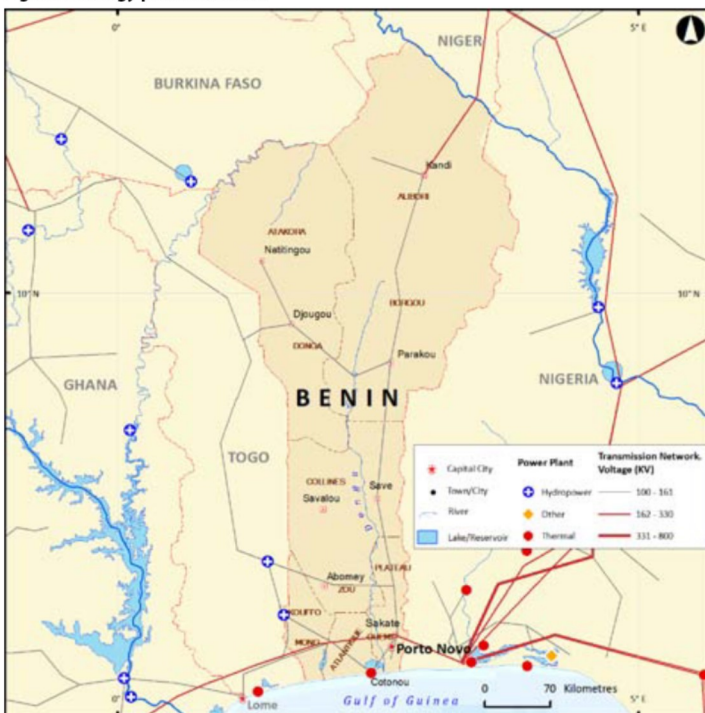




Figure 1: Energy profile of Benin



Energy Consumption and Production

By 2013, Benin had a population of 10.32 million (Table 1). Electricity production in 2015 was 54 ktoe with 99.2 per cent of it generated from fossil fuels. Industry consumed 22.2 per cent of electricity produced in 2015 (Table 2). Key consumption and production statistics are shown in Figures 2 and 3.

Table 1: Benin's key indicators

Key indicators	Amount
Population (2013 million)	10.32
GDP (billion 2005 USD)	6.02
CO ₂ emission (Mt of CO ₂)	5.22

(IEA, 2016)

Energy Resources

Biomass

Benin's domestic energy sector is dominated by the use of biomass-based energy sources. There is potential for biodiesel from crops such as Jatropha, castor, palm, cotton, peanut and soy. Other sources of biomass energy include agricultural residues, ethanol and biofuels. The potential for agricultural residues is estimated at about 5 million tonnes (REEEP, 2012). Ethanol production is limited to two plants: The Benin Sugar Plant (YUEKEN) and the Benin International Plant produce 4,200 m³ and 3,000 m³ of ethanol a year from sugar and cassava, respectively. However, a poor distribution infrastructure limits its usage in the transport sector (REEEP, 2012).

Two installations that process vegetable oil to transport fuels are operational, with a combined capacity of 210,000 tonnes, one located in Bohicon and the other, a palm oil plant, in Hinvi. However, only 30 per cent of the installed capacity is currently being exploited (REEEP, 2012).

Hydropower

Benin has huge potential for hydroelectricity generation. There is commercially viable potential of 760 MW on the River Oueme and there is also potential to support rural electrification through exploiting the over 80 other sites with small-scale hydropower plants (REEEP, 2012).

Figure 2: Total energy consumption, (ktoe)

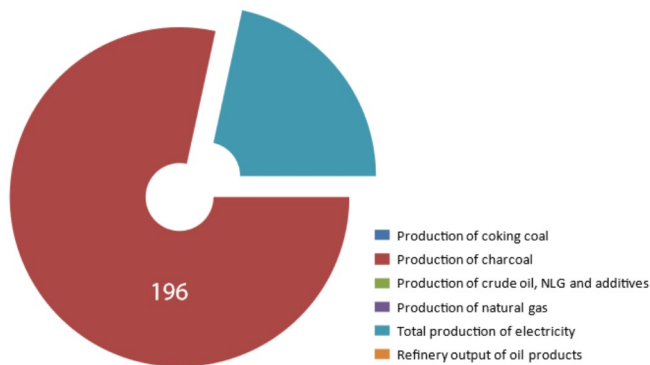


Figure 3: Total energy consumption, (ktoe)

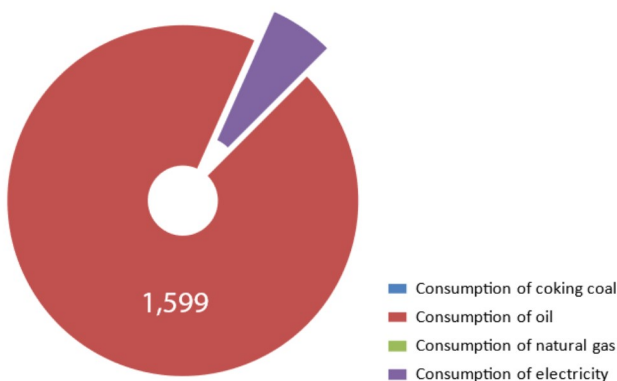


Table 2: Total Energy Statistics (ktoe)

Category	2000	2005	2010	2015 P
Production of coking coal	-	-	-	-
Production of charcoal	128	150	180	196
Production of crude oil, NLG and additives	-	-	-	-
Production of natural gas	-	-	-	-
Production of electricity from biofuels and waste	0	0	0	1
Production of electricity from fossil fuels	11	20	13	51
Production of nuclear electricity	-	-	-	-
Production of hydro electricity	0	0	0	0
Production of geothermal electricity	-	-	-	-
Production of electricity from solar, wind, etc.	0	0	0	2
Total production of electricity	12	20	13	54
Refinery output of oil products	-	-	-	-
Final consumption of coking coal	-	-	-	-
Final consumption of oil	459	917	1 568	1 599
Final consumption of natural gas	-	-	-	-
Final consumption of electricity	34	51	75	99
Consumption of oil in industry	48	42	47	48
Consumption of natural gas in industry	-	-	-	-
Consumption of electricity in industry	9	10	12	12
Consumption of coking coal in industry	-	-	-	-
Consumption of oil in transport	315	476	1 009	1 152
Consumption of electricity in transport	-	-	-	-
Net imports of coking coal	-	-	-	-
Net imports of crude oil, NGL, etc.	-	-	-	-
Net imports of oil product	527	1 144	1 603	1 799
Net imports of natural gas	-	-	-	-
Net imports of electricity	32	51	80	85

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

(AFREC, 2015)

Oil and natural gas

The crude oil reserves in Benin are divided into 17 blocks for exploration purposes. Seven of these have active exploration activities with extensive geological and geophysical studies being conducted. Oil production from the Sèmè oil field off Cotonou came on line in 1982 and closed in 1998. At its height, it had a production of 8,000 bpd. Currently, South Atlantic Petroleum (SAPETRO) from Nigeria is looking to produce in one of these blocks.

By the end of 2011, there was 1.0bcm (35.3 bcf) of proved recoverable natural gas reserves (WEC, 2013). Although these reserves are moderate, Benin produces no natural gas and imports all it needs. The Société Béninoise de Gaz is responsible for importing natural gas, which is supplied by the West African Gas Pipeline.

Peat

Benin has about 100 km² of peat but is not yet exploiting this as an energy source (WEC, 2013).

Wind

Wind speeds vary between 3 and 6 m/s but detailed information is unavailable, so an overview of the existing energy potential of wind power cannot be made (REEEP, 2012).

Geothermal

There is a dearth of information on the geothermal potential of Benin. The topography is generally flat and there is little active volcanism, suggesting a low potential (REEEP, 2012).

Solar

About 448 kW of solar energy is currently being used to support rural solar electrification systems such as health care units and telecommunication in Benin. The documented solar energy potential ranges between 3.9 and 6.2 kWh/m² (REEEP, 2012).

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Rural Benin

Tracking progress towards sustainable energy for all (SE4All)

By 2012, access to electricity in Benin was only 38.4 per cent, with 68 per cent in urban areas and only 14.5 per cent in rural areas (Table 3 and Figure 4). Access to modern fuels is also low, with only 6.21 per cent using non-solid fuel nationwide; only 2 per cent have access in rural areas and 11 per cent in urban areas (World Bank, 2015); (World Bank, 2016). Low electrification rates are linked to the insufficient and unreliable power supply and this has severe economic consequences. For instance, in 2009, firms indicated that around 6.2 per cent of value was lost because of power outages (World Bank, 2015).

The energy intensity (the ratio of the quantity of energy consumption per unit of economic output) of the Benin economy was 9.7 MJ per US dollar (2005 dollars at PPP) in 2012, down from 10.2 MJ per US dollar in 1990. The compound annual growth rate (CAGR) between 2010 and 2012 was -0.63 (World Bank, 2015).

The share of renewable energy in the total final energy consumption decreased from 93.7 in 1990 to 50.57 per cent in 2012 (World Bank, 2016). Traditional solid biofuels form the biggest share of renewable sources at 42.1 per cent of TFEC in 2012, while modern solid biofuels contributed 8.5 per cent (World Bank, 2015). Renewable sources contributed a 0.6 per cent share of electricity generation in 2012.

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

In September 2015, Benin articulated its energy-related Intended Nationally Determined Contributions (INDCs) (Table 4). The

Table 3: Benin'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	22	25	28	38.4		
	7.1.2 Per cent of population with primary reliance on non-solid fuels	2	6	6	6		
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	93.7	70.3	51.5	50.57		
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)			4.3	4.3 (2011)		4.74 (2013)
	Level of primary energy intensity(MJ/\$2005 PPP)	10.2		9.8	9.7	9.81	9.67

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
38.4%	6.21%	4.9	50.57%
			

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

INDC
*Promote solar photovoltaic powered public lighting in rural and peri-urban areas by providing households with up to 1 million solar lamps and bulbs;
*Promote solar power plants construction by building 40 MW total capacity of solar power plants;
*Increase hydroelectricity production;
-Build hydroelectric dams of 259.9 MW total capacity
-Increase rural electrification: with a goal of electrifying 1,000 villages
-Promote households access to low electricity consumption bulbs with a target to reach 1.2 million lamps
-Support the acquisition and distribution of 200,000 household connection kits by the SBEE (national electricity utility company)
*Promote households' access to liquefied natural gas (LNG) and its related equipment for cooking: roughly 275,000 households are considered for this programme and 35 per cent of the gas refill rate will be subsidized for households;
*Increase electricity production from natural gas by building a 400 MW natural gas plant;
*Build an LNG storage and regasification unit as well as a connecting pipeline to the gas terminal in the port of Cotonou;
*Promote affordable cooking stoves: disseminate 140,000 improved cooking stoves;
*Promote high efficiency carbonization stoves;
*Create plantations for fuel wood industry for a total area of 5,000 ha;
*Develop lagoon and lake transport in Benin using existing systems of river and lake routes in the five riparian regions of Lake Nokoue;
*Develop intra- and intercity public transport system in and between Parakou and Porto-Novo;
*Establish a differential taxation policy in favor of imported used cars less than five (5) years of age;
*Establish a policy that levies importation taxes on public transportation vehicles, and continue to promote 4T motorbikes to the detriment of 2T motorbikes by applying fiscal and tariff levy on 4T mopeds and their spare parts.

Source: (ROB, 2015)

Table 5: Benin'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 • Directorate General for Energy (DGE) • Beninese Agency for Rural Electrification and Energy Control (ABERME) - policy • Electrical Community of Benin (CEB) • Agency for the Control of Internal Electrical Installations (CONTRELEC)
Presence of a Functional Energy Regulator	Ministry of Energy and Water (MEE) Benin Agency for Rural Electrification and Energy Control (ABERME) Regulatory Authority created in 2013
Ownership of sectoral resources and markets (Electricity/power market; liquid fuels and gas market)	<ul style="list-style-type: none"> • Ministry of Energy and Water • National oil company SONACOP • Other licensed companies include Total Benin, Texaco Benin S. A. and Oryx Benin S. A.
Level of participation in regional energy infrastructure (Power Pools) and institutional arrangements	West African Power Pool (WAPP)
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"> • Communaute Electrique du Benin (CEB) - production, distribution and the import of electricity in both Togo and Benin • Societe Beninoise d'Energie Electrique (SBEE) – handles 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	
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"> • Policy and Strategy Document for the Development of the Electricity Sector that provides the long term vision and the strategy of the country by 2025 • 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"> • Law No.98-032 1998, Portant Réforme du Secteur de l'Électricité: Structural Reform of the Electricity Sector, is the current power sector law • Decree No.2001-173, fixing the condition and applicable mode of the Law No.98-032 1999 for structural reform of the electricity sector

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

main aim is to contribute to reducing cumulative GHG emissions from current emissions.

Institutional and Legal Framework

The Ministry of Energy and Water is in charge of the energy sector. The energy regulator is the

Benin Agency for Rural Electrification and Energy Control (ABERME). The Communauté Electrique du Benin (CEB) handles production, distribution and importation of electricity in both Togo and Benin and the Société Béninoise d'Energie Electrique (SBEE) handles distribution. On a regional level, the country is a member of the West Africa Power

Pool. The legal framework is provided by the Law No.98-032 1998, the Structural Reform of the Electricity Sector (Table 5).

The main sector policy is the Policy and Strategy Document for the Development of the Electricity Sector that provides the long-term vision and the strategy of the country by 2025.