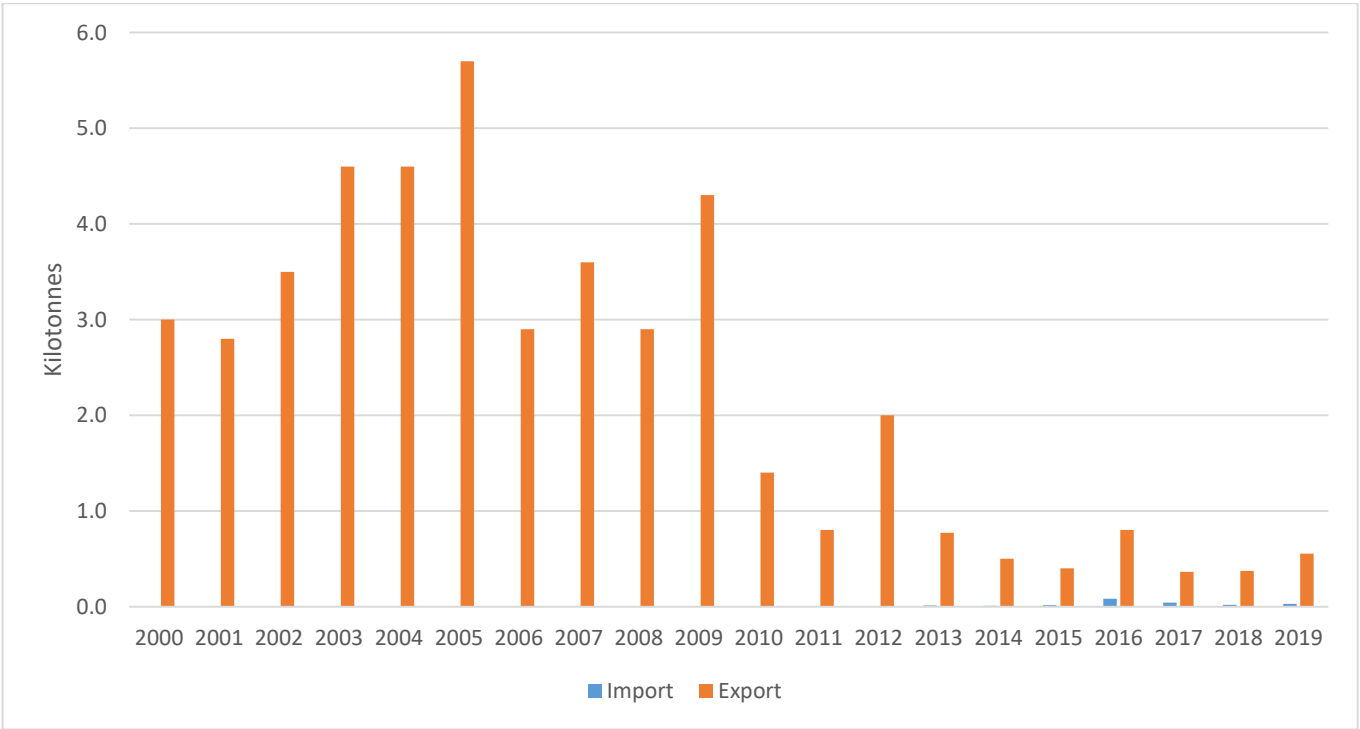
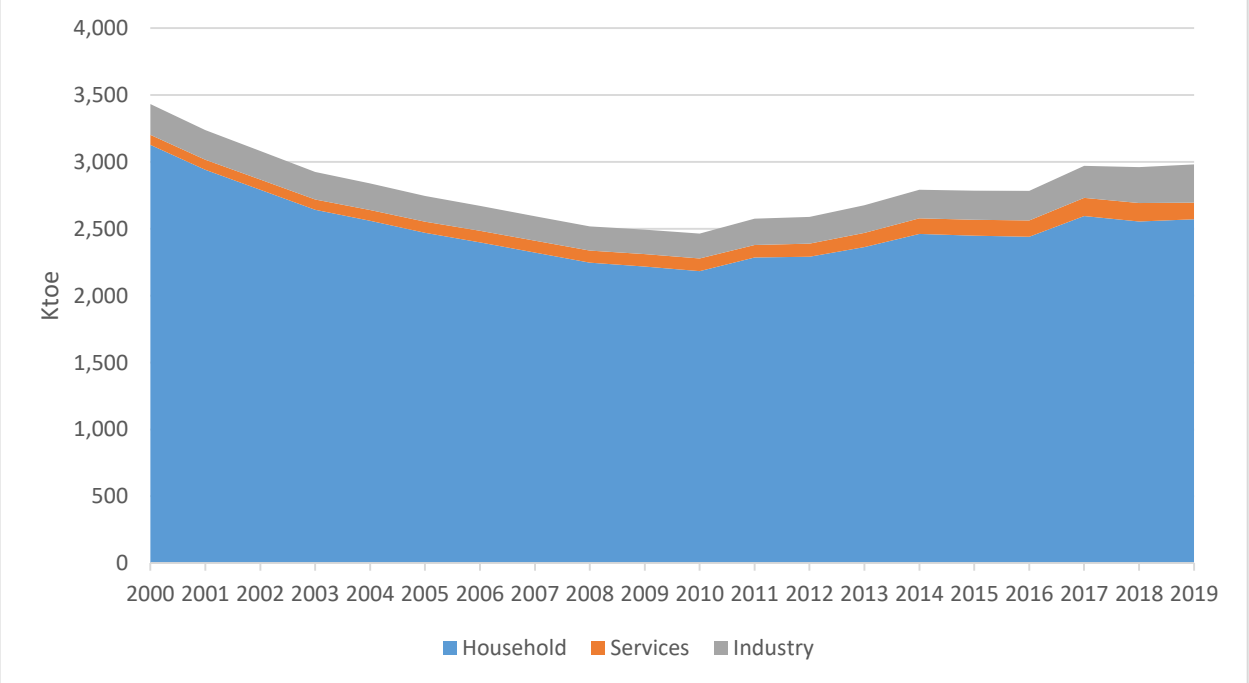


Table 6.3: Biomass Consumption by Sector (Ktoe)

Year	Household	Services	Industry	Total
2000	3,127.4	75.0	230.1	3,432.4
2001	2,940.9	75.4	221.6	3,237.8
2002	2,791.7	76.5	213.6	3,081.8
2003	2,641.9	77.1	205.8	2,924.7
2004	2,559.7	80.5	198.8	2,839.0
2005	2,469.8	83.2	192.2	2,745.2
2006	2,398.3	86.8	186.2	2,671.3
2007	2,322.0	89.0	182.7	2,593.7
2008	2,246.6	90.2	180.9	2,517.8
2009	2,217.5	93.1	182.6	2,493.3
2010	2,183.2	94.6	186.1	2,463.9
2011	2,285.3	93.3	197.0	2,575.6
2012	2,290.9	97.9	200.0	2,588.8
2013	2,363.1	106.1	206.8	2,676.0
2014	2,461.4	116.7	213.6	2,791.7
2015	2,448.3	119.1	217.3	2,784.7
2016	2,440.2	121.9	221.2	2,783.4
2017	2,595.0	136.1	239.3	2,970.4
2018	2,554.5	138.0	268.4	2,961.0
2019	2,570.9	124.4	286.0	2,981.3

Figure 6.3: Trend in Biomass Consumption by Sector



SECTION SEVEN: ENERGY PRICES

AN OVERVIEW

7.1 Crude Oil Prices

Table 6.1 presents crude oil prices over the period 2001 to 2019. The monthly average crude oil price reduced from US$ 25.77/bbl in January 2001 to US$ 19.33/bbl in December. This represents a monthly reduction of about 2.4%. The maximum average crude oil price in 2001 was US$27.68/bbl which occurred in February. The highest crude oil price over the period was 134.8/bbl which occurred in July 2008 (Table 6.1). The maximum monthly average price per barrel of crude oil in 2018 was US$80.63/bbl, reducing to US$ 71.66/bbl in 2019. This represents a reduction of about 11.1% over the 2018 price.

7.2 Petroleum Product Prices

The average prices of premium gasoline, gasoil, kerosene and LPG in 2000 was Ghp13.69/litre, Ghp12.78/litre, Ghp 12.78/litre and Ghp 18.24/kg respectively. The prices increased to Ghp116/litre, Ghp118.04/litre, Ghp91.00/litre and Ghp 83.81/kg for premium gasoline, gasoil, kerosene and LPG respectively as at the end of 2010 (Table 6.2). This represents an annual average increase in average prices of 24.0%, 24.9%, 21.7% and 16.5% for premium gasoline, gasoil, kerosene and LPG respectively. The prices further increased to GHp 534.8/litre, GHp 544.2/litre**,** GHp 471.7/litre and GHp 530.3/kg for premium gasoline, gasoil, kerosene and LPG respectively, representing an annual average increase of 18.4%, 18.5%, 20.1% and 22.8% for premium gasoline, gasoil, kerosene and LPG respectively as at the end of 2019. Between 2018 and 2019, there was an increase of 9.2% for premium gasoline as well as 8.6% for gas oil, 9.0% for kerosene and 5.2% for LPG over the average prices for the products in 2018.

7.3 Average Electricity End User Tariff

The average electricity end user tariff[5] increased at an annual average growth rate of 21.8%, from Ghc 0.017/kWh in 2000 to Ghc 0.716/kWh in 2019 (Table 6.4). In dollar terms, the average electricity end user tariff increased from US$ 0.024/kWh in 2000 to US$ 0.137/kWh in 2019, representing an annual average growth rate of 9.6%. In 2018, the average electricity end user tariff in the local currency was Ghc 0.705/kWh, increasing by 1.6% to Ghc 0.716/kWh in 2019 whilst the price in dollar terms reduced by 10.6% from US$ 0.154/kWh in 2018 to US$ 0.137/kWh in 2019.

[5] Average Electricity End User Tariff = $\frac{\text{Total Electricity Sales (in Ghc) by Distribution Companies}}{\text{Total Electricity Sales (in kWh) by Distribution Companies}}$

Table 7.1: Average Crude Oil Prices (US$/bbl)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001	25.8	27.7	25.7	25.4	25.4	26.7	25.7	25.8	26.1	21.5	19.2	19.3
2002	20.0	20.2	24.0	26.0	25.7	24.5	25.7	26.3	28.3	27.5	24.5	27.5
2003	30.2	32.4	29.5	24.8	25.4	27.2	28.2	29.4	26.8	29.0	28.8	29.6
2004	30.6	30.3	32.7	30.0	37.1	35.5	37.7	41.7	42.8	49.4	44.6	40.6
2005	44.9	45.9	53.3	53.2	49.9	55.6	57.9	63.8	63.7	59.4	56.2	57.6
2006	63.9	61.1	63.1	70.6	71.0	69.7	74.2	73.9	63.5	60.1	60.0	62.5
2007	54.6	59.0	62.4	67.5	67.9	70.6	75.8	71.2	77.0	82.5	92.1	91.5
2008	91.9	94.5	103.0	110.4	124.6	133.5	134.8	115.2	100.8	73.6	55.1	43.3
2009	45.6	43.7	47.3	51.2	58.6	69.3	65.8	73.1	68.2	73.9	77.5	75.2
2010	76.9	74.7	79.9	85.7	77.0	75.7	75.5	77.1	78.2	83.5	86.1	92.4
2011	96.8	104.1	114.6	123.1	114.5	113.9	116.7	109.8	110.0	108.8	110.6	107.7
2012	111.6	127.0	124.6	125.9	109.4	95.9	102.8	113.2	113.0	111.5	109.5	109.2
2013	112.3	116.1	109.5	103.3	103.3	103.3	107.4	110.3	111.2	109.5	107.8	110.6
2014	107.3	108.8	107.7	108.1	109.2	112.0	108.2	103.5	98.6	88.1	79.4	62.4
2015	49.7	58.7	57.0	60.9	65.6	63.8	56.8	48.2	48.6	48.1	44.4	37.7
2016	31.9	33.4	39.8	43.3	47.6	49.9	46.6	47.2	47.2	51.4	47.1	54.9
2017	55.5	56.0	52.5	53.7	51.1	47.5	49.2	51.9	55.2	57.5	62.9	62.3
2018	69.1	65.7	66.7	71.7	77.1	75.9	75.0	73.9	79.1	80.6	66.0	57.7
2019	60.2	64.5	67.1	71.7	70.3	63.1	64.2	59.5	62.3	59.6	62.7	65.2

Source: Bank of Ghana

Figure 7.1: Trend in Crude Oil Prices

Table 7.2: Average Ex-pump Prices for Petroleum Products

Year	Premium Gasoline (Ghp/lt)	Gas Oil (Ghp/lt)	Kerosene (Ghp/lt)	LPG (Ghp/kg)
2000	13.7	12.8	12.8	18.2
2001	22.0	18.6	18.6	21.6
2002	23.3	19.6	19.6	22.0
2003	43.5	38.0	38.0	37.3
2004	44.4	38.9	38.9	38.0
2005	65.0	57.8	49.7	52.4
2006	81.2	75.5	62.4	67.2
2007	89.6	83.8	73.8	78.4
2008	111.3	113.9	106.5	98.2
2009	100.2	102.4	79.3	73.1
2010	117.0	118.1	91.0	83.8
2011	151.9	153.3	91.0	104.8
2012	171.3	172.9	91.0	130.6
2013	206.0	208.7	127.2	202.8
2014	294.1	291.3	285.0	299.0
2015	310.1	301.9	296.9	268.3
2016	366.1	367.4	283.0	375.7
2017	425.0	423.3	346.5	456.0
2018	489.7	500.9	432.9	503.9
2019	534.6	543.7	471.3	530.2

Figure 7.2: Trend in Average Ex-pump Prices for Petroleum Products

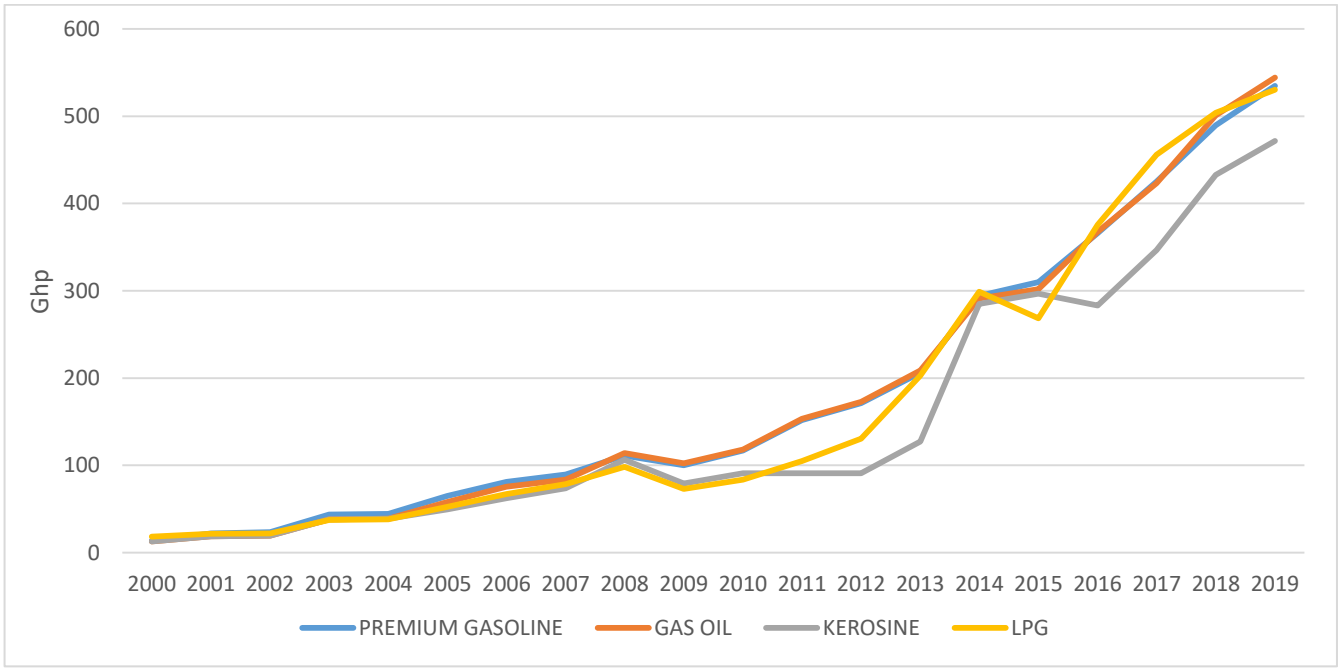


Table 7.3: Electricity Tariff by Customer Class

Tariff Category	Effective Date									
	Dec, 2011	Oct, 2013	Jan, 2014	Jul, 2014	Oct, 2014	Apr, 2015	Jul, 2015	Dec, 2015	Oct, 2018	Jul, 2019
Residential										
0 - 50 (Exclusive)	9.5	15.7	17.2	19.3	20.5	21.1	21.1	33.6	27.7	30.8
51 - 300 (GHp/kWh)	17.6	31.4	34.5	38.7	41.2	42.3	42.3	67.3	55.5	61.7
301 - 600 (GHp/kWh)	22.8	40.8	44.9	50.2	53.5	54.9	54.9	87.4	72.1	80.1
600+ (GHp/kWh)	25.3	45.3	49.8	55.8	59.4	61.0	61.0	97.1	80.1	89.0
Service Charge for Lifeline Consumers (GHp/month)	165.3	295.7	324.5	363.8	387.5	397.7	397.7	633.2	213.0	213.0
Service Charge for Other Residential Consumers (GHp/month)	165.3	295.7	324.5	363.8	387.5	397.7	397.7	633.2	633.2	703.9
Non-Residential										
0 -300 (GHp/kWh)	25.3	45.2	49.6	55.6	59.2	60.8	60.8	96.8	67.8	75.3
301 - 600 (GHp/kWh)	26.9	48.1	52.8	59.2	63.0	64.7	64.7	102.1	72.1	80.1
600+ (GHp/kWh)	42.4	75.9	83.3	93.4	99.5	102.1	102.1	162.5	113.8	126.5
Service Charge (GHp/month)	275.5	492.9	540.9	606.3	645.9	662.9	662.9	1,055.3	1055.3	1173.2
SLT - Low Voltage										
Maximum Demand (GHp/kVA/month)	1,542.9	2,760.3	3,028.9	3,395.1	3,616.9	3,712.1	3,712.1	5,909.6	5909.6	-
Energy Charge (GHp/kWh)	26.3	47.1	51.7	58.0	61.8	63.4	63.4	100.9	75.7	98.9
Service Charge (GHp/month)	1,102.2	1,971.7	2,163.5	2,425.1	2,583.6	2,651.5	2,651.5	4,221.2	4221.1	4692.6
SLT - Medium Voltage										
Maximum Demand (GHp/kVA/month)	1,322.5	2,366.0	2,596.2	2,910.1	3,100.2	3,181.8	3,181.8	5,065.4	5065.4	-
Energy Charge (GHp/kWh)	20.4	36.5	40.0	44.9	47.8	49.1	49.1	78.1	58.6	75.1
Service Charge (GHp/month)	1,542.9	2,760.3	3,028.9	3395..1	3,616.9	3,712.1	3,712.1	5,909.6	5909.6	6569.6
SLT - High Voltage										
Maximum Demand (GHp/kVA/month)	1,322.5	2,366.0	2,596.2	2,910.1	3,100.2	3,181.8	3,181.8	5,065.4	5065.4	-
Energy Charge (GHp/kWh)	18.7	33.5	36.8	41.2	43.9	45.1	45.1	71.8	53.8	78.8
Service Charge (GHp/month)	1,542.9	2,760.3	3,028.9	3,395.1	3,616.9	3,712.1	3,712.1	5,909.6	5909.6	6569.6
SLT-High Voltage - Mines										
Capacity Charge (GHp/KVA/Month)	1,542.9	2,760.3	3,028.9	3,395.1	3,616.9	3,712.1	3,712.1	5,909.6	5909.6	-
Energy Charge (GHp/kWh)	29.8	53.2	58.4	65.5	69.8	71.6	71.6	114.0	102.6	249.2
Service Charge (GHp/Month)	1,542.9	2,760.3	3,028.9	3,395.1	3,616.9	3,712.1	3,712.1	5,909.6	5909.6	6469.6

Table 7.4: Average Electricity End-User Tariff

Year	GHS/kWh	US$/kWh
2000	0.017	0.024
2001	0.034	0.047
2002	0.065	0.077
2003	0.071	0.080
2004	0.074	0.082
2005	0.073	0.080
2006	0.078	0.084
2007	0.097	0.100
2008	0.148	0.123
2009	0.148	0.104
2010	0.211	0.145
2011	0.245	0.158
2012	0.232	0.124
2013	0.307	0.156
2014	0.464	0.145
2015	0.541	0.147
2016	0.817	0.210
2017	0.798	0.183
2018	0.705	0.154
2019	0.716	0.137

Source: Bank of Ghana

Figure 7.3: Trend in Average Electricity End-User Tariff