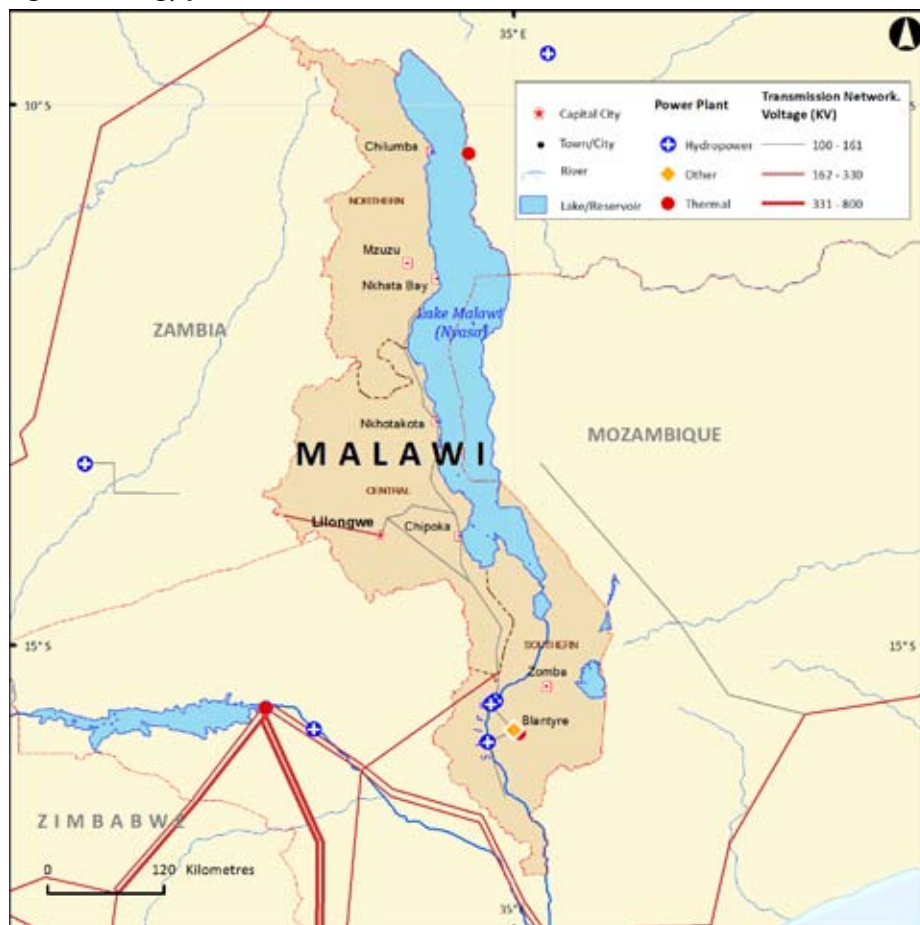




Figure 1: Energy profile of Malawi



Energy Consumption and Production

By 2013, the population of Malawi was 16.19 million (Table 1). In 2015, total electricity produced was 252 ktoe of which 98.4 per cent came from hydro sources (Table 2). In the same year, the final consumption of electricity was 148 ktoe (AFREC, 2015). Figures 2 and 3 show the main energy statistics.

Table 1: Malawi's key indicators

Key indicators	Amount
Population (million)	16.19
GDP (billion 2005 USD)	4.33
CO ₂ emission (Mt of CO ₂)	1.21

Source: (World Bank, 2015)

Energy Resources

Biomass

Nine out of 10 people use some form of biomass as a source of energy, and this translates to about 88.5 per cent of the total energy needs. In urban and rural areas, 43.4 and 41.8 per cent of people use charcoal and firewood for cooking, respectively (Gamula, Hui, & Peng, 2013). The high usage of biomass by the growing population is a major driver behind loss in forest cover. Government programs to improve efficiency in the sector are on-going. These include technologies options such as improved cook-stoves and the use of substitute fuels implemented by various government initiatives such as the National Sustainable and Renewable Energy Programme (NSREP) (REEEP, 2012).

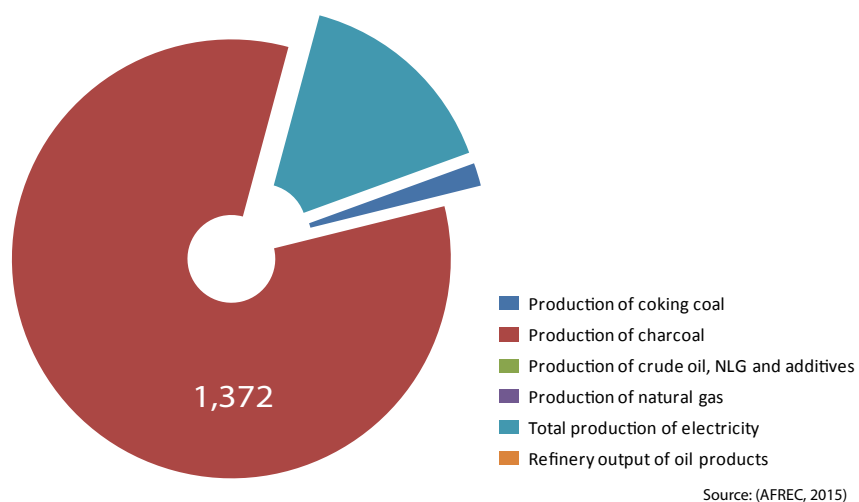
Hydropower

By 2011, installed capacity was 300 MW (WEC, 2013).

Oil and natural gas

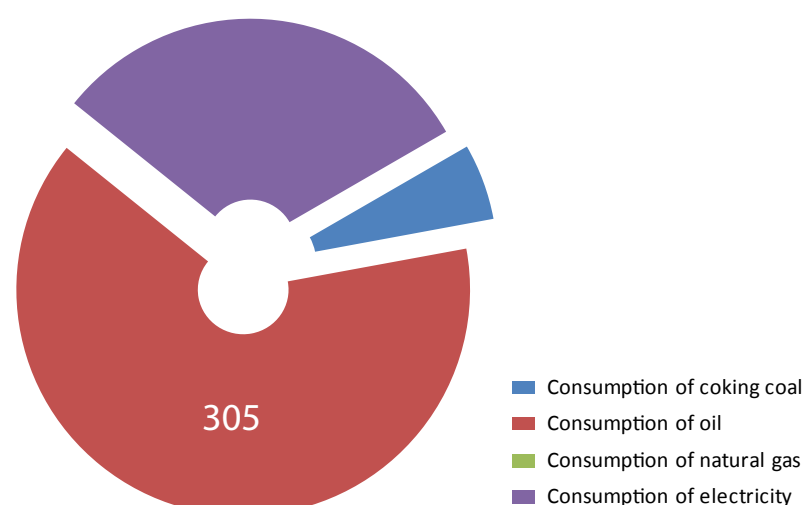
Malawi is not an oil producing country and imports almost all its refined oil products. In 2015, final consumption of oil was 305 ktoe and imports of oil products was 391 ktoe. Fossil fuels were used to produce 1 ktoe of electricity in 2015 down from 18 ktoe in 2010 (AFREC, 2015).

Figure 2: Total energy production, (ktoe)



Source: (AFREC, 2015)

Figure 3: Total energy consumption, (ktoe)



Source: (AFREC, 2015)

Table 2: Total energy statistics (ktoe)

Category	2000	2005	2010	2015 P
Production of coking coal	44	26	40	28
Production of charcoal	1,711	1,511	1,374	1,372
Production of crude oil, NLG and additives	-	-	-	-
Production of natural gas	-	-	-	-
Production of electricity from biofuels and waste	0	0	0	0
Production of electricity from fossil fuels	16	18	18	1
Production of nuclear electricity	-	-	-	-
Production of hydro electricity	88	112	149	248
Production of geothermal electricity	-	-	-	-
Production of electricity from solar, wind, Etc.	0	0	0	3
Total production of electricity	104	130	167	252
Refinery output of oil products	-	-	-	-
Final Consumption of coking coal	48	42	37	26
Final consumption of oil	264	340	304	305
Final consumption of natural gas	-	-	-	-
Final consumption of electricity	96	121	158	148
Consumption of oil in industry	0	0	0	0
Consumption of natural gas in industry	0	0	0	0
Consumption of electricity in industry	-	-	-	-
Consumption of coking coal in industry	0	0	0	0
Consumption of oil in transport	0	0	0	0
Consumption of electricity in transport	-	-	-	-
Net imports of coking coal	-10	12	0	0
Net imports of crude oil, NGL, Etc.	-	-	-	-
Net imports of oil product	264	340	351	391
Net imports of natural gas	-	-	-	-
Net imports of electricity	-	-	-	-

- : Data not applicable

0 : Data not available

(P): Projected

(AFREC, 2015)

Peat

Malawi has 492 km² of peatlands (WEC, 2013).

Coal

Malawi starting mining coal over three decades ago and has a total of four coal fields. The proven recoverable reserves of coal in 2011 was 2 million tonnes of sub-bituminous

coal; in 2011, coal production was 0.1 million tonnes (WEC, 2013). Production from the two active fields in Rumphu district does not meet the required local industrial volumes, so imports from Mozambique make up the deficit (Gamula, Hui, & Peng, 2013).

Wind

Malawi's lakeshore areas provide the windy conditions ideal for generating energy from this resource. Mean wind speeds are above 5 m/s for most of the year (Gamula, Hui, & Peng, 2013) and it is estimated that with serious investment Malawi has the potential to meet its energy demand from wind in less than 15 years (REEEP, 2012).

Nuclear

Malawi produces 1.2 per cent of global uranium production used for generating nuclear power (IEA, 2014). There are two known deposits in northern Malawi — 63,000 tonnes of proven reserves at Kayerekera in Karonga district and

another still being analysed at Illomba in Chitipa district (Gamula, Hui, & Peng, 2013). The uranium mines are self-sufficient in energy supplied by thermal generators on site. The government has long-term plans to invest in nuclear power (Gamula, Hui, & Peng, 2013).

Solar

Solar energy levels range from 900 W/m² to 1,200 W/m² depending on the time of the year (Gamula, Hui, & Peng, 2013). If implemented it is reliable and can be deployed for domestic use, irrigation and small businesses.

Tracking progress towards sustainable energy for all (SE4All)

Malawi is one of 20 countries worldwide that account for 83 per cent of the global energy-access deficit; it also has one of the lowest electrification rates (Table 3 and Figure 4) (World Bank, 2015). The national electrification rate was 9.8 per cent in 2012, with access proportions of 2.0 per cent in rural areas and 37.1 per cent in urban areas (World Bank, 2015); (World Bank, 2016). Government is implementing a rural electrification programme, but it will take time before national grid connections reach the currently unconnected population. National access to non-solid fuels in 2012 was 3.09 per cent, with 2 per cent in rural areas and 11 per cent in urban areas (World Bank, 2015).

Malawi's energy intensity increased at a compound annual growth rate (CAGR) of -1.57 per cent over the 20 years between 1990 and 2010 and at -1.42 per cent CAGR from 2010 to 2012. Between 2010 and 2012, the Malawi economy's energy intensity (the ratio of the quantity of energy consumption per unit of economic output) decreased from 10.5 MJ to 10.2 MJ per US dollar (2005 dollars at PPP) (World Bank, 2015).

The share of renewable energy in total final energy consumption (TFEC) decreased from 86.4 to 78.4 per cent between 1990 and 2012. In 2012, modern solid biofuels formed the biggest share of renewable sources at 36.61 per cent, followed by traditional biofuels at 35.1 per cent of TFEC, hydro at 6.9 per cent and liquid biofuels at 0.1 per cent. Renewable sources contributed 99.3 per cent of the share of electricity capacity and 57.4 per cent of the electricity generated in 2012 (World Bank, 2015).

Table 3: Malawi's progress towards achieving SDG7 – Ensure access to affordable, reliable, sustainable and modern energy for all

Target	Indicators	Year					
		1990	2000	2010	2012	2000-2010	2011-2015
7.1 By 2030, ensure universal access to affordable, reliable and modern energy services	7.1.1 Per cent of population with access to electricity	3	5	9	9.8		
	7.1.2 Per cent of population with primary reliance on non-solid fuels	2	2	3	3		
7.2 By 2030, increase substantially the share of renewable energy in the global energy mix	7.2.1 Renewable energy share in the total final energy consumption	86.1	76.9	81.3	78.7		
7.3 By 2030, Double the rate of improvement of energy efficiency	7.3.1 GDP per unit of energy use (constant 2011 PPP \$ per kg of oil equivalent)						
	Level of primary energy intensity(MJ/\$2005 PPP)	14.3		10.5	10.2	10.13	10.16

Sources: (World Bank, 2015); (World Bank, 2016)

Figure 4: SDG indicators

Percentage of population with access to electricity	Access to non-solid fuel (% of population)	GDP per unit of energy use (PPP \$ per kg of oil equivalent) 2013	Renewable energy consumption (% of total final energy consumption), 2006-2011, 2012
9.8%	3.09%	NA	79.24%

Table 4: Malawi's key aspects/key mitigation measures to meet its energy Intended Nationally Determined Contributions (INDCs)

INDC
*Produce 2000 solar water heaters (SWH)
*Increase SWH from 2,000 to 20,000 by 2030
*Install 20,000 solar PV systems
*Increase solar PV from 20,000 to 50,000 by 2030
*Produce 2 million litres of bio-diesel/year
*Increase biodiesel production from 2 to 20 million/year
*Produce 18 million litres of ethanol/year
*Increase ethanol production from 18 to 40 million litres per year
*Increase the number of passengers using mass transport by 1 per cent
*Increase the number of passengers using mass transport by 30
*Producing 351 MW of hydroelectricity
*Increase generation of hydroelectric power (HEP) by 800 MW by 2025
*Distribute energy saving cook stoves to 400,000 households
*Increase the number of households adopting energy saving stoves to 2 million by 2030

Source: (MEM, 2015)

Table 5: Malawi's institutional and legal framework

Basic Elements	Response
Presence of an Enabling Institutional Framework for sustainable energy development and services (Max 5 institutions) most critical ones	<ul style="list-style-type: none"> • Ministry Of Natural Resources and Environmental Affairs • Rural Electrification Management Committee
Presence of a Functional Energy Regulator	<ul style="list-style-type: none"> • Malawi Energy Regulatory Authority
Ownership of sectoral resources and markets (Electricity/power market; liquid fuels and gas market)	
Level of participation in regional energy infrastructure (Power Pools) and institutional arrangements	<ul style="list-style-type: none"> • Southern Africa Power Pool
Environment for Private Sector Participation	
Whether the Power Utility(ies) is/are vertically integrated or there is unbundling (list the Companies)	<ul style="list-style-type: none"> • Electricity Supply Corporation of Malawi (ESCOM) Limited
Where oil and gas production exists, whether upstream services and operations are privatized or state-owned, or a mixture (extent) e.g., licensed private exploration and development companies)	
Extent to which Downstream services and operations are privatized or state-owned, or a mixture (extent)	<ul style="list-style-type: none"> • Ministry of Natural Resources and Environmental Affairs
Presence of Functional (Feed in Tariffs) FIT systems	
Presence Functional IPPs and their contribution	
Legal, Policy and Strategy Frameworks	
Current enabling policies (including: RE; EE; private sector participation; & PPPs facilitation) (list 5 max) most critical ones	<ul style="list-style-type: none"> • National Energy Policy 2003 • Rural Electrification Fund;
Current enabling laws/pieces of legislation (including: RE; EE; private sector participation; & PPPs facilitation) – including electricity/grid codes & oil codes (5 max or yes/no) most critical ones	<ul style="list-style-type: none"> • Act 20, the Energy Regulation Act • Act 21, the Rural Electrification Act • Act 22, the Electricity Act • Act 23, the Liquid Fuels and Gas (Production and Supply) Act

This table was compiled with material from (REEEP, 2012) and (Gamula, Hui, & Peng, 2013)

Intended Nationally Determined Contributions (INDC) within the framework of the Paris climate Agreement

Malawi was keen to participate in global initiatives to combat climate change, especially since its economy is agro-based and climate-sensitive. The country's energy-related Intended Nationally Determined Contributions (INDC) are found in Table 4.

Institutional and Legal Framework

The Ministry of Natural Resources, Energy and Environment is in charge of the energy sector (Table 5). The energy regulator is the Malawi Energy Regulatory Authority. The Electricity Supply Corporation of Malawi (ESCOM) Limited is a publicly owned company and the only electrical power supplier. On a regional level, Malawi is a member of the Southern Africa Power Pool. The legal framework is provided by the Act 22, the Electricity Act. The main sector policy is the Energy Policy 2003, which aims to stimulate economic development and rural transformation by

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