
Energy Situation Report – West Africa

West African countries together form a part of the Economic Community for West African States (ECOWAS). ECOWAS comprises of 15 countries in the region with a total population in excess of 340 million. In 2011, an estimated average of 60 % of the total population resided in rural areas

ECOWAS Region - Key Statistics

Area	5,112,903 km ²
Density	49.2 / km ²
Population	340 million
Total Available Generation	10,000 MW
Average Electricity Access	70 %

(Source: Adeyemo, 2014)

Current Energy Situation Overview

Without considerable investment- energy poverty and its profound economic and societal consequences will continue to be a challenge for West Africa in 2030 (Vilar, 2012). The region - with a total population in excess of 340 million - has one of the lowest modern electricity consumption rates in the world. Electricity access rates in the region vary from below 20 % in countries like Liberia, Sierra Leone, Niger and Burkina Faso to more than 50 % in Senegal and more than 70 % in Ghana. In Nigeria, the largest country in West Africa, it has been estimated that 96 million people - 55 % of the population - do not have access to electricity (WEO, 2015). For the ECOWAS region as a whole, only 19 % of the rural population has access, with this predominantly being in larger rural centres and some localities (Vilar, 2012). Poor electricity access in the region is due to a variety of regulatory, social, economic, technical and financial constraints such as insufficient generation, high prices of petroleum, lack of financing, and transmission and distribution losses (Dramé 2014).

Traditional biomass, mainly for cooking, represents the bulk of final energy consumption 'reaching up to 70-85 % in some of the countries' (Vilar, 2012). In urban areas, charcoal remains the basic fuel despite efforts to promote LPG, whilst the rural population tends to use firewood in traditional stoves. With increasing population and urbanisation, the use of firewood is having a severe impact on forest and woodland environments, as well as impacting the health and quality of life of rural/urban people, in particular, women and girls (Vilar, 2012).

The lack of access to electricity has serious implications for poverty alleviation in the region. While a substantial portion of the population in these countries has limited access to electricity, there are also endemic power shortages throughout the region, which means that the reliability of electricity supply also remains low. Only three countries i.e. Nigeria, Ghana and Côte d'Ivoire account for more than 80 % of generation and consumption.

West African countries need to improve access to electricity in order to improve the living conditions of people. Over the last few years, there have been efforts to reform the electricity generation and distribution system in the region. These reforms have been primarily aimed at restructuring and privatising the state owned (and usually vertically integrated) public electricity utilities so as to attract much needed private investment in the sector.

Key Challenges for Energy Access in Western Africa

- **Financing:** Private sector investment in electricity in rural areas is limited due to low consumption, influenced by an inability of consumers to pay and the high costs of diesel generation (Vilar, 2012).
- **Affordability:** Urban and rural poor spend proportionately more of their income 'for poor quality energy services than the better-off for better quality services' (Vilar, 2012). Poor households cannot afford high electricity connection charges and rely on kerosene for lighting and on wood fuel, charcoal, and bottled gas for cooking (Eberhard et al., 2011). Even if the grid reaches a rural area, the families may be hard pressed to afford it- making exploring renewable off-grid solutions, all the more important.
- **Energy Security:** Diversification of energy sources is needed: for some countries more than 90 % of electricity generation is from expensive diesel or heavy fuel. (Vilar, 2012). This dependence results in high power generation costs, with much of the fuel having to be imported in the case of the smaller oil importing countries in the region (Vilar, 2012).
- **Reliance on traditional biomass** (firewood and charcoal): Represent the bulk of energy consumption
- Whilst most governments have now set up Rural Electrification Agencies and/or Rural Electrification Funds, the impact of such organisations may be hampered by a **lack of financial/technical expertise** (Vilar, 2012).
- **Drought and conflict:** Drought has seriously reduced the power available to hydro-dependent countries in West Africa - countries with major hydropower installations in affected catchments such as Ghana, have had to switch to expensive diesel power. Furthermore, war has seriously damaged power infrastructure in Liberia and Sierra Leone. Overall, countries in conflict perform worse in the development of infrastructure than countries at peace (Eberhard et al., 2011).

Policy Environment

The ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) was established in July 2010, demonstrating the resolve of ECOWAS member states to improve energy access, energy security, counter climate change and reduce emissions (Vilar, 2012). ECREEE has attained international recognition as a regional renewable energy and energy efficiency (RE&EE) promotion agency (ECREEE, 2014). The activities of the agency cover a range of areas, including: policy development, capacity building, resource assessment, knowledge management, and investment promotion (Vilar, 2012).

There have been several notable achievements by the agency since its formation including:

- In the first call for proposals for the ECOWAS Renewable Energy Facility, 41 projects were approved with an overall volume of €2 million.
- The web-based ECOWAS Observatory for Renewable Energy and Energy Efficiency (ECOWREX) has also been established, providing targeted investment/business information for the private and public sectors.
- The ECOWAS Renewable Energy Investment Initiative (EREI) was also formed to support the development of a renewable energy project pipeline for medium and large-scale projects.

ECOWAS Renewable Energy Policy: ECOWAS member states have recognised that to achieve goals for energy access and energy security there will need to be an increased use of

renewable energy, as well as increasing energy efficiency (Vilar, 2012). This led to the adoption of regional policies for renewable energy and energy efficiency in October 2012 by the ECOWAS energy ministers.

The ECOWAS Renewable Energy Policy (EREP) along with the ECOWAS energy efficiency policy aims to respond to the energy crisis and challenges in the region. They seek to increase use of renewable energy sources, and to help enable, amongst other things, universal access to electricity by 2030 (Vilar, 2012). The EREP aims to be complementary to the West African Power Pool (WAPP) power supply strategy both in terms of contributing to bulk power generation and with regard to achieving universal energy access for rural areas (Vilar, 2012). The EREP is based on five guiding principles:

1. Subsidiarity: ‘The EREP will intervene in regional actions only when they can bring added value to national actions’.
2. Participatory Approach: Involvement of end users in the definition of technical and organisational options – creation of a forum of ‘national stakeholders for the private sector and the civil society together with the national officials from the relevant ministries, utilities and regulatory authorities’.
3. Optimisation of the use of available financial resources: mobilisation will require a mix of public development aid, and national public and private financing, as well as prioritising high impact/low cost solutions.
4. Promoting public-private partnerships: Partnerships to cover technical aspects, management systems, fund-raising and financial risk-taking.
5. Support to Gender Equality: Efforts to be made to mainstream gender issues.

West African Power Pool: In 2000, ECOWAS announced the creation of the West Africa Power Pool (WAPP). The aim of the WAPP is to integrate the various national power systems into a single regional electricity market. Multilateral finance institutions like the World Bank and the African Development Bank are promoting regional integration as it is seen as creating economies of scale, which in turn allow for lower costs across all aspects of infrastructure, including power. Estimates suggest that regional collaboration could reduce electricity costs in Africa by US \$2 billion per annum. Therefore, the WAPP could have a positive impact on both local and regional economic development.

The broader objectives of WAPP are as follows:

- To enhance cooperation among West African countries for developing electricity infrastructures;
- Promote investment in the sector;
- Improve electric system reliability and provide a forum for policymakers to share their views concerning the electricity sector;
- Share the benefits of trade and investment; and
- Agree upon common rules to protect the public and the environment

The WAPP is especially important for countries like Benin, Burkina Faso, Togo and Niger that are dependent on imports for a significant portion of their supply. In the West African Power Pool, Benin, Togo, and Burkina Faso import power from Côte d’Ivoire and Ghana, and Niger imports from Nigeria. WAPP also aims to achieve closer regulatory integration in West Africa. However, despite some success, the overall trading volume in the region remains quite low. Unlike other power pools in Africa, WAPP is also responsible for developing new infrastructure. The WAPP Articles of Association require WAPP to ensure ‘the full and effective implementation of the WAPP Priority Projects.’ (Eberhard et al. 2011).

The WAPP Executive Board is responsible for developing a regional transmission and generation master plan. Within the WAPP Secretariat, the Secretary General negotiates directly with donors to finance feasibility studies for new projects and subsequently secures grant financing for feasible projects. WAPP has already obtained funding for feasibility studies from several donors, including the World Bank and the U.S. Agency for International Development (Eberhard et al. 2011).

In 2005, WAPP became a specialised agency of ECOWAS and this reinforced the organisation's autonomy. In 2007, the heads of state of member countries announced the establishment of an overarching Energy Protocol to promote investor security and to open access to national transmission grids across the region. In 2008, the ECOWAS Regional Electricity Regulatory Authority was also established to regulate cross-border electricity exchanges in the region (Eberhard et al. 2011).

A project titled Commercial Reorientation of the Electricity Sector Toolkit (CREST) is being deployed as an experiment in several areas that are served by West African electricity providers (Eberhard et al. 2011). The CREST approach is bottom-up and is aimed at addressing systems losses, low collection rates and poor customer services (Eberhard et al. 2011).

Off-Grid trends

Off-grid solutions represent an important source of access to electricity in rural areas, especially in those areas that are located at a considerable distance from the power grid. Projections by the IEA suggest that by 2040, 70 % of the electricity in rural areas will be provided through these sources (IEA, 2014). For example, the new projects in wind and solar established by independent power producers in Cape Verde could be indicators of change in the off-grid energy situation in the region (Vilar, 2012).

West Africa is proving to be 'fertile ground' for pay-as-you-go solar (PV-tech, 2015). For example, the Ghana-based pay-as-you-go solar firm PEG recently raised \$3.4 million for the expansions of its presence in the country. The firm focuses on rural, remote communities and aims to install 500,000 systems in West Africa over the next five years. PEG targets those households earning \$1-10 per day – offering systems for \$0.5 per day for a year, which can be paid for my mobile money, after the year point customers own their systems outright (PV-tech, 2015). Functions of the solar technology include lighting, mobile phone charging and a radio. Where there are adequate resources available, small hydro and wind projects can also compete with solar PV in off-grid/mini grid applications (IEA, 2014).

SOURCE: IEA, World Energy Outlook 2015

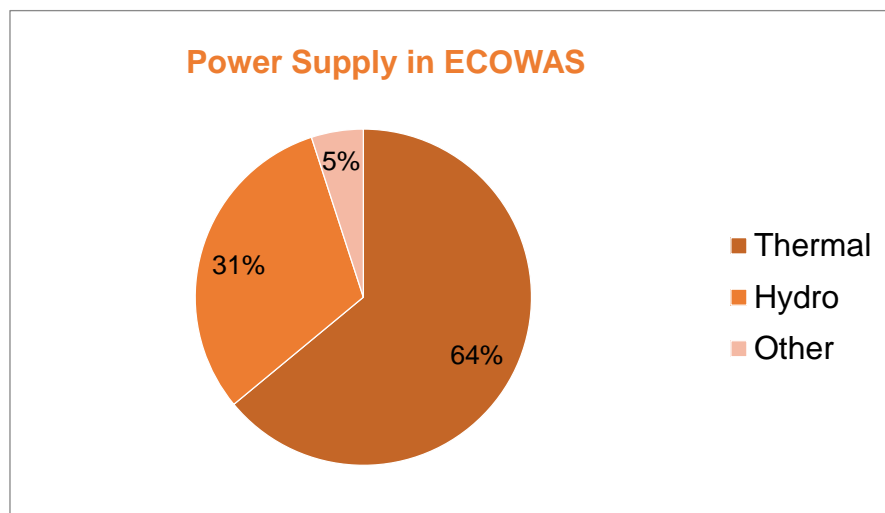
Electricity access in Africa - 2013

Region	Population without electricity millions	National electrification rate %	Urban electrification rate %	Rural electrification rate %
Africa	635	43 %	68 %	26 %
Sub-Saharan Africa	634	32 %	59 %	17 %
Benin	7	29 %	57 %	9 %

Burkina Faso	14	17 %	56 %	1 %
Cabo Verde	0	94 %	100 %	84 %
Côte d'Ivoire	15	26 %	42 %	8 %
Gambia	1	36 %	60 %	2 %
Ghana	7	72 %	92 %	50 %
Guinea	9	26 %	53 %	11 %
Guinea-Bissau	1	21 %	37 %	6 %
Liberia	4	10 %	17 %	3 %
Mali	11	26 %	53 %	9 %
Niger	15	15 %	62 %	4 %
Nigeria	96	45 %	55 %	37 %
Senegal	6	55 %	90 %	28 %
Sierra Leone	6	5 %	11 %	1 %
Togo	5	27 %	35 %	21 %

Country Statistics

Energy mix: Electricity generation across West Africa remains heavily dependent on fossil fuels and estimates suggest that oil and gas account for a substantial portion of the total generation capacity, especially in oil rich countries like Nigeria. Increases in the installed thermal capacity in the region took place in the 1990s. Renewable sources of energy like hydropower account for only 20 % of the total installed capacity, but provide a larger portion of actual generation- the power supply split for the region is shown in the chart below (Adeyemo, 2014). The high share of fossil fuels in the energy mix results in high generation costs. In 2012, grid-based capacity in the region was estimated to be around 20,000 MW (IEA, 2014). Another issue is the low level of per-capita demand in the region. It is estimated that per-capita demand will increase from 153 kWh to 235 kWh by 2020. However, this is much lower than the 2009 global average of 2,730 kWh.



Renewable Energy in the region

The ECOWAS region is endowed with substantial renewable energy resources, with renewable energy technologies approaching grid parity in certain circumstances. ECOWAS member states recognise that achieving the goals for energy access and energy security will mean not only increased efficiency in the use of energy but the increased use of renewable energy (Vilar, 2012).

Renewable energy potential

- Wind potential is concentrated in coastal zones of Cape Verde, Senegal, The Gambia, and possibly Ghana, Mali and Nigeria.
- Potential for micro-hydro schemes is found particularly in Cote d'Ivoire, Ghana, Guinea, Guinea-Bissau, Liberia, Togo and Sierra Leone.
- Solar resource is abundant in northern regions such as Niger, Burkina Faso, Mali and the north of Ghana and Nigeria.
- Except for Cape Verde and the Sahelian areas of Mali, Burkina Faso and Niger, there are substantial biomass resources.

Cape Verde has been a pioneer in prioritising renewable energy. It aims for 100 % electricity generation by renewable energy sources by 2020 and has taken a number of steps towards implementation e.g. grid-connected wind farms and solar PV plants (Vilar, 2012).

The institutional, regulatory, legal, tariff structure and frameworks for renewable energy is 'largely non-existent or weakly implemented' in the region (Vilar, 2012). Of the total investment of €1.92 billion for the ECOWAS energy sector, only 5 % is accounted for by renewable energy, and Independent Power Producer (IPP) investment is 3.5 %. Except for in Cape Verde, Ghana and Nigeria 'there are no regulatory authorities dealing with renewable energy' (ibid.).

Senegal, Ghana, Mali, Liberia, Guinea and Nigeria have developed detailed renewable energy policies, with Ghana and Senegal passing a renewable energy law (Vilar, 2012). The Gambia also validated its draft renewable energy law in December 2012. Furthermore, Liberia, Mali and Senegal have adopted ambitious renewable energy targets of 30 %, 25 % and 15 % (installed capacity) respectively by 2021, and Ghana and Nigeria 10 % by 2020 (ibid.)

There are five countries that currently have no defined renewable energy targets: Guinea-Bissau, Burkina Faso, Sierra Leone, Togo and The Gambia. However, these countries are actively developing renewable energy projects. For example, in Burkina Faso (PV and biofuels), Togo (wind) and Sierra Leone (Small-scale hydro) and The Gambia (wind and biofuels) (ibid.).

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