

# Country Power Market Brief: Cameroon

## Background

Cameroon is the most populated country in the CEMAC region and with a fast growing population. Most of its population lives in the Central and Coastal regions. Its economic growth slowed down in 2009, but regained its momentum in 2010. Although its share is decreasing, the extractive sector remains an important source of revenue for the country.

Electricity demand still represents a small share of the country's total energy consumption. Most of the country's rural areas remain un-electrified. The balance between power supply and rapid growing demand remains fragile, particularly during the dry season when the hydropower capacity drops. Meanwhile, the country has high wood biomass potential and the second largest hydropower potential in Africa.

The present market brief was prepared in the context of a workshop organised in Yaoundé on 4 December by Cameroon's Government, the EUEI-PDF, ARE and Practical Action. The document aims at informing participants about the country's power sector potential and stimulating private sector involvement in the sector.

### General<sup>1</sup>

Surface (km <sup>2</sup> )	466,650
Population (millions)	19.4
Population Density (inhab/km <sup>2</sup> )	41.6
Annual population growth rate (%)	2.8
Share of urban pop. (%)	52.7.6
GDP (\$bn)	25,538
GDP per capita (\$)	2,400
GDP growth rate (%)	3.8
ODA % of GNI	2.4
Human dev. (rank)	150/186
Governance levels (rank)	118.1/600
Ease of doing business (rank)	161/185

### Power sector<sup>2</sup>

Electrification rate (%)	57%
Rural electrification rate (%)	~449
Electricity use p.c./year (kWh)	771
Total electricity demand (GWh)	4,863
Total electricity generation (GWh)	5,834
% electricity in energy supply (%)	4
% hydro in power production	73
Installed capacity (MW)	1926
Grid losses (%)	25
Hydropower potential (MW)	20
Biomass potential (MW)	>100

<sup>1</sup> Sources: UN, CIA, WB 2010-2012

<sup>2</sup> Sources: ESMAP, MEWD, 2008-2012

## INSTITUTIONAL, POLICY, LEGISLATIVE AND REGULATORY<sup>3</sup> FRAMEWORK

In its “Vision 2035”, Cameroon set as its main target to become an emerging country. One of the initiative’s sub-targets is to achieve universal access to electricity. The first ten years of implementation (2010-2020) are covered by the Growth and Employment Strategy Paper which also includes energy goals. The strategy aims at improving country’s security of supply at the lowest cost possible, ensuring reliability of energy services and building the capacity of energy stakeholders. The Government has set renewable energy targets such as achieving 3000 MW of hydropower installed capacity by 2020.

As regards energy access, Cameroon has established a long term power policy under the Energy Sector Development Plan 2030, which aims at achieving a 75% total and 20% rural electrification rates by 2030. Concerning rural electrification, the Rural Electrification Master Plan aims at electrifying 660 localities through grid extension, but also isolated diesel and mini-hydro grids.

One of the main objectives of the government is to achieve financial stability. For instance, over the last years the Government has sharply reduced subsidies on kerosene and gas used for industrial purposes. Seemingly, Cameroon has set one of the highest electricity tariffs in Central Africa.

Category <sup>4</sup>		Range	€/kWh
LV		<110 kWh	0.08
		>801 kWh	0.15
Public Lighting		Independently of range	0.10
MV	Normal hours	0-200 hours monthly	0.11
		>401 hours	0.09
	Peak hours	Independently of range	0.13
HV		Negotiate on casa by case basis	

<sup>3</sup> You can also access all laws and regulation at the website of the Ministry of Water and Energy ([www.minee.cm](http://www.minee.cm))

<sup>4</sup> For more information: Décision Numéro 0096 of 28 May 2012 de l’ARSEL

Cameroon has also approved special measures with a view to attract private investment to the renewable energy field. For instance, equipment manufacturers benefit from special fiscal measures and import duty reductions. The Rural Energy Fund subsidises studies and investments in rural energy projects up to 80 and 70 % respectively. The Governemnt has foreseen the creation of a new fund (Fonds de Développement du Secteur de l’Electricité).

## DEMAND

In 2010, energy consumption represented 5747 ktoe<sup>5</sup>, of which 70% was consumed by households, 16% by transport and 6% by the industrial sector. Wood remains the main energy consumed in the country covering around 72.6% of the total energy consumption. Cameroon’s wood biomass demand grows nearly at the same pace of the total energy demand (2.4%/year). In spite of being in continuous decline since the mid 1980s, demand for oil products remains the second largest (20%). For instance, it is estimated that kerosene lamps are used for lighting by two-thirds of the rural population and 10% of the urban population.

Although increasing, electricity only represented 7.3% of the total energy consumption in 2010. During the period 2005-2011, the country’s electrification rate increased from 49.7% to 57% thanks to the Government’s efforts on extending and densifying the grid. Notwithstanding, while the Government’s focus on grid electrification has had positive effects in urban areas, rural electrification rates stand at 19% having slightly regressed since 2005.

In 2010, Cameroon’s total electricity end-use stood at 4,863 GWh. The residential sector represented only 20% of electricity end-use (986 GWh). The industry remained the largest power consumer in Cameroon with 2,781 GWh in 2010, particularly the aluminium (48%) and extractive sectors (18%). Nonetheless, due to regular power outages many industries have invested in diesel generators for self generation.

<sup>5</sup> For a full profile of structure of final energy consumption, please refer to SIE Cameroon 2010

Although the share of self-produced electricity (9,480 MWh) is than the interconnected electricity consumption (986,485 MWh), grid connected electricity only represented 12% of the bill, while self-generation represented 18% of the total. This can be explained by the higher costs for off-grid thermal generation (746 FCFA/kWh) than for grid connected electricity (69 FCFA/kWh).

## SUPPLY

In 2010, total electricity production represented 5,834 GWh with a total installed capacity of around 1925.86 MW. Cameroon has an on-grid total installed capacity of around 1323.96 MW, of which approximately two thirds is hydropower and the rest is thermal (604.96 MW). Cameroon's hydropower installed capacity has not varied widely since the early 2000s. Cameroon counts with three large scale hydropower plants with a total capacity of 719 MW which consists in three plants; Song Loulou (384 MW), Edéa (263 MW) and Lagdo (72 MW) combined with three upstream reservoirs on tributaries to the Sanaga river (Mbakaou, Mape, Bamendjin) with a total storage capacity of 7.6 billion cubic meters. In 2011, hydropower plants produced 73% of the total electricity, while thermal power plants produced 10%. The declining demand for thermal power can be explained by its higher generation costs.

In 2010, additional 586 MW of thermal capacity were installed for self-generation, of which 562 MW are onshore and 24 MW are offshore. Self-producers owned around 37% of the total installed capacity and produced 17% of the electricity. Biomass is also used for self generation by agro-industries such as SODECOTON, SOCAPALM, CDC and SOSUCAM in the cotton, palm-oil and sugar sectors which use residues for self-cogeneration with a total power output of approximately 88 GWh per year. 3.8% of households also have gensets for self-generation. The share of gensets amongst rural households increases up to 6.1% compared to only 1.7 of households in urban areas.

Furthermore, there are 26 isolated diesel grids with a total installed capacity of 15.3 MW and a total power output in 2011 of 42,765 MWh. A number of

micro- and pico-hydropower projects with a total installed capacity of 515.5 kW have also been developed by Action pour un Développement Équitable, Intégré et Durable (ADEID)<sup>6</sup>. In spite of the country's high solar potential, there is only evidence of a solar mini-grid developed by Global Village Cameroon (GVC) in the rural area of Ngan-ha with an installed capacity of 9.5 kW to electrify 75 households as well as public buildings. Cameroon has a few areas where wind can be exploited at a commercial level. A locally manufactured small wind turbine has been installed in Bandzeng, village located in the department of Bui, which registers wind speeds of 10 m/s, the only region where high speed winds have been registered.

Type	Source	Capacity (MW) <sup>7</sup>
On-grid	Hydro	<b>719</b>
	Thermal	<b>604.96</b>
Self-gen <sup>8</sup>	Thermal	<b>586</b>
Off-grid <sup>9</sup>	Thermal	<b>15.3</b>
	Hydro	<b>0.5</b>
	Solar	<b>0.1</b>
<b>TOTAL</b>		<b>1925.86</b>

Cameroon's network has an extension of 28,720 Km and relies upon three interconnected systems:

- The Southern Interconnected Grid (SIG), 225 kV network connecting the major hydropower stations to the aluminium industry (ALUCAM) and Yaoundé and Douala, main consumption areas. The system is doubled by the former 90 kV system. On the West, there is a 90 kV spur to Bafoussam and Bamenda. A shorter 90 kV spur is supplying Mbalmayo on the east.
- The Northern Interconnected Grid (NIG), the grid is based on a 110 kV and 90 kV structure dispatching the power generated by Lagdo power station sufficient to cover for the region's modest demand.

<sup>6</sup> Please refer to EUEI-PDF 2013 or the authors of the paper for more information on the off-grid installed capacity.

<sup>7</sup> Please refer to EUEI-PDF 2013 or the authors of the paper for more information on the off-grid installed capacity.

<sup>8</sup> There are as well biomass-to-power plants with an unknown installed capacity.

<sup>9</sup> The team could not find the exact capacity of the small wind turbine

- The Eastern Interconnected Grid (EIG), low voltage distribution grid of 30 kV.

After descending considerably during the period 2003-2006, network losses restarted increasing in 2007. In 2010, they stood at 25%, of which 12% were technical and 13% were commercial.

## CHALLENGES

Cameroon's main challenge will be to maintain the balance between supply and demand over the next years. Improving the state of the grid will be key to reduce losses. Furthermore, the grid does not have enough capacity to feed the highly densified areas at an adequate voltage without back-up from the on-grid thermal plants.

In spite of the well established power sector framework, there is still a lack of adequate regulation and institutional setting for the off-grid, renewable energy and energy efficiency sectors. The government is currently working on a specifically dedicated text for renewable energies and another on energy efficiency.

## POWER SECTOR EXPANSION PLANS AND RENEWABLE ENERGY POTENTIAL

Only 5% of Cameroon's hydropower potential has been exploited. As a result, the Government has planned to install additional 720 MW by 2020<sup>10</sup>. Future large hydropower plans include: the construction of the Lom Pangar reservoir that will add generation capacity to Song Loulou and Edéa plants. Sustained yearly flow will increase to 1000 m<sup>3</sup>/s and guarantee hydro generation up to 600 MW. The Lom Pangar power station (30 MW) is also scheduled to supply the EIG and commissioning should take place by 2017. New hydropower projects are in the pipeline (Nachtigal, Song Mbengue, Kikot, Bini Warak, etc.). AES-SONEL is also currently working with SIEMENS on a more sophisticated water management modelling software which should improve the productivity of the Sanaga river basin.

The Government is also implementing interventions that will strengthen and extend Cameroon's network. These interventions are supported by donors such as the African Development Bank and are aimed at attracting new investment in the sector. Seemingly, the EUEI-PDF is also supporting the establishment of a bill on energy efficiency that creates an enabling investment environment.

Cameroon has an average solar irradiation ranging from 4.5 kWh/sq m/day in the south to 5.74 kWh/sq. m/day in the north. A Lighting Africa market study estimates that there are around 4.9 million households in Cameroon who remain un-electrified, 2.4 million are located in rural areas and 2.5 million in urban areas. It is expected that the majority of urban households without access to electricity will be electrified through the grid while about 20% of rural households will be electrified through off-grid systems. There is as well a big commercial niche of businesses and public centers that remain un-electrified. In 2008, the 65% of the schools and 68% of health centers remained un-electrified<sup>11</sup>.

Some wind assessments have already been carried out by ECOVALEN, but the country's wind potential remains largely un-explored. According to available data, wind potential is only present in the western part of the country. The department of Bamboutos registers wind speeds of 6.65 m/s and would have the capacity to host three wind fields with a total cumulative installed capacity of 14 MW.

Cameroon's potential to produce electricity from biomass residues is estimated at 1,072 GWh, of which 700 GWh could be exported to the grid. Seemingly, local agro-industries have planned several cogeneration projects. SFID, company located in Mbang, has a cogeneration project of 2 MW, including 500 kW for rural electrification. The SIM company located in Yaoundé processes 100,000 m<sup>3</sup> per year of biomass and generates about 30% wastes in the form of saw dust which could feed a cogeneration plant of about 1.5 MW. Excess would be sold to the grid. In addition, there is potential for off-grid cogeneration from small rice and sawmills in

<sup>10</sup> For a list of projects, please refer to MINEE 2011

<sup>11</sup> Please, refer to Lighting Africa 2012 for concrete recommendations for the pico-PV sector.

remote areas. There is also big potential to produce palm oil to be used as biofuel.

<b>Institutions</b>	<b>Role</b>
<b>Ministère de l'Eau et de l'Energie (MINEE)</b>	Policy formulation and implementation and monitoring
<b>Agence de Régulation du Secteur de l'Electricité (ARSEL)</b>	Under MINEE, monitoring and implementing of national electrification programmes and energy sector regulation
<b>Agence d'Electrification Rurale (AER)</b>	Technical and financial assistance to rural operators and end-users, inc. management of Rural Energy Fund.
<b>Electricity Development Corporation (EDC)</b>	Established in 2006, state owned company responsible for managing the public power infrastructure.
<b>Electricity transmission management company <i>To be established.</i></b>	Management of transmission network. Meanwhile, AES SONEL acts as acting management company.
<b>Agence pour la Promotion et la Rationalisation de l'Usage Energétique <i>To be established.</i></b>	Body in charge energy efficiency measures.
<b>AES SONEL</b>	Concessionary of the public sector. Privatised in 2001 when a US based company AES Corp took 56% stake.
<b>Laboratoire de la Recherche Energétique</b>	Under the Ministère de la Recherche. Research on renewable energies.
<b>Private operators</b>	Kribi Power Development Company (KPDC) – AES-SONEL subsidiary; Mekin Hydroelectric Development Corporation (Hydro-Mékin); Dibamba Power Development Corporation (DPDC); and AGGREKO
<b>Donors</b>	AFD, GIZ, JICA, WB, AfDB, EU, UNDP, UNIDO and IFC (Lighting Africa)

## REFERENCES

Lighting Africa, “Lighting Africa Policy Report Note – Cameroon”, 2012, IFC and WB

Ministère de l'Eau et de l'Energie, “Situation Energétique du Caméroutn - Rapport 2011 », Mai 2011, SIE-Afrique and IEPF

EUEI-PDF and ARSEL, “Development of a National Energy Efficiency Policy, Strategy and Action Plan in Cameroon – Inception report”, 2013

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