

Country Power Market Brief: Djibouti

Background

Djibouti's government is strongly committed to increase electrification rates and diversify its energy mix. The country is endowed with high renewable energy potential (from solar, wind and geothermal) for on-grid and off-grid applications that, if properly developed, can contribute to improve its energy security, lower the tariffs, increase electrification rates and reliability in the supply.

Djibouti has low electrification rates, suffers from regular blackouts and high dependency on energy imports; and has one of the highest tariffs in the world. Meanwhile, the country's power demand is growing fast as a consequence of its economic growth.

The present market brief was prepared in the context of the Africa-EU Energy Partnership Business Dialogue organised during the 29-30 May 2013 in Djibouti Ville with the main purpose to inform participants on the country's power sector potential with a view to support dialogue between non-state and public actors.



Source: AF-Mercados.

Distances and routes are approximations. The power lines follow the roads appearing on this map. Tadjoura and Obock have isolated power networks.

General¹

Surface	23,000 km ²
Population	0.9 million
Population density	35 inhab./ km ²
Share of urban pop.	70%
GDP	\$ 1.354 billion
GDP per capita	\$ 1,523 (139/183 rank)
ODA % of GNI	14.9
Human development	164/186 (rank)
Governance levels	171/600 (score)
Ease of doing business	171/185 (rank)

Power sector²

Electrification rates	~50%
Electricity demand	421.73 GWh
Electricity supply	395.7 GWh
Installed capacity	125.96 MW
Power imports	154.97 GWh
Grid losses	16%
Power retail tariffs	\$ 30 cent/kWh
Power import tariffs	\$ 6-7 cent/kWh
Geothermal potential	650 MW
Wind potential	56.65 MW
Solar potential	55 MW

¹ Sources: UN (2008, 2013), IMF (2012), WB (2011, 2013) and DISED (2013)

² Sources: AF Mercados, German Chamber of Commerce and the Centre d'Etudes et de Recherche de Djibouti.

Demand

In 2011, the total electricity demand represented 421.73 GWh distributed in three different systems, the main grid and two isolated networks. Djibouti's demand is characterised by its fast growth levels. Power demand for the main grid is expected to grow by 70-75% in the period 2011-2035, while demand for the isolated networks of Tadjoura and Obock is expected to increase by 62.5% and 49.5% respectively during 2011-2035.

Demand	2012		2035	
	Demand (GWh)	Peak (MW)	Demand (GWh)	Peak (MW)
Main grid	413.5	73.8	1,745.1	311.4
Tadjoura (isol.)	5.2	1.2	14	3.2
Obock (isolated)	3	0.7	5.9	1.3

Supply

In 2011, total power supply represented 395.7 GWh. Production levels have been growing at an estimated annual rate of 5.7% over the last 40 years, but more slowly than demand. As a consequence of random and scheduled power cuts, an estimated 8.73 GWh of demand for the main grid could not be served in 2011.

In 2011, the country's total installed capacity equalled to 125.96 MW fully generated using diesel gensets distributed in four different generation plants.

Supply	Plant	Genset units ³	Total Cap. (MW) ⁴
Main grid	Boulaos	15	108.2
	Marabout	6	14.4
	Tadjoura	6	2.2
Isolated	Obock	5	1.2

The current network scheme is based on a 63 KV backbone, fed by Djibouti Ville generation units (Boulaos and Marabout) and the 230 KV Ethiopian interconnector. Isolated systems' grids are based on lower voltage distribution networks. In 2011, grid losses represented about 16% of the electricity produced due to the poor state of the grid and illegal connections.

Djibouti decreased its power production by 37.64% over the 2010-2011 period as a result of the commissioning of Ethiopia's interconnector which also allowed for a reduction in the non-served

³ The units were installed during the decade of 2000 and will be retired in the first half of the 2030 decade.

⁴ In 2012, overall thermal power production costs accounted for 180,4 USD₂₀₁₀/MWh and a primary source cost of 65,9 USD₂₀₁₀/MWh. Fixed O&M 43,4 USD/MW and Variable O&M 8,71 USD/MW.

interconnected demand. Out of the total power supply, 154.97 GWh were imported from Ethiopia. Power imports from Ethiopia are regulated by a bilateral contract establishing a maximum energy trading of 243 GWh per year over the period 2012-2015 and up to 70% of the Djiboutian load up to 2019. It has set a very attractive tariff that varies between 6-7 USD cent/kWh.

Power production is largely based on thermal power plants, while, at the same time, Djibouti has no proven oil resources. As a result, its energy self-sufficiency levels are low (32%, IRENA, 2009) and its tariffs (USD 30 cent/kWh) remain amongst the highest in the world. In spite of this, the financial situation of Electricité de Djibouti (EDD), the state-owned and vertically integrated utility, continues deteriorating. Fuel subsidies represent a heavy burden for the State, up to 1.5% of its GDP (IMF, 2012).

As a result of the high tariffs and unreliable power supply, the private sector (e.g. Freeport of Djibouti) has developed its own means to produce electricity, but it is not allowed to sell excess power to the grid. The public sector remains the biggest consumer of electricity (40%) in Djibouti.

Policy targets and reforms

The Government of Djibouti has planned to increase its electrification rates up to 60% by 2015 and is strongly committed to support the development of the renewable energy sector. As a matter of fact, the increase in the share of renewable energies in the country's energy mix has been identified as a key objective of its energy policy as well as of its Visions 2020 and 2035. In both cases, a target of 87-100% share of renewables in the energy mix has been set.

The authorities also aim to (i) improve the efficiency and financial performance of the electricity utility; (ii) refurbish and extend the power grid; (iii) and diversify power supply sources through exploration of renewable energy potential and the creation of interconnections (REEGLE).

As regards rural electrification, the government has set a solar development plan with the following targets: (i) equipping 70 rural boreholes and 100 other wells with solar pumps, (ii) equipping all rural health centres and 100 rural schools with solar arrays, (iii) increasing rural electrification up to 30% by 2017 with the installation of solar PV systems in 5,000 households (REEGLE).

The EUEI PDF was approached by the Djiboutian authorities in order to formulate a ten-year National Strategy and a five-year Action Plan for the development of the electricity sector in line with the above-mentioned targets. The project also aims at establishing a new electricity legislative act and a new regulation that sets adequate tariff and Power Purchase Agreement (PPA) schemes for the renewable energy sector.

Power sector expansion plans

The Jaban HFO generation plant is in the pipeline (Kuwait Fund). The completion of its first phase with an installed capacity of 45 MW is expected for 2015. It has been planned that the plant reaches a capacity of 140 MW by 2030 (EDD). The study from AF Mercados also foresees the development of 116.3 MW of Diesel (30 MW) and OCGT (77.3 MW).

The African Development Bank (AfDB), which financed the first phase of Ethiopia's interconnector, has approved funding to expand the interconnector with the construction of a second 230 KV line expected to enter into operation in 2017.

Renewable energy potential

The main renewable source of the country is geothermal, the only energy source available in the country that has firm capacity. It has been investigated since the 1970s with two main potential areas identified, Lake Assal and Lake Abbéc, each of them with a 150 MW potential capacity. Many donor-driven projects aimed at supporting its development have been carried out (e.g. UNEP African Rift Geothermal Development Facility – ARGeo). Reykjavik Energy Invest currently holds a concession to pilot geothermal development. The process has been slowed down due to high upfront costs of the projects which are located in remote areas and that require the construction of a new grid. Concerns as regards the viability of the water resources for bulk power generation, their high salinity levels and the risks involved in the success of the drilling works constitute additional barriers. Although the completion of the initial construction

phase of the plant (50 MW) has been planned for 2013-2014, AF Mercados estimates that the earliest date for commissioning will be 2020.

Regarding wind, Djibouti's Government has carried out feasibility studies in 14 sites, of which most of them have revealed average wind speeds above 5 metre per second (m/s). Ghoubet, Gali Maaba and Day gave results close to 9 m/s. According to AF Mercados, the site of Ghoubet remains the most interesting. The construction of a 20 MW wind park in Ghoubet is being considered by the European Commission for the provision of power supply to seawater desalination. China has also signed an agreement with the Djiboutian government to develop the wind resources in Ghoubet. Nonetheless, being located close to Lake Abbéc, the Ghoubet project faces serious challenges due its remoteness. If the geothermal plant of the Lake Abbéc is built, both projects could share the same interconnection line. Other possible locations such as Ali Sabieh, Bada Wein, Egralyta and Djibouti ville have been identified to host wind farms with a capacity above 5 MW. Day, Hol-Hol and Yoboki have been identified to host wind farms with a capacity below 1 MW. The previously mentioned World Bank (WB) support programme also includes a small wind component for isolated areas.

Irradiation levels in Djibouti have been studied since the 1980s proving high potential all over the country (5-6.5 kWh/m²). According to the Centre des Etudes et la Recherche de Djibouti (CERD), the South-West is the region that enjoys the highest irradiation levels, particularly Dikhil. The Government plans to build a manufacturing facility of PV modules, and two grid-connected PV plants near Djibouti Ville, one of 10 MW (expandable to 25 MW) and another of 20 MW. The construction of a solar thermal plant with a 10 MW capacity is also being studied. The Agence Djiboutienne de Développement Social (ADDS) is currently developing an off-grid solar project aimed at achieving the targets set by the Solar Development Programme. The mentioned World Bank programme includes a feasibility study for solar rural electrification. Although not yet studied, hybridisation of the thermal plants of Tadjoura and Obock isolated systems could also be evaluated.

Key players of the power sector

Ministère de l’Energie et des Ressources Naturelles (MERN)	In charge of policy and regulatory aspects (including licensing and tariffs).
Centre des Etudes et la Recherche de Djibouti (CERD)	Evaluation of the renewable energy potential in Djibouti
Agence Djiboutienne de Développement Social (ADDS)	Responsible for the implementation of rural electrification objectives included in the Solar Development Plan.
Agence Djiboutienne de Maîtrise de l’Energie (ADME)	In charge of the country’s energy efficiency programme.
Electricité De Djibouti (EDD)	Responsible for power penetration (including renewable energy) and imports, as well as transmission and distribution. EDD directly operates in the following regions: Djibouti, Ali-Sabieh, Arta, Dikhil, Obock and Tadjoura. The operations in the other regions are ensured by private operators.
Société Internationale des Hydrocarbures (SIH)	Responsible for hydrocarbon imports, processing and operations. Total and Shell are in charge of operations. The refining facility is in charge of processing hydrocarbons.

Non-exhaustive list of development partners involved in Djibouti’s energy sector:

Agence Française de Développement (AFD), the African Development Bank (AfDB), the European Investment Bank (EIB), the European Union (EU), the European Union Energy Initiative Partnership Dialogue Facility (EUEI PDF), the United Nations Environment Programme (UNEP) and the World Bank (WB).

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