



Figure 1: Energy profile of Angola



Energy Consumption and Production

In 2013, Angola had a population of just over 21 million with an energy sector dominated by hydropower and oil (IEA, 2016) (Table 1). Electricity production in 2015 was 617 ktoe with 73.2 per cent of it generated from hydro and 24.7 per cent from fossil fuels (Table 2) (AFREC, 2015). Total final consumption (TFC) of electricity has been steadily increasing in recent years, rising from 132 ktoe in 2009 to 535 ktoe in 2015. In 2015, industry used 27.4 per cent of total electricity consumption (AFREC, 2015). Key consumption and production statistics are shown in Figures 2 and 3.

Table 1: Angola's Key Indicators

Key indicators	Amount
Population (million) (2013)	21.47
GDP (billion 2005 USD)	58.79
CO ₂ emission (Mt of CO ₂)	18.49

(IEA, 2016)

Energy Resources

Hydropower

Angola's hydropower potential is a whopping 150 TWh/yr and supplies most of the country's electricity (WEC, 2013). The installed capacity is 790 MW and by 2011, 80 MW of hydro was under construction (WEC, 2013). For example, studies are underway on major hydro schemes at Lauca and Caculo-Cabaca on the River Kwanza, for a combined installed capacity of 4,000 MW, as well as the Baynes Mountain transboundary project on the River Kunene along the border with Namibia (WEC, 2013).

The hydroelectricity potential that is commercially viable is 72 TWh/year (18 GW) but only less than 5 per cent has so far been exploited. The technical hydroelectricity potential is estimated at 80 TWh/annum (Liu, Masera, & Esser (eds), 2013).

Figure 2: Total energy consumption, (ktoe)

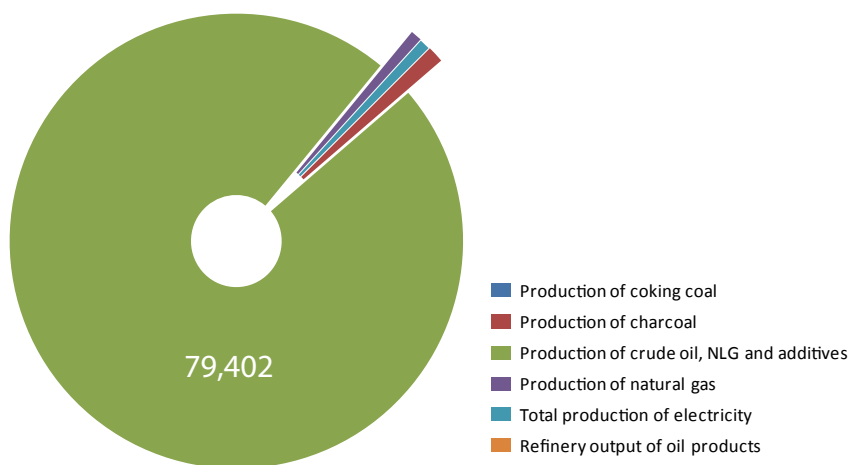


Figure 3: Total energy consumption, (ktoe)

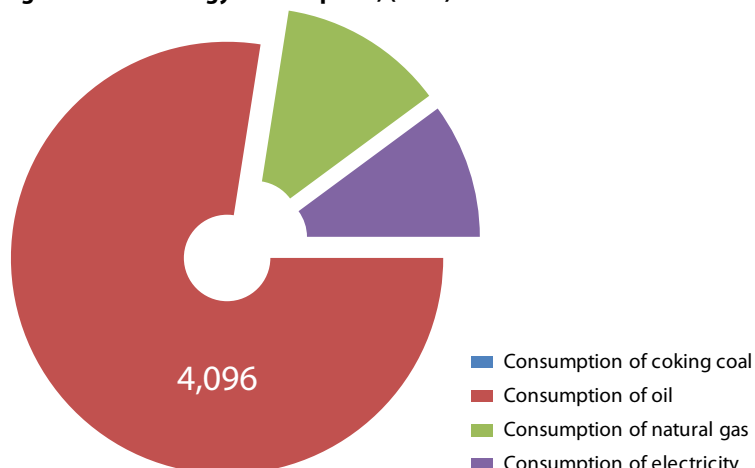


Table 2: Total Energy Statistics (ktoe)

Category	2000	2005	2010	2015 P
Production of coking coal	-	-	-	-
Production of charcoal	626	725	849	956
Production of crude oil, NLG and additives	34,390	58,194	82,070	79,402
Production of natural gas	526	681	626	652
Production of electricity from biofuels and waste	0	0	0	0
Production of electricity from fossil fuels	46	78	150	165
Production of nuclear electricity	-	-	-	-
Production of hydro electricity	78	150	318	452
Production of geothermal electricity	-	-	-	-
Production of electricity from solar, wind, etc.	0	0	0	0
Total production of electricity	124	228	468	617
Refinery output of oil products	1,806	1,946	1,944	1,949
Final consumption of coking coal	0	0	0	0
Final consumption of oil	1,499	2,159	4,381	4,096
Final consumption of natural gas	526	681	665	656
Final consumption of electricity	132	195	415	535
Consumption of oil in industry	212	517	458	456
Consumption of natural gas in industry	526	681	663	704
Consumption of electricity in industry	31	53	136	147
Consumption of coking coal in industry	0	0	0	0
Consumption of oil in transport	790	1,209	2,153	2,354
Consumption of electricity in transport	0	0	0	0
Net imports of coking coal	0	0	0	0
Net imports of crude oil, NGL, etc.	-34,623	-54,826	-78,587	-77,736
Net imports of oil product	-89	552	2,706	2,841
Net imports of natural gas	0	0	0	0
Net imports of electricity	3	0	0	0

- : Data not applicable
0 : Data not available
(P): Projected

(AFREC, 2015)

Oil

Oil first started being produced in Angola in 1956. By the end of 2011, proven oil reserves were estimated at 9,500 million barrels, and by 2013, this had increased to 13 million barrels. Between 2011 and 2013, production grew from an estimated 623,050 barrels a day to 11 million barrels (WEC, 2013); (OECD/IEA, 2014; Cristovao, Undated).

Natural gas

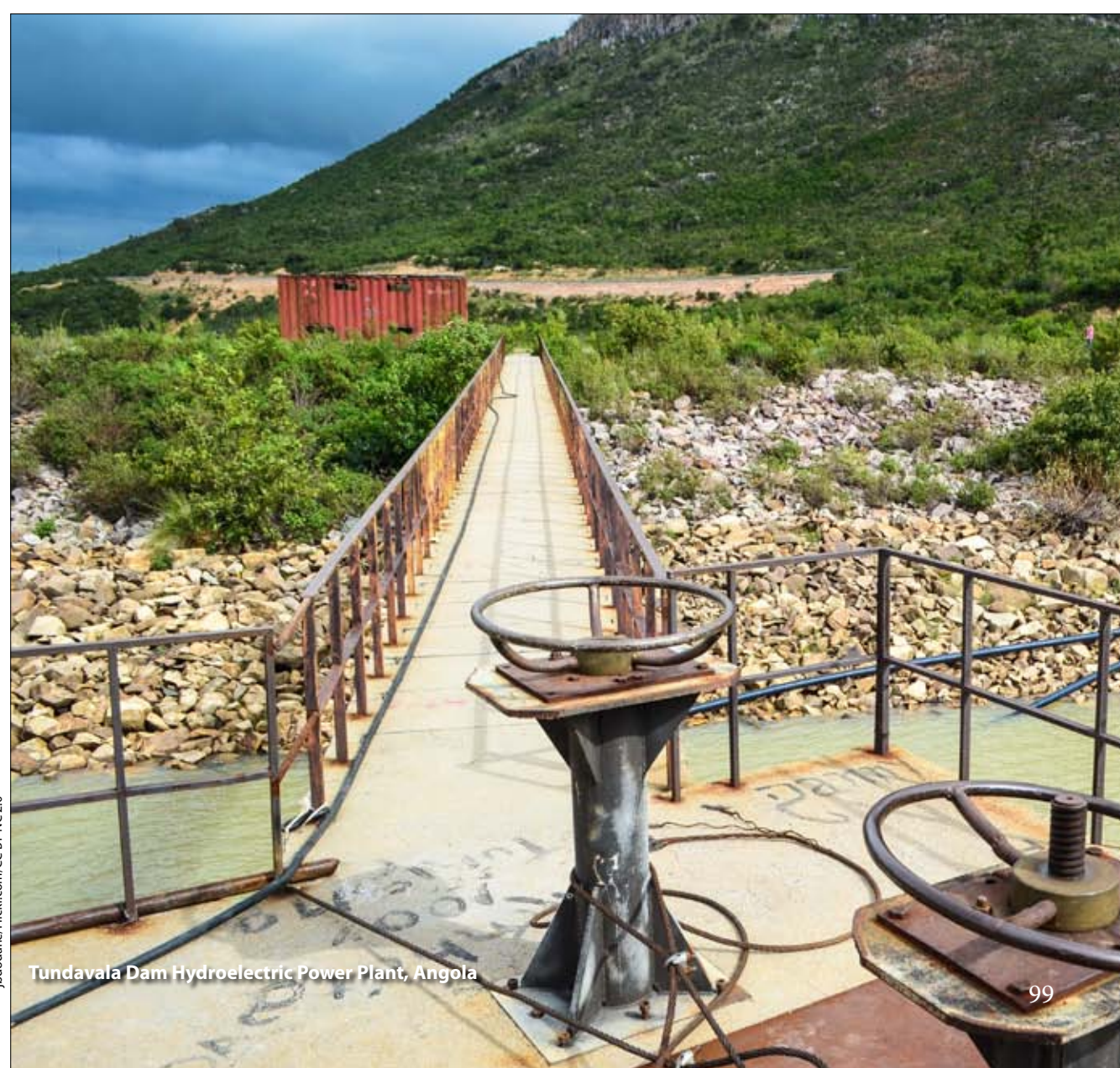
Estimated reserves of gas are equivalent to 5,685.7 bcm, while production is currently 0.7 bcm (WEC, 2013).

Peat

Peatland covers a total extent of 264 km² (WEC, 2013), but it is currently not an important source of energy.

Wind

Wind mapping of the country is underway but the potential for exploitation is not fully known. It is estimated that in Namibe province, however, there is potential to install wind farms that could generate up to 100 MW of electricity (Cristovao, Undated).



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Tundavala Dam Hydroelectric Power Plant, Angola

Tracking progress towards sustainable energy for all (SE4All)

National access to electricity was 37 per cent in 2012 and access to non-solid fuels was 44 per cent in 2012 (Table 3 and Figure 4). About 13.12 million people are without access to electricity, mostly in rural areas. This means that most people use traditional solid biomass and waste (typically consisting of wood, charcoal, manure and crop residues) to meet off-grid heating and cooking needs, mainly in rural areas where the electrification rate is only 6 per cent (World Bank, 2016). The urban electrification rate is 83 per cent. Between 2010 and 2012, a total of 416,000 people gained access to electricity. The national grid is divided into three systems — the central, northern and southern systems. Outside of these, localities are either electrified using isolated systems or do not have access to electricity at all (IEA, 2011).

The level of energy intensity of the Angolan economy fell during the 22 years between 1990 and 2012 from 5.6 to 4.0 MJ per US dollar (2011 dollars at PPP). The literature indicates that Angola's power sector is among the least efficient in Africa, with financial losses in the region of 1.6 per cent of GDP (REEEP, 2012).





The share of renewable energy in total final energy consumption (TFEC) grew from 54.9 per cent in 2010 to 57.2 per cent in 2012. Most of this energy was provided by solid biofuels and traditional biomass (53.3 per cent). Hydropower contributed only 2.6 per cent (World Bank, 2015). Renewable energy as a share of electricity generated is 70.9 per cent.

Table 3: Angola'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	28	31	35	37		
	7.1.2 Per cent of population with primary reliance on non-solid fuels	2	21	40	44.3		
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	72.3	75.5	54.9	57.18		
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)	-	-	10.3	10.5 (2011)		
	Level of primary energy intensity (MJ/\$2005 PPP)	5.6	-	4.1	4.0	4.05	4.0

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) 2011	Renewable energy consumption (% of total final energy consumption), 2012
37%	44.3%	10.88	57.18%
			

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

Angola is committed to addressing the global fight against climate change and has articulated its intention to reduce greenhouse gas (GHG) emissions, which in 2013 were estimated at 18.49 MT of CO₂ (IEA, 2016). The energy-related

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

- *Reach 27 per cent of electricity generated from renewable sources of energy by 2030;
- *Generalize high-performance lighting; implement thermal insulation of buildings between 2021 and 2030;
- *Increase the share of liquefied petroleum and natural gas in the consumption of fuels between 2021 and 2030.

Source: <http://www4.unfccc.int/>

Intended Nationally Determined Contributions (INDC) that were published in November 2015 are highlighted in Table 4.

Table 5: Angola'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 Energy and Water (MINEA) • National Directorate for Energy that supervises generation, transmission and distribution activities • Empresa Nacional de Electricidade (ENE) is in charge of generation, transmission and distribution of electricity to the country's three main grids and remote systems • Ministry of Finance sets tariffs
Presence of a Functional Energy Regulator	<ul style="list-style-type: none"> • Instituto Regulador de Sector Eléctrico (IRSE) • Atomic Energy Regulatory Agency (AREA)
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	
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"> • A Public Utility (merging GAMEK and ENE generation assets) to manage the generation assets • A Public Utility dedicated to network management and the transmission of electricity along the high voltage lines • A Distribution Utility (merging ENE, EDEL and the Municipalities) devoted to power distribution
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)	
Presence of Functional (Feed in Tariffs) FIT systems	
Presence Functional IPPs and their contribution	Hidrochicapa (Russian-led consortium) that built a 16-MW hydropower facility to facilitate its diamond mining operations in Lunda Sul province. Others include Kahrama, Shariket Kahraba Berrouaghia (SKB), Shariket Kahraba Koudiet Eddraouche (SKD), Shariket Kahraba Hadjret Ennouss (SKH), Shariket Kahraba Skikda (SKS) and Shariket Kahraba Terga (SKT)
Legal, Policy and Strategy Frameworks	
Current enabling policies (including: RE; EE; private sector participation; & PPPs facilitation) (list 5 max) most critical ones	National Energy Security Strategy and Policy of 2011 authenticated by Presidential Decree No. 256/11 of 29 September
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"> • General Electricity Act No. 14-A/96 of May 1996. Decree 20/90 of 1990 that gives the Ministry of Finance the authority to set tariffs • Decree 45/01 of 2001 on standardizing tariffs • Decree 4/02 of 2002 establishing the sector regulator, the Instituto Regulador de Sector Eléctrico (IRSE)

This table was prepared with material from (REEEP, 2012), (MINEA, 2016) and (MINEA and UNDP, 2015)

Institutional and Legal Framework

The Ministry of Energy and Water is in charge of the energy sector (Table 5). The energy regulator is Instituto Regulador de Sector Eléctrico (IRSE). The electricity sector is vertically integrated with different utilities managing electricity generation,

transmission and distribution. On a regional level, the country is a member of the Southern Africa Power Pool. The legal framework is provided by the General Electricity Act No. 14-A/96 of May 1996. The main sector policy is the National Energy Security Strategy and Policy of 2011.