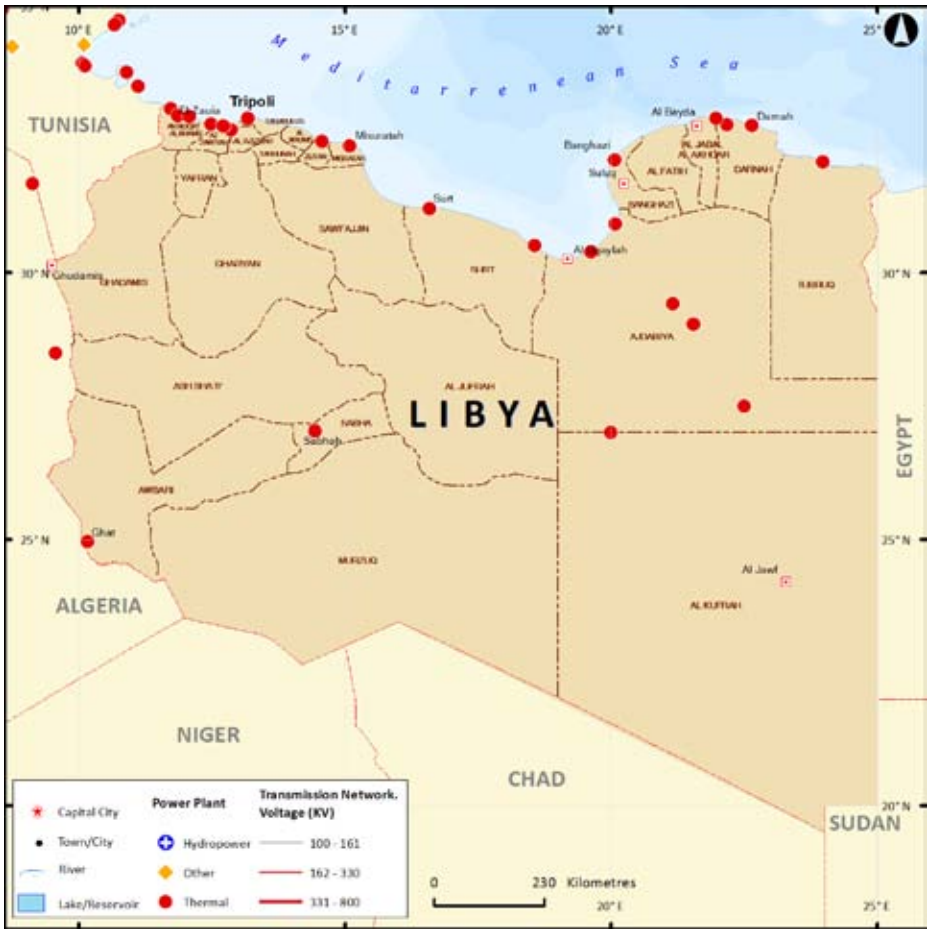
# Libya

**Figure 1: Energy profile of Libya**




## Energy Consumption and Production

In 2013, Libya had a population of 6.2 million and in 2015, the total amount of electricity produced was 3,105 ktoe of which 99.9 per cent was from fossil fuels (Tables 1 and 2). In the same year, final consumption of electricity was 2,690 ktoe (AFREC, 2015). Figures 2 and 3 highlight the key energy statistics.

**Table 1: Libya's key indicators**

| Key indicators | Amount |
|---|---|
| Population (million) | 6.20 |
| GDP (billion 2005 USD) | 37.99 |
| $CO_2$ emission (Mt of $CO_2$) | 43.23 |

Source: (World Bank, 2015)

## Energy Resources

### Biomass

Libya's biomass potential of 2 TWh/year is currently not an important energy source and is thought to be only suitable for domestic consumption (REEEP, 2012).

### Hydropower

The lack of resources for hydropower seriously hinders the development of this sector, and it is likely to remain like this for the near future (REEEP, 2012).

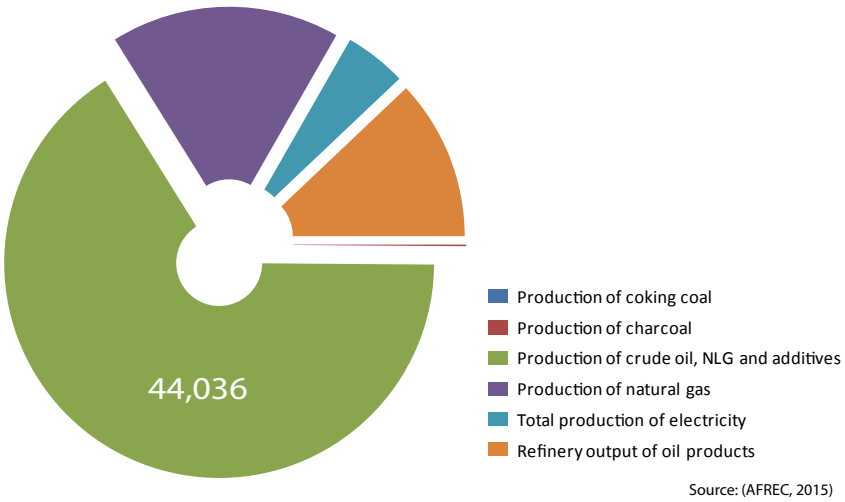
### Oil and natural gas

Libya is a net exporter of energy sources by a large amount, but imports petroleum products, amounting to 3,208 ktoe, due to inadequate refining capability. Total crude oil exports in 2013 were 48,307 increasing to 66,325 ktoe in 2015 (AFREC, 2015). Natural gas exports in the same period were 9,328 and 6,067 ktoe respectively (AFREC, 2015). Electricity produced from petroleum in 2015 was 3,103 ktoe (AFREC, 2015). The crude oil reserves in Libya are the largest in Africa, however the security situation is having impacts on the sector.

### Wind

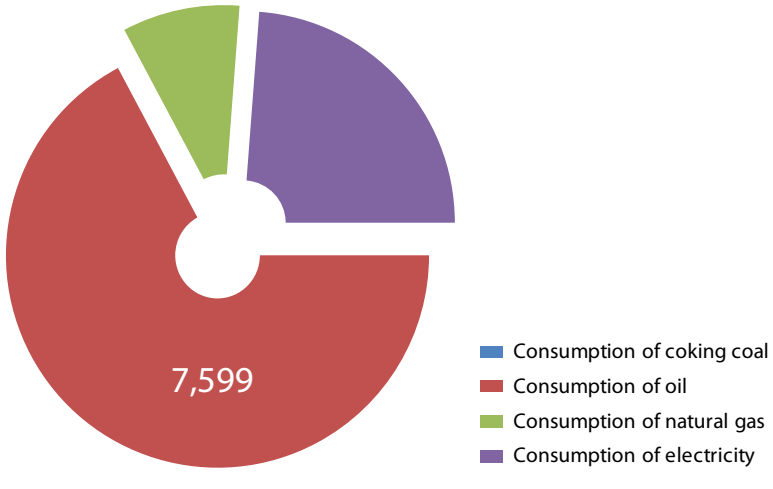
In Africa, high quality wind resources are confined to a few areas. Somalia has the highest onshore potential of any country, followed by Sudan, Libya, Mauritania, Egypt, Madagascar and Kenya (Mukasa, Mutambatsere,

**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 | - | - | - | - |
| Production of charcoal | 0 | 0 | 77 | 79 |
| Production of crude oil, NLG and additives | 63,884 | 77,528 | 73,240 | 44,036 |
| Production of natural gas | 5,337 | 10,619 | 14,340 | 11,450 |
| Production of electricity from biofuels and waste | 0 | 0 | 0 | 0 |
| Production of electricity from fossil fuels | 1,316 | 1,935 | 2,816 | 3,103 |
| Production of nuclear electricity | - | - | - | - |
| Production of hydro electricity | - | - | - | - |
| Production of geothermal electricity | - | - | - | - |
| Production of electricity from solar, wind, Etc. | 0 | 0 | 0 | 2 |
| Total production of electricity | 1,316 | 1,935 | 2,816 | 3,105 |
| Refinery output of oil products | 15,128 | 15,877 | 19,478 | 8,053 |
| Final Consumption of coking coal | 0 | 0 | 0 | 0 |
| Final consumption of oil | 6,137 | 6,394 | 8,759 | 7,599 |
| Final consumption of natural gas | 2,388 | 3,228 | 1,971 | 1,015 |
| Final consumption of electricity | 1,051 | 1,679 | 2,442 | 2,690 |
| Consumption of oil in industry | 1,467 | 1,494 | 2,296 | 1,896 |
| Consumption of natural gas in industry | 1,027 | 984 | 421 | 204 |
| Consumption of electricity in industry | 263 | 273 | 179 | 124 |
| Consumption of coking coal in industry | 0 | 0 | 0 | 0 |
| Consumption of oil in transport | 3,845 | 3,974 | 5,770 | 5,204 |
| 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. | -46,518 | -60,360 | -48,307 | -66,325 |
| Net imports of oil product | -4,636 | -4,889 | -1,455 | 3,208 |
| Net imports of natural gas | -726 | -4,901 | -9,328 | -6,067 |
| Net imports of electricity | 0 | 0 | -7 | 4 |

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

(AFREC, 2015)

Arvani, & Triki , 2013). According to (Gatnash, 2012), average wind speeds of 5.3-6.2 m/s have been recorded at 40 m altitude. These speeds are suitable for the small-scale development of wind energy if commercial viability is difficult. It is likely that inland, wind speeds could be higher.

### Tidal energy

Given that Libya has a coastline of 1,770 km, there is likely to be potential for the development of tidal energy but comprehensive studies to determine this need to be carried out (Gatnash, 2012).

### Geothermal

The geothermal energy sector has some potential especially in the area of indoor cooling, along the lines of similar systems in Palestine. This would greatly reduce energy consumption contributing to environmental sustainability reducing home energy usage by much. The sector could benefit from more in depth studies to determine viability. However according to (REEEP, 2012) Underground Thermal Energy Storage (UTES), in which surplus heat is stored in pipes in the ground during the warmer months to be extracted during the cooler winter seasons is being looked at as an option. Furthermore, near Waddan City, new technology may make it possible to use the existing low-temperature geothermal source for power generation (REEEP, 2012).

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### Solar

Libya has expansive areas of unencumbered desert land that could lend itself to the development of solar energy. Daily solar radiation has been measured at 7.5 kWh/$m^2$ (REEEP, 2012). By 2015, there was 2 ktoe of solar and wind energy installed in the country (AFREC, 2015).

## Tracking progress towards sustainable energy for all (SE4All)

By 2010, 100 per cent of Libya had access to electricity in both rural and urban areas (Table 3 and Figure 4) (World Bank, 2015). By 2012, 99.99 per cent of the population also has access to non-solid fuels (World Bank, 2015) (World Bank, 2016).

Between the 1990-2000 and 2000-2010 period, the 2000, the energy intensity decreased from a compound annual growth rate (CAGR) of -3.10 per cent to -1.67 per cent respectively. Over the tracking period 2010-2012 it returned to 3.70 per cent . The energy intensity of the Libya economy (the ratio of the quantity of energy consumption per unit of economic output) increased from 4.7 MJ in 2010 to 5.1 MJ per US dollar (2005 dollars at PPP) (World Bank, 2015).

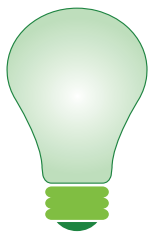
The share of renewable energy in the total final energy consumption has been declining. In 1990, it was 3.1 per cent decreasing to 1.69 per cent in 2012 (World Bank, 2015) (World Bank, 2016).

**Table 3: Libya'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 | 97 | 100 | 100 | 100 | | |
| | 7.1.2 Per cent of population with primary reliance on non-solid fuels | 90 | 99 | 100 | 99.99 | | |
| 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 | 3.1 | 2.1 | 2.1 | 1.7 | 2.26 | 1.69 |
| 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) | | | 11.2 | 13.3 (2011) | | |
| | Level of primary energy intensity(MJ/$2005 PPP) | | | 4.7 | 5.1 | | |

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 |
|---|---|---|---|
| 100%  | 99.99%  | 7.45  | 1.69% |

Tarek Siala / Flickr.com / CC BY 2.0

**Tripoli at night**

**Table 4: Libya'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 | • Ministry of Electricity and Renewable Energy<br>• Energy Council<br>• Atomic Authority<br>• Solar Energy Research Centre management,<br>• Renewable Energy Authority of Libya (REAOL) 2007<br>• Centre for Solar Energy Studies (CSES) |
| Presence of a Functional Energy Regulator | None |
| Ownership of sectoral resources and markets (Electricity/power market; liquid fuels and gas market) | State-owned General Electricity Company of Libya (GECOL) |
| Level of participation in regional energy infrastructure (Power Pools) and institutional arrangements | Comite Maghrebin De L'electricite (COMELEC) Power Pool |
| Environment for Private Sector Participation | |
| Whether the Power Utility(ies) is/are vertically integrated or there is unbundling (list the Companies) | |
| 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) | • National Oil Corporation (NOC) |
| 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 | • Renewable energy roadmap to 2030<br>• National Energy Efficiency Action Plan (NEEAP) |
| 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 | • Prime Ministerial Decision of 8 September 2009 establishing Energy Council<br>• Draft Electricity Bill |

This table was compiled with material from (REEEP, 2012)

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

The country has not defined its energy-related Intended Nationally Determined Contributions (INDC).

## Institutional and Legal Framework

The Energy Council is in charge of the energy sector; and there is also a Ministry of Electricity