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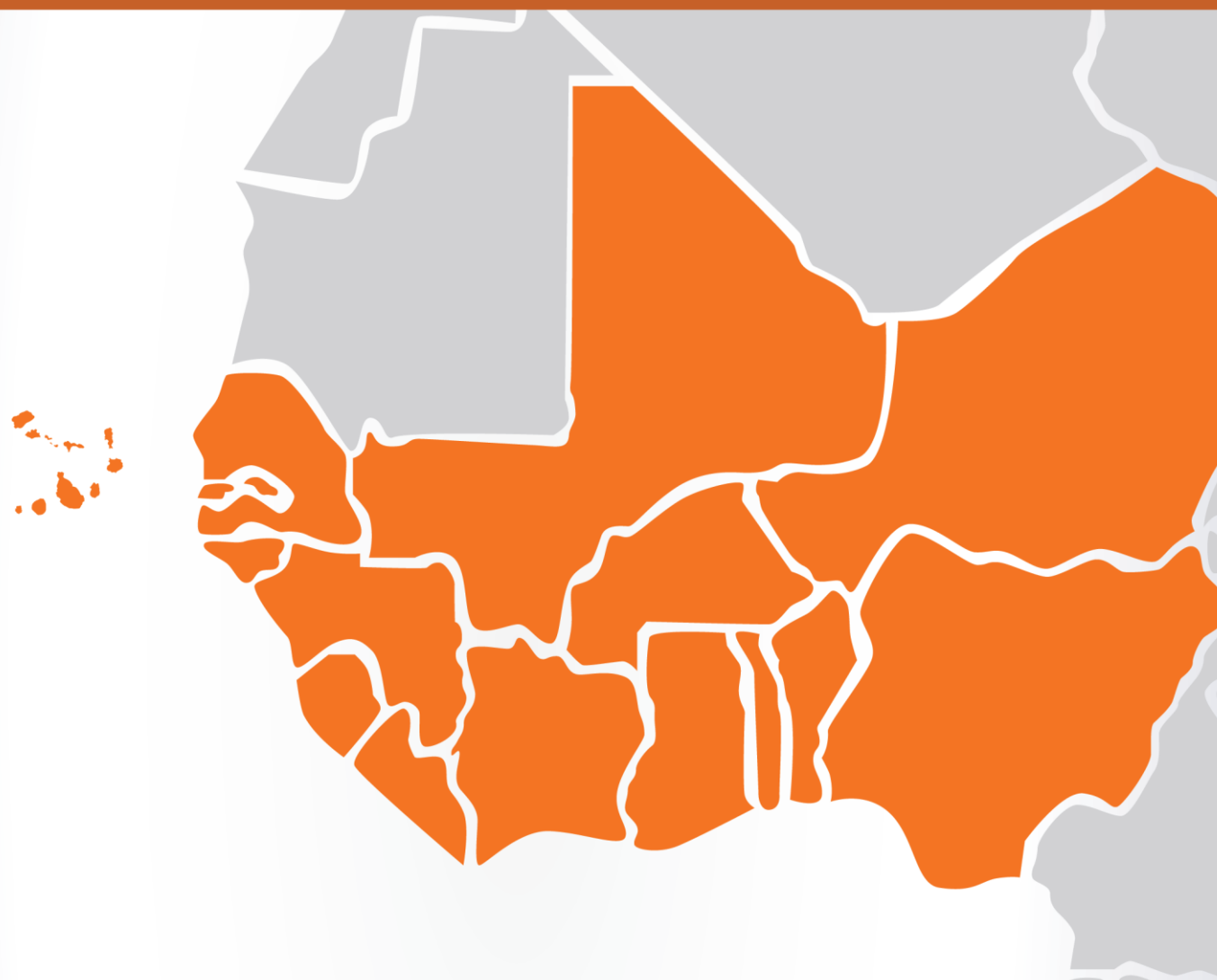
REGIONAL PROGRESS REPORT ON RENEWABLE ENERGY, ENERGY EFFICIENCY AND ENERGY ACCESS IN ECOWAS REGION

MONITORING YEAR: 2018



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ECOWAS CENTRE FOR RENEWABLE ENERGY AND ENERGY EFFICIENCY
CENTRO PARA AS ENERGIAS RENOVÁVEIS E EFICIÊNCIA ENERGÉTICA DA CEDEAO
CENTRE POUR LES ENERGIES RENOUVELABLES ET L'EFFICACITÉ ENERGÉTIQUE DE LA CEDEAO

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ABBREVIATIONS

AEME	Agence pour l'Économie et la maîtrise de l'énergie du Sénégal
AfDB	African Development Bank
AFREC	African Energy Commission
AMADER	Agence Malienne pour le Développement de l'Energie Domestique et l'Electrification Rurale (Mali)
CEMG	Clean Energy Mini-Grid
CFL	Compact Fluorescent Light (bulbs)
ECOSHAM	ECOWAS Standards Harmonization Model
ECOWAS	Economic Community of West African States
ECOWREX	ECOWAS Observatory for Renewable Energy and Energy Efficiency
ECREEE	ECOWAS Centre for Renewable Energy and Energy Efficiency
EE	Energy Efficiency
EEEP	ECOWAS Energy Efficiency Policy
ELECTRA	Empresa de Electricidade e Água, SA
EREP	ECOWAS Renewable Energy Policy
EU	EU
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (Germany)
GOGLA	The Global Off-Grid Lighting Association
GW / GWh	Gigawatt / Gigawatt hour
HV	High Voltage
ICS	Improved Cook-Stoves
IEA	International Energy Agency
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency
kW / kWh	Kilowatt / Kilowatt Hour
LBC	Lampes de Basse Consommation
LCL	Low Consumption Lights
LED	Light Emitting Diode
LMSH	Large and Medium Scale Hydropower
LPG	Liquefied Petroleum Gas
LV	Low Voltage
MCA-Benin II	Millennium Challenge Account - Benin II
MEPS	Minimum Energy Performance Standards
MoE	Ministry of Energy

MV	Medium Voltage
MW / MWh	Megawatt / Megawatt hour
NEEAP	National Energy Efficiency Action Plan
NERC	Nigerian Electricity Regulatory Commission
NESP	Nigerian Energy Support Program
NIGELEC	Société Nigerienne d'Electricité
NREAP	National Renewable Energy Action Plan
PERACOD	Program for the promotion of renewable energy, energy efficiency and access to energy services
PPA	Power Purchase Agreement
PRODERE	Programme Régional de Développement des Energies Renouvelables et de l'Efficacité Energétique
PV	Photovoltaic
RE	Renewable Energy
REAs	Rural Electrification Authorities
SEforALL	Sustainable Energy for All
SENELEC	Société Nationale d'Électricité du Sénégal
SHS	Solar Home System
SHP	Small Hydro Power
SME	Small and Medium sized Enterprise
SWH	Solar Water Heaters
ToR	Terms of Reference
UEMOA	Union Economique et Monétaire des Etats de l'Afrique de L'Ouest
UNDP	United Nations Development Program
WAPP	West African Power Pool
WB	World Bank

DEFINITIONS

Electricity access: Access to electricity is the share of households with electricity supplied by electricity grid (national grid and mini-grids), and the share of households with electricity supplied by stand-alone renewable energy systems. Conventional stand-alone systems such as diesel or petrol generators contribute also to provide access to electricity, but these are not taken into in this report.

Energy-efficient building: An energy-efficient building is defined as a building that is designed and built in a way that minimizes demand for and consumption of energy/electricity for cooling. Buildings considered are old and new public buildings with a total useful area over 500 m2 having at least one energy audit conducted.

Household: A household is defined as a person or group of persons who normally live and feed together, and recognize a particular person as the head.

Improved cook-stove: An improved cook-stove is characterized by having a particular feature that reduces the amount of wood, charcoal, animal or crop residue used by the cook-stove. Their use in developing countries is been promoted based on two main advantages: reducing the negative health impacts associated with exposure to toxic smoke from traditional stoves (women and children are generally more affected) and reducing the pressure placed on local forests.

Losses in electricity supply: losses during electricity supply refers to the amounts of electricity injected into the transmission and distribution grids that are not paid by users. Total losses have two components: technical and non-technical. Technical losses occur naturally and consist mainly of power dissipation in electricity system components such as transmission and distribution lines, transformers, and measurement systems. Non-technical losses are caused by actions external to the power system and consist primarily of electricity theft, non-payment by customers, and errors in accounting and record keeping. These three categories of losses are sometimes referred to as commercial, non-payment and administrative losses respectively, although their definitions vary in the literature.

Medium and large hydro: According to the ECOWAS Small Scale Hydropower Program, medium and large hydropower plants are defined as hydropower plants with a capacity exceeding 30MW.

On-grid lights: On-grid lights are defined as lights connected to the national grid or mini-grids.

Penetration rate of efficient lights: penetration rate of efficient light is defined as the number of efficient lights sold or installed as a share of the total number of lights (efficient + inefficient) sold or installed.

RE mini-grid, hybrid mini-grid (or Clean Energy Mini Grid - CEMG): it is defined as a mini-grid where at least 10% of the total installed capacity is RE-based.

Small Hydropower Plants: according to the ECOWAS Small Scale Hydropower Program, small hydro plants are defined as hydropower plants with installed capacity between 1 and 30MW.

Stand-alone renewable energy systems: they are defined as off-grid RE systems for lighting and powering electric appliances. These should provide at the minimum, electricity services such as lighting and phone charging (tier 1 of the SEforALL multi-tier framework for access to electricity).[1] This excludes solar lamps that are for lighting only.

[1] Further information: World Bank/IEA (2014): SEforALL Global Tracking Framework.

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EXECUTIVE SUMMARY

This report is the third regional progress report within the framework of the Regional Monitoring and Reporting for the ECOWAS Renewable Energy and Energy Efficiency policies and the Sustainable Energy Country Action Plans (abbreviated as Regional Monitoring Framework).

In 2018, only 52.3% of the ECOWAS population had access to the electricity grid, which makes a concrete case for promoting the deployment of off-grid systems such as mini-grids and stand-alone technologies. These technologies will help to increase electricity access, in order to attain the 65% regional access target by 2020.

Medium and large hydropower plants play a significant role in the region's electricity supply. With more than five gigawatts of installed capacity, they contributed approximately 26.8% of electricity generated in 2018. Grid-connected renewable energy (small hydropower, solar PV, wind and biomass) contributed 2% of installed capacity. This goes to show that more effort is required in the short term to achieve the target of 10% by 2020.

About 2.5% of the rural population had electricity access provided by decentralized renewable energy solutions such as Clean Energy Mini-Grids (CEMGs) and Solar Home Systems (SHS). The number of existing CEMGs was short compared to the target of 60,000 CEMGs to be installed by 2020. Even though several donor projects contributed to increase electricity access by providing SHS and the fact that 2018 represented a relevant year for fundraising for the West Africa off-grid solar sector, the percentage of 2.5% fell far from the regional target of 2020, which establishes a share of rural population served by these type of systems to 22%.

Efforts are ongoing at various sectors towards improving the institutional and legislative framework in order to increase the rate of energy efficiency. These improvements include, for example, in the domestic sector - promotion of efficient lighting and efficient electrical appliances; in the public and industrial sectors - energy efficiency improvements in public lighting, public buildings, energy efficiency in industrial processes; and the electricity sector - reduction of losses in transmission and distribution networks.

As electricity generation capacity increases, reducing the technical losses[2] in transmission and distribution networks is increasingly important. Although network losses have been decreasing overtime, 36% of the electricity produced was lost in the ECOWAS region, amounting to 26,207 GWh in 2018. This gap is far from the set target of 10% for 2020.

Some member states have not been able to provide quantitative data for some particular indicators. For example, data about penetration rate of improved cookstoves (ICS) in the region cannot be precisely estimated. This is because the relevant framework and processes are not yet in place in the member states, to help collect and access the penetration rate of such systems. The same applies to energy efficiency indicators such as the market share of energy-efficient appliances. Where no quantitative data was available, qualitative analysis was used.

The individual countries and the region at large requires regular updates on renewable energy, energy efficiency and energy access in order to make effective decisions when planning. This Progress Report serves as an important tool for policy makers and other stakeholders by providing annual snapshots and trends along the three axes[3] covered.

[2] Technical losses occur naturally and consist mainly of power dissipation in electricity system components such as transmission and distribution lines, transformers, and measurement systems. Non-technical losses are caused by actions external to the power system and consist primarily of electricity theft, non-payment by customers, and errors in accounting and record keeping.

[3] Renewable Energy, Energy Efficiency and Energy Access

1 INTRODUCTION

The ECOWAS ministers in charge of energy have expressed their willingness to work towards the achievement of the SEforALL targets. In October 2012, they mandated the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) to co-ordinate and implement the SEforALL initiative. In July 2013 the ECOWAS Heads of State adopted the ECOWAS Renewable Energy Policy (EREP) and the ECOWAS Energy Efficiency Policy (EEEP). A summary of the main targets in both policies are presented in Table 1 below.

Table 1: Main targets for ECOWAS region contained in EREP and EEEP

RENEWABLE ENERGY	**2020**	**2030**
Installed renewable energy capacity (excl. medium and large hydropower)	2,425 MW	7,606 MW
Renewable energy power generation (excl. medium and large hydropower)	8,350 GWh	29,229 GWh
Renewable energy in electricity mix (excl. medium and large hydropower)	10%	19%
Renewable energy in electricity mix (incl. medium and large hydropower)	35%	48%
Share of (rural) population served with off-grid renewable energy systems	22%	25%
Ethanol as share of petrol consumption	5%	15%
Biodiesel as share of diesel and fuel-oil consumption	5%	10%
Improved cook stoves penetration	100%	100%
Use of modern fuel alternatives for cooking *e.g.* liquefied petroleum gas (LPG)	36%	41%
Solar water heaters • Residential homes – new detached house price exceeding 75,000 Euros (EUR) • Social institutions • Agro-food industries • Hotels	 At least 1 per house 25% 10% 10%	 At least 1 per house 50% 25% 25%
ENERGY EFFICIENCY	**2020**	**2030**
Implement energy efficiency measures that free up 2,000 MW of power generation capacity	Measures implemented	Not specified for 2030
Distribution losses in 2020	10%	Not specified for 2030
Penetration rate of efficient bulbs	100%	100%
Energy efficiency in public buildings larger than 500 square metres (m^2) (new or renovation): implement energy efficiency measures and issue energy performance certificate	100%	100%

Source: EREP, EEEP

Between 2014 and 2015, following the adoption of the regional policies, all ECOWAS member states developed their National Renewable Energy Action Plans (NREAPs), National Energy Efficiency Action Plans (NEEAPs) and SEforALL Action Agendas[4], with support from ECREEE. Implementation of these plans is expected to contribute towards achieving the regional targets. In other words, the aggregated targets of each ECOWAS country as expressed in the Sustainable Energy Country Action Plans mainly aligns with the regional targets declared in EREP and EEEP. At regional level, the electricity access target expressed through the SEforALL Action Agendas

[4] Collectively referred to as the Sustainable Energy Country Action Plans
ECREEE (2017).

translates into approximately 90%. This corresponds to approximately 440 million people and needs to be viewed in the context of the declared universal electricity access goal.

The Sustainable Energy Country Action Plans are based on templates validated by the member states. The Regional Monitoring and Reporting Framework was validated at the ECOWAS Sustainable Energy Workshop held in Dakar in April 2016, and adopted at the 11th Meeting of the ECOWAS Energy Ministers held in Conakry, Guinea, in December 2016.

In the resolution that adopted the framework, all member states were required to nominate national focal persons that is responsible for compiling and submitting annual national monitoring reports to ECREEE. These reports should present the most recent updates on achievement of the targets in their NREAPs, NEEAPs and SEforALL Action Agendas. They should also contain a summary of the main activities implemented in pursuance to the achievement of the targets during the previous year. It is on the basis of these national reports that ECREEE annually assess the status of implementation of the regional policies.

2 OBJECTIVE, METHODOLOGY AND DATA COLLECTION

The main objective of this report is to provide an assessment of renewable energy, energy efficiency and energy access in the ECOWAS region at the end of 2018. It also, in comparism with the set targets for 2020 and 2030 identify the gaps and trends as at 2018.

To assess the 2018 regional profile and track the progress along the three axes, data was collected from the 15 ECOWAS member states. The National Monitoring Report template was sent to the focal person in each member states and with support from ECREEE, they were validated. These validated reports were consolidated into the regional progress report.

Two main types of data were collected; (i) quantitative data, such as the installed generation capacity or the population size, and (ii) qualitative data generated by surveys, such as the market penetration rate of efficient lighting or ICS. Wherever possible, primary data sources took precedence, but secondary sources were considered in circumstances where there was insufficient data. Examples include data from international organisations or reports published by other credible third-party institutions.

Each national focal person used the national statistical services to report about demographic data such as population size, number of households and average household size. Data for installed electricity capacity and electricity losses were obtained from utilities, regulators or ministries. Similarly, data on electricity generation capacity was primarily supplied by the utilities. Where necessary, data published by government institutions was preferred, such the Ghana and Nigerian Energy Commission and Nigerian Electricity Regulatory Commission (NERC) reports.

Data on electricity access was collected from the national utilities and mini-grid operators, as well as national censuses developed by the national statistics offices. These censuses are considered credible sources of information and cover the entire population of a given country. In general, the number of households served by the grid shown in the census does not match the number of connections to the grid. It would therefore be unrealistic to only count the number of customers connected to the electricity grid as those having access to electricity. The values reported in this report are very much in line with those reported by the International Energy Agency (IEA).[5]

[5] IEA (2018).

Clean cooking access was measured in terms of share of households using ICS and alternative fuels such as LPG. The use of alternative cooking fuels is usually included in censuses, which normally contain a question on primary household cooking fuel. In contrast, the censuses do not explicitly cover ICS. This means any available data is not a representation of the entire population and in many cases is only an estimate. To assess the ICS market, information from relevant distribution initiatives was collected along with related sales figures. Such data does not directly indicate the usage of ICS, which is a disadvantage. In addition, the framework mandates reporting on only ICS units with a minimum efficiency of 35%.[6] These data collection methods meant it was not possible to discern the minimum efficiency of ICS units.

The reports aim to monitor the electricity access at household level served by renewable energy stand-alone systems. Therefore, no information is provided regarding the installation of such systems in public institutions such as universities, schools and health centers. It is the task of Rural Electrification Authorities (REAs) or private operators and companies to collect data on off-grid electrification. ECREEE requested from each focal person, information on the number of stand-alone renewable energy systems distributed or sold and the share of households with electricity access served by renewable energy stand-alone systems. Alongside the efforts of each focal person, ECREEE tried to obtain the same kind of information from different sources including donor reports and distributors or installers.

Data on the number of clean energy mini-grids (CEMGs) in the region came mainly from the REAs, private operators, donors, national directorates of energy and national Energy Information Systems.

In most countries, it was not possible to quantify the penetration rate of energy-efficient lights. Information was collected from reports of initiatives undertaken by various actors as well as sales of energy-efficient lights in individual countries. In addition, this report provides updates on initiatives launched by governments (e.g. legislation banning incandescent lamps, introduction of standards and labels). These updates keep each country accountable to ensure it meets regional and national goals. In a similar manner, energy-efficient buildings were identified and recorded, but not substantial enough for comparism within the region.

The same applied to SWH systems – another market segment lacking in facts. Given that the ECOWAS member states do have system for registering SWH sales and installations, the only data available came from relevant projects that cited in this report. A similar reporting and data collection approach was also used for biofuels production in the region. Finally, secondary data sources were used to compile information on industries that have implemented energy efficiency measures, because data from the primary sources are lacking.

[6] EREP defines “improved cookstoves” as fuelwood or charcoal stoves with a minimum efficiency of 35%.

3 STATUS OF ENERGY ACCESS, RENEWABLE ENERGY AND ENERGY EFFICIENCY IN THE ECOWAS REGION

3.1 Energy access

Access to energy is based on electricity access and use of modern cooking solutions. Electricity access is considered as connections either to the national electrical grid (interconnected and isolated utility grids), Clean Energy Mini-Grids (CEMGs) and to stand-alone renewable energy systems. The indicators used to monitor electricity access includes share of households connected to electrical grid, share of households connected to CEMGs[7] and share of households served by stand-alone renewable energy systems.

Access to modern cooking solutions is measured according to share of households using efficient cookstoves and alternative cooking fuels.

3.1.1 Access to electricity

Access to electricity is calculated as the share of households and population with electricity supplied by the national electricity grid (interconnected and isolated utility grids), CEMGs, and by renewable energy stand-alone systems.[8] In theory, aggregating all these types of access should provide each country's total rate of access to electricity.

3.1.2 Access to electricity grid

The regional target for electrification access in terms of population is 65% by 2020.[9] In 2018, the overall population of the ECOWAS region was approximately 376 million people living in 68 million households. According to the World Bank,[10] 54% of the population live in rural areas, while 46% live in urban areas. The average household size varies by country. Cabo Verde shows the lowest value at 3.5 people per household while Mali comes highest at eleven people per household.

Just over half the population (52.3%) and 54.2% of households had access to an electrical grid, which represents no increase compared to 2017.[11] Even though an increase is observed in some countries such as Côte d'Ivoire, The Gambia, Ghana, Senegal, Sierra Leone and Togo (ECREEE 2019), the fact that the number of the population could increase faster as compared to electricity access. And the lack of updated national household surveys in countries like Nigeria, could explain why the regional electricity access has not increased from 2017 to 2018.

The different population's electrification rate across the region in 2018 are displayed in Figure 1, which also shows its comparisons with the 2020 national electrification access targets.

[7] In this report, renewable energy mini-grids, hybrid mini-grids and CEMGs use the same definition.
[8] Conventional stand-alone systems such as diesel or petrol generators contribute also to electricity access but these are not covered in the monitoring framework.
[9] ECREEE (2017).
[10] https://data.worldbank.org
[11] ECREEE (2019).

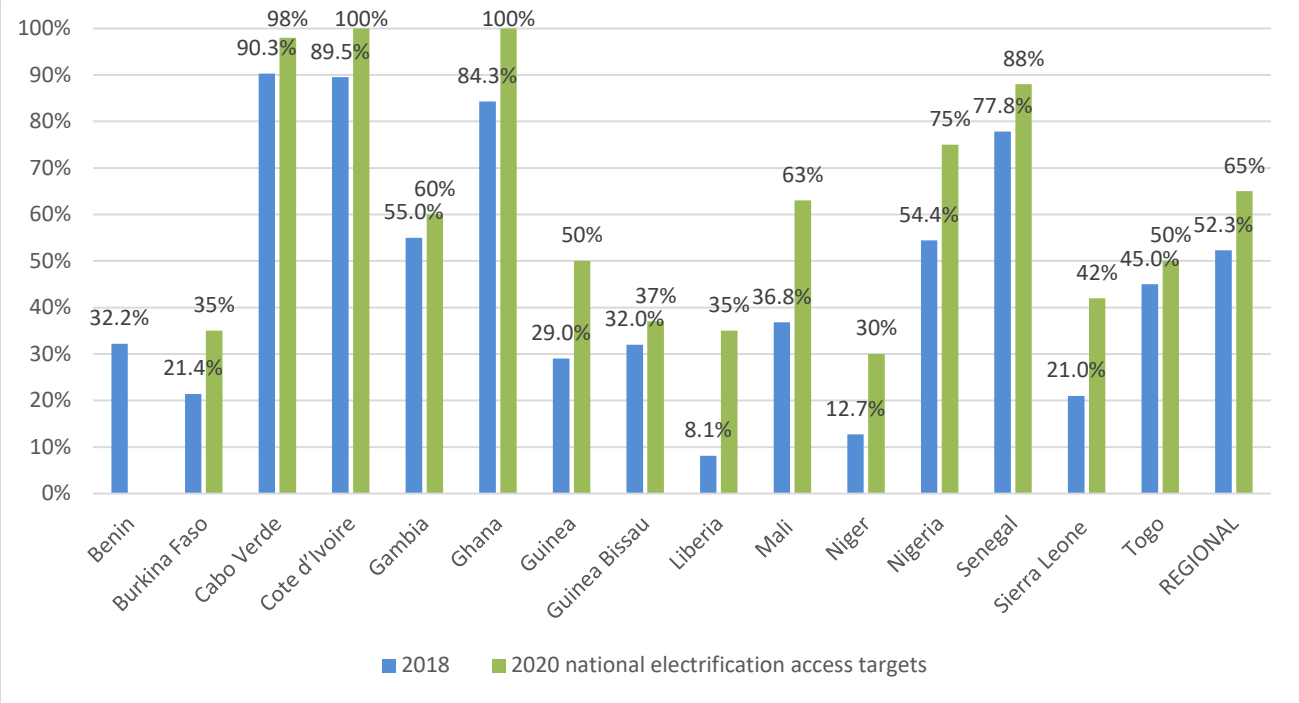


Figure 1: Share (%) of population connected to an electricity grid in 2018

Source: national monitoring reports 2018 (based on data reported by the national directorates of energy and national energy information services, national statistics services and annual utility and electricity regulator reports for 2018; ECREEE (2017).

Notes:

Electricity access is presented in terms of population, in order to be consistent with the national electrification targets established by the ECOWAS countries in the national action plans. Benin and Togo did not specified national electrification targets for 2020 but both countries specified 100% access by 2030.

According to the data reported by the national utilities, there were approximately 20 million of residential customers in 2018. That would represent a regional share of households connected to the grid of 29%, that differs of the mentioned rate of 54.2%. This difference could be explained by the fact that a single connection does not necessarily equate to an individual household. It is common practice in almost all of the countries for a single grid connection to serve two or more households (connection in cascade). Moreover, in some cases known as compound houses more than one household lives in the same house but in different rooms.

3.1.3 Share of households served by clean energy mini-grids

In 2018, around 200,000 rural households were connected to 470 operational CEMGs, with a total installed capacity of 45 MW. These numbers were generated from the best available data collected from the private operators and companies, donors, REAs and other relevant energy institutions. Updated information on the existing CEMGs is provided on ECOWREX. [12] In addition, country highlights of 2018 are presented in Box 1.

Table 2 displays the number of existing and operational CEMGs in 2018; their installed capacity; the reported or estimated number of households with electricity access; and the estimated number of people with access to electricity through the CEMGs. Existing CEMGs in 2018 amounted to 535, falling far short of the regional target promoting 60,000 CEMGs by 2020. As this target seems to be unattainable, the region will need to make enormous progress in the coming years to drive the deployment of CEMGs for rural electrification, in order to the 2030 targets.

[12] ECOWAS Observatory for Renewable Energy and Energy Efficiency: www.ecowrex.org

Table 2: Existing and operational CEMGs in 2018

Country	Existing CEMGs	Operational CEMGs	Installed capacity (MW-only operational CEMGs)	Reported/estimated number/share (%) of households served by operational CEMGs	Estimated population served by operational CEMGs
Benin	67	6	0.15	174	957
Burkina Faso	31	31	1.9	1,528	9,168
Cabo Verde	7	7	0.3	0.26%	1,425
Côte d'Ivoire	7	7	0.5	698	3,790
The Gambia	1	1	0.06	0.24%	21,746
Ghana	19	19	0.5	1,312	5,248
Guinea	3	3	3.6	1.4%	168,787
Guinea-Bissau	3	2	1.2	964	6,751
Liberia	16	15	8.2	15,623	70,306
Mali	77	77	18.6	5.1%	943,787
Niger	13	13	0.5	2,330	20,737
Nigeria	48	46	1.42	5,135	25,679
Senegal	182	182	3.1	3.5%	178,420
Sierra Leone	57	57	1	1.8%	23,250
Togo	4	4	5	838	6,536
Regional	**535**	**470**	**46**	**334,496**	**1,486,587**

Sources: national monitoring reports 2018 (based on the information provided by private operators, donors, REAs, national directorates of energy, national energy information systems, energy commissions and ECOWREX).

Notes:

The estimated population served by operational CEMGs is calculated using the average number of people per rural household.

Nigeria: values for installed capacity and connections are based on available information and are probably understated because of a lack of information on all operational projects implemented by the private sector.

The number of existing and operational CEMGs in 2018 was remarkable in Mali, Senegal and Benin as compared with the rest of countries, but also in Burkina Faso, Ghana, Nigeria and Sierra Leone, countries where the implementation of donor and private operator projects has increased the existing number of CEMGs. In Nigeria, the number of operational renewable energy mini-grids in the country is supposed to be higher but exact data is unavailable due to a lack of official data collection on the activities implemented by the different private operators.[13] The residual increase in the number of operational CEMGs in the region is explained by the implementation of private projects and/or donor funded projects such as those in Niger (eleven CEMGs implemented by a company called SuperSolar) or Liberia (EU) and Guinea Bissau (SABER-AFREC, UNIDO).

Box 1: Country highlights on renewable energy mini-grids

Burkina Faso

26 new CEMGs were installed in the framework of the GCF AfDB funded Programme d'Electrification Rural Yeleen.[14] The main objective of this program is to develop and validate an innovative rural electrification

[13] Nigerian Economic Summit Group (2018); since 2010 the number of commercial developers has grown to at least nine active members in the Nigerian chapter of the Africa Mini-Grid Developers Association (AMDA).

[14] https://www.afdb.org/fileadmin/uploads/afdb/Documents/Environmental-and-Social-Assessments/Burkina_Faso-Projet_Yeleen_d_electrification_rurale-CGES.pdf

model through CEMGs, without the need of public subsidies and that which allow Productive Uses of Energy. The project aims the installation of 100 CEMGs over a two-year period (2018-2020), that would allow the connection of 50,000 households in 100 villages of rural areas, including also 500 connections for productive uses.

Niger
11 new CEMGs were installed in the framework of the World Bank funded project "Projet d'Accès à l'Énergie Solaire au Niger".[15] The second component of the project supports rural electrification in the country by the implementation of CEMGs operated by private companies.

Senegal
48 new CEMGs were installed in the framework of the UNDP funded Programme d'Urgence de Développement Communautaire (PUDC).[16] The program aims to contribute to improving rural population's access to basic social services through the establishment of socio-economic infrastructure. The first component plans the electrification of 325 villages in rural areas.

Togo
In the context of a rural electrification project reported by the MoE, 317 rural communities will be provided with electricity access through the installation of 5 CEMGs.

3.1.4 Share of households served by renewable energy stand-alone systems

Renewable energy stand-alone systems such as Solar Home Systems (SHS) are a significant way to provide rural populations with access to electricity services.

Table 3 gives the share of households connected to renewable energy stand-alone systems.

Table 3: Share of households connected to stand-alone renewable energy systems in 2018

Country	Reported share of households served by stand-alone renewable energy systems (%)	Estimated number of stand-alone renewable energy systems
Benin	0.2	235,088
Burkina Faso	10.7 (2015)	278,751
Cabo Verde	0.1	n/a
Côte d'Ivoire	2.16 (2014)	94,971
The Gambia	n/a	580
Ghana	n/a	224,784
Guinea	n/a	n/a
Guinea-Bissau	0.03	3,126
Liberia	n/a	47,115
Mali	0.5	173,605
Niger	0.002	7,765
Nigeria	n/a	780,739
Senegal	0.4	182,407
Sierra Leone	6.6	61,940
Togo	1.1	17,116

[15] http://documents.worldbank.org/curated/en/705161492064925159/pdf/SFG3260-EA-FRENCH-P160170-Box402901B-PUBLIC-Disclosed-4-10-2017.pdf
[16] https://www.sec.gouv.sn/programme-d%E2%80%99urgence-de-d%C3%A9veloppement-communautaire-pudc

Regional	**-**	**2,107,987**

Source: national monitoring reports 2018 (based on data provided by national directorates of energy, national Energy Information Systems, REAs, national statistical services, donors, private operators and the "Global Off-Grid Lighting Association (GOGLA) 2018" report).

Notes:

The reference year for the reported share of households connected to stand-alone renewable energy systems is 2018. If different from 2018, the reference year is provided in brackets.

Senegal: in 2017, a share of 8% was reported. The difference in 2018 can be explained because the share in 2018 considers all the households in the country, and the share of 8% refers only to the total number of rural households.

At regional level it was not possible to calculate the share due to the fact that not all countries reported the penetration rate at household level. Also in some countries the reference year was not 2018.

In 2018, ten countries reported the share of households with electricity access through stand-alone renewable energy systems. However, not all the countries shared the same reference year. This fact together with the non-availability of penetration rate in five countries made it impossible to quantify the penetration rate at regional level. Still, it is clear that stand-alone renewable energy systems might have represented a small contribution to the electricity access at regional level. The lack of available information on the penetration rate shows that there is no systematic way to collect relevant data and thus assess the share of access from these systems.

The estimated number of stand-alone renewable energy systems was based on available data and may over- or understate the real number. The estimation was the sum of the values provided by different sources such as relevant official institutions in charge of energy and national statistical services; regional and country programs (PRODERE, GIZ Energizing Development Program); the Global Off-Grid Lighting Association (GOGLA) annual market reports from 2016 to 2018; private operator and donor activities.

The West African market for pico-PV products (<=10 Wp) and SHS (11-100 Wp) is nascent and volatile in complete contrast to the East African equivalent. Many companies are using Pay-As-You-Go (PAYG) business models. Although these are widespread in eastern and southern Africa, they are new to West Africa. Such models allow users to make a down payment followed by regular payments over a given period (often using mobile money). These companies usually sell plug-and-play systems with small capacities. Several companies, such as Azuri, FRES, PEG Africa and Nova Lumos are using this model in West Africa.[17]

GOGLA and the World Bank's Lighting Global programme publish semi-annual market reports with sales data from major companies distributing pico-PV products (<=10 Wp) and SHS (11-100 Wp).[18] Table 4 presents the information collected for the period of years from 2016 to 2018.

Table 4. Pico PV and Solar Home Systems sold or distributed from 2016 to 2018

Region/country	Products sold 2016-2018 (units)	Cash sales revenue (USD millions) 2016-2018
Benin	205,871	2.4
Burkina Faso	271,006	5.8
Cabo Verde	n/a	n/a
Côte d'Ivoire	94,798	0.3
The Gambia	576	n/a

[17] The Global Off-Grid Solar Market Report, Semi-Annual Sales and Impact Data reports from GOGLA contain a list of the companies and distributors operating in the region and/or worldwide.

[18] The report from 2016 estimates that they captured 50% of the total pico-PV and SHS market. In 2017 they estimated that the data reported represented about 30% of all sales of pico-PV products and SHS. About 70 companies and distributors participated in the data collection.

Ghana	153,914	4
Guinea	n/a	n/a
Guinea-Bissau	n/a	n/a
Liberia	38,890	0.8
Mali	152,062	5
Niger	7,595	n/a
Nigeria	780,739	15.4
Senegal	182,407	2.2
Sierra Leone	57,711	0.8
Togo	17,116	0.09
Regional	**2,008,920**	**49**

Source: GOGLA (2016, 2017, 2018)

West Africa is moving forward with about 2 million units sold and over USD 49 million in revenue but this is still far from the market level in East Africa. East Africa has become a global hub for PAYGO but expansion into West Africa has gathered substantial momentum.[19] Moreover, 2018 was a fruitful year for fundraising for the West Africa off-grid solar sector. In this context, the year witnessed a growth primarily in equity.[20]

Country highlights on stand-alone renewable energy systems are presented in Box 2.

Box 2: Country highlights on stand-alone renewable energy systems

Benin

The Millennium Challenge Account (MCA)-Benin II launched the first request for applications for the Off Grid Clean Energy Facility (OCEF).[21]The project aims to increase access to electricity for the unserved population in rural and peri-urban areas by reducing barriers to investment in the off-grid electric power sector. The third window of the project aims to support companies to import, sell, distribute, install, and maintain household-level PV technologies including solar home kits, SHS and other products including solar Productive Use of Energy appliances.

Côte d'Ivoire

The Zola Energy Côte d'Ivoire Pay-as-you-go Solar Home Systems project, which is implemented by Zola EDF Côte d'Ivoire (ZECI) and funded by AfDB, aims to install SHS in 100,000 rural households by 2020.

Liberia

The local company EcoPower Liberia announced the importation of 1,552 SHS that will be installed under PAYGO business models in the regions of Karnplay, Sanniquille, Ghanta, Gbarnga, Bong, Lofa and Nimba.

Mali

The Hybrid Rural Electrification System (SHER) project of AMADER supports the national targets on rural electrification by partially subsidizing the investment costs necessary for the promotion and installation of CEMGs and SHS intended to provide affordable electricity access to low-income households living in isolated rural areas. The activities concern the connection of 9,770 households to CEMGs and the installation of 2,400 individual solar kits. In the context of this project, 4,437 solar kits were installed in rural households.

[19] GOGLA (2018)
[20] Power Africa (2019)
[21] https://ocef.bj/en/

Niger
In the context of the World Bank funded Projet d'Accès à l'Énergie Solaire au Niger, 40 rural communities in the regions of Maradi, Zinder, Agadez and Diffa, were provided with electricity access through the installation of 5,400 PV modules (648 KWp of installed capacity in total).

Senegal
The national telecommunications company (SONATEL) launched the Orange Energie project that will provide electricity access to unserved communities in the regions of Mbour and Fatick through the distribution of 1,000 SHS.

Togo
Different projects reported by the MoE and that are under implementation in 2018 will provide electricity access to 309 rural communities in the coming years. Moreover, the rural electrification national project (CIZO) aims to provide electricity access to 300,000 rural households by 2020 through the installation of solar kits in PAYGO business models. In 2018, 12,000 households in the Savanes region, and 20,000 households in the total of the country, were provided with electricity access in the context of this national project.

3.1.5 Access to modern cooking energy

Access to modern cooking is assessed in terms of household penetration rates for modern fuel alternatives for cooking and ICS. These indicators show the living conditions prevailing in a typical household. Numbers of units sold and distributed are also presented for countries with data available. Although the volume of units sold may not necessarily align with the reported penetration rates, it provides an additional layer of information about the overall status of clean cooking market trends.

3.1.5.1 Share of ECOWAS households using modern fuel alternatives for cooking (*e.g.* LPG, biogas, solar cookers, kerosene, ethanol gel fuel)

Modern cooking fuel alternatives, such as LPG, are promoted as a cleaner and more efficient way to cook. The Information provided is from the latest censuses or surveys conducted by the national Directorates of Statistics. Table 5 displays census or survey results from the ECOWAS countries conducted in different years between 2004 and 2018.

Table 5: Share (%) of households using modern cooking solutions in ECOWAS countries

Country	LPG	Electricity	Kerosene	Other	Census/survey year
Benin	5.0%	0.3%	2.8%	-	2013
Burkina Faso	10.7%				2015
Cabo Verde	78.2%		-	-	2018
Côte d'Ivoire	22%				2014
The Gambia	38.5%				2004
Ghana	24.8%	0.3%	0.1%	-	2017
Guinea	0.8%	0.6%	0.5%	-	2014
Guinea-Bissau	4.5%				2018
Liberia	1%	0.9%	0.4%	-	2008
Mali	28.3%				2018
Niger	0.5%	-	-	-	2012
Nigeria	0.9%	0.2%	25%	-	2008

Senegal	43.5%			-	2014
Sierra Leone	0.2%				2018
Togo	2.8%	0.1%	0.4%	-	2010

Source: national statistical services, national directorates of energy and/or national Energy Information Systems
Notes:
The percentage was not disaggregated according to technology in Burkina Faso, Côte d'Ivoire, The Gambia, Guinea-Bissau, Mali, Senegal and Sierra Leone.
Other modern cooking alternatives includes technologies such as solar cookers, biogas, ethanol gel, etc.

The national censuses reports that over the years wood and charcoal use has gradually shifted to LPG or a combination of LPG and traditional fuels. LPG was mainly used in urban areas. For instance in Cabo Verde the national statistics service reported that 91.1% of urban households used LPG and electricity as energy source for cooking compared to 42.7% in rural areas. This is similar to the other ECOWAS countries.

Country highlights on modern cooking solutions are presented in Box 3.

Box 3. Country highlights on modern cooking solutions

Burkina Faso
According to the MoE, 12,005 biodigesters have been distributed from 2010 to 2018 in the context of the Programme National de Biodigesteurs.

Guinea
A national Decree was underway, for the establishment and the operation of a national fund to support the promotion and use of LGP in the country.

Liberia
According to the MoE, over 10,000 LPG cylinders were in use in the capital, Monrovia.

Mali
Since 2009 the share of households using LPG for cooking has significantly improved. Between 2004 and 2016 AMADER distributed approximately 130,000 LPG stoves. In 2018 consumption of LPG was expected to amount to 15,625 tonnes though 18,009 tonnes were actually consumed. This amounted to 614 tonnes less than the 18,623 tonnees consumed in 2017. According to the MoE, the number of gas stoves placed on the market in 2018 fell to 1,936 as compared with 24,000 in 2017. In addition, bioethanol stoves were not distributed in the market as expected. Both situations caused a fall in the rhythm of increasing the share of households with access to modern alternative solutions. However, the MoE reported that the gas consumed in 2018 made possible to preserve approximately 81,042 ha of forest (1 tonne of gas consumed contributes to the preservation of approximately 4.5 ha of forest).

Togo
The country is elaborating a national project to develop the policy and the national action plan to promote the escalation of clean cooking technologies in the country.

3.1.5.2 Share of ECOWAS households using improved cookstoves

The penetration rates of ICS in the region ranged from 0.009% in Cabo Verde to 71.7% in Mali. Table 6 presents the penetration rate for all countries that reported information.

Table 6: Share of households with improved cookstoves in the ECOWAS countries

Country	Share (%)	Reference year
Benin	10.7	2017
Burkina Faso	32.3	2018
Cabo Verde	0.009	2018
The Gambia	48.7	2004
Ghana	24.8	2017
Guinea	0.5	2018
Guinea Bissau	10	2018
Liberia	1	2017
Mali	71.7	2018
Niger	2	2016
Senegal	13.5	2014

Source: national monitoring reports 2018 (based on information provided by the national statistical services, national directorates in charge of energy and national REAs)

Clearly, the reference year was not the same in every country. In Niger, access to clean cooking solutions is at 2%, but technology is not specified. Cabo Verde has the lowest value because most households use LPG for cooking. At regional level, most countries did not report the penetration rate of improved cookstoves. A possible reason is that, unlike LPG, ICS was not generally included as an indicator in national surveys on household living conditions carried out periodically by the national statistical services. In countries such as Sierra Leone, the penetration rate of ICS should have been considerable, as 72% of the population uses firewood as main fuel for cooking.[22]

The EREP includes a ban on inefficient cookstoves from 2020. It targets the use of wood and charcoal cookstoves with minimum efficiency at the high rate of 35%. A Non-governmental organisation (NGO) - the Clean Cooking Alliance, gives ICS with an efficiency equal to or greater than 35% a Tier 3 classification.[23] This means the fuel or cookstove efficiency level makes a positive environmental impact.[24] However, many ECOWAS countries do not have testing facilities for imported or even locally manufactured cookstoves. As no raw data was available, it was not possible to confirm whether countries reporting improved cookstove penetration rates only include ICS operating above the efficiency threshold.

Country highlights of 2018 are presented in Box 4.

Box 4. Country highlights on improved cookstoves

Burkina Faso
According to the MoE, the national penetration rate of ICS for *dolo* is set at 12%. *Dolo* is a local drink that is widely consumed by people in town and in the countryside.

Mali
80,887 ICS were distributed in 2018, which compares to a forecast of 100,000 each year. From 2004 to 2018, a total of 1,956,239 ICS have been distributed benefitting around 13.7 millions of people.

[22] Sierra Leone Integrated Household Survey (SLIHS) 2018 (October 2019).
[23] Clean Cooking Alliance (www.cleancookstoves.org)
[24] http://cleancookstoves.org/technology-and-fuels/standards/defining-clean-and-efficient.html

Liberia, Sierra Leone

A significant number of ICS were distributed under the GIZ Energizing Development (EnDev) programme. Indeed, 2,186 ICS were also distributed in Liberia, and 7,600 in Sierra Leone. Most of the ICS distributed in Liberia were delivered in Montserrado county, where most stove producers and retailers are based. In addition, private retailers had distributed 11,600 ICS in Liberia by 2017. For instance, the company Empowerment Society Intl, Sjedi reports it has distributed 8,000 units. The private sector in Liberia has called for a new subsidy to decrease duty and tax on imports of renewable products such as cookstoves[25].

Nigeria

In Nigeria 7,000 ICS had been distributed by 2017.[26] The Nigerian Alliance for Clean Cookstoves, an NGO, aims to install 10 million stoves within ten years through a coordinated effort between partner organisations. In Nigeria, the arid north is the region most dependent on fuelwood. This area could provide a good pilot for efficient woodstoves while the southwest could be a good place for interventions aiming to displace kerosene with LPG.

3.2 Renewable energy

3.2.1 Installed capacity

Table 7 presents the total on-grid installed capacity and the installed on-grid renewable energy capacity in 2018 in the ECOWAS region. Details on the renewable energy plants connected to the grid in 2018 are presented in Annex 1.

Table 7: On-grid installed electricity capacity (MW) in the ECOWAS region, 2018

Country	Total installed capacity (MW)	Installed RE capacity (including LMSH) (MW)	Installed RE capacity (excluding LMSH) (MW)
Benin	238.5	2	2
Burkina Faso	359.6	68.5	68.5
Cabo Verde	179	34.5	34.5
Côte d'Ivoire	2,172	879	55
The Gambia	132.8	1.05	1.05
Ghana	4,889	1,623	42.6
Guinea	617.2	368	51
Guinea-Bissau	18	0	0
Liberia	126	88	0
Mali	817	315	5.7
Niger	180.9	7	7
Nigeria	12,340	1,941	31.4
Senegal	1,086	143	143
Sierra Leone	140	75.6	25.6
Togo	229.3	66.6	1.6
Regional	**23,526**	**5,612**	**469**
Renewable energy share in 2018 (%)		**24%**	**2%**
Renewable energy share – target 2020 (%)		**35%**	**10%**

[25] Duty and tax amount to more than 35% of the ICS price in Liberia.

[26] http://cleancookstoves.org/resources_files/nigeria-market-assessment-mapping.pdf

Source: national monitoring reports 2018 (based on the 2018 utility and electricity regulator reports and the national directorates of energy and energy commissions), ECOWREX and EREP.
Notes:
LMSH: Large and Medium Scale Hydropower.

The total installed capacity in the region was 23,447 MW. Renewable energy capacity accounts for 24% (5,612 MW) of total capacity. Of the 5,612 MW renewable energy capacity, 5,143 MW (91 %) is provided by medium and large hydropower plants.[27] The remaining 469 MW is split between small and mini- hydropower (191.5 MW); PV (234 MW); wind energy (27 MW); and bioenergy (16 MW). The aim is to increase the renewable energy share of the regional electricity mix to 10% by 2020 excluding medium and large hydropower, and 35% including medium and large hydropower.

ECOWAS countries will need to make more effort in the next two years to commission new renewable energy plants of small hydropower, PV, wind and bioenergy, in order to achieve the 10% target. Several renewable energy on-grid projects in Cabo Verde, Côte d'Ivoire, Mali and Senegal will increase the share in the coming years and will help to achieve the 2020 target if commissioned before 2020 (Box 5). However, the EREP's target on small hydropower (787 MW of installed capacity by 2020) seems to be unachievable considering that installed capacity was 191.5 MW in 2018.

Figure 2 shows the on-grid installed renewable energy capacity by source excluding medium and large hydropower from 2016 to 2018.

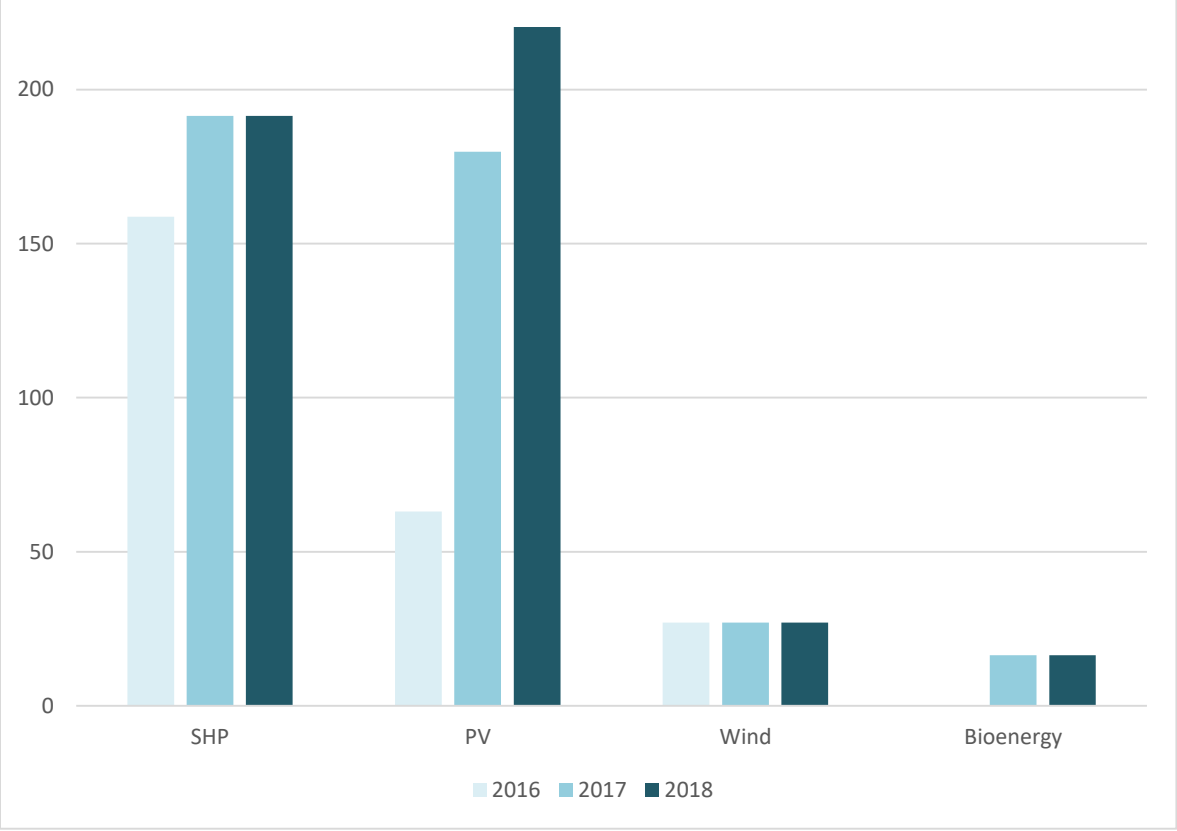


Figure 2: Installed renewable energy capacity in MW (excluding medium and large hydropower)
Source: national monitoring reports 2018 (based on the 2018 utility and electricity regulator reports and the national directorates of energy and energy commissions), EREP and ECOWREX
SHP = small hydropower

[27] Definitions in the ECOWAS Small Scale Hydro Power Program show medium-sized hydropower at 30-100 MW. Large hydropower starts at 100 MW while small hydropower plants have an installed capacity of 1-30 MW.

There was a significant increase in on-grid installed PV capacity. Capacity has increased from 63 MW in 2016 to 234.1 MW in 2018. The increase in PV installed capacity as compared to 2017 is explained by the commissioning of new solar projects in Cabo Verde (1.3 MW), Ghana (20 MW), Senegal (40 MW) and Niger (7 MW). This trend will continue in the next few years as some projects are under development or construction in Côte d'Ivoire or Mali (see Box 5). Bioenergy and wind installed capacity remained the same as compared to 2017.

Box 5. Country highlights on installed renewable energy capacity

Cabo Verde
The country advanced in the implementation of a new solar power plant of 10 MW in Calheta São Miguel (Santiago island). The facility is expected to be commissioned by 2020. In the context of the Master Plan of the Energy Sector, the country launched two more IPP competitive tenders for a 10 MW wind park in São Domingos (Santiago island) and a 5 MW solar plant in Boa Vista. Furthermore, 1.3 MW of solar on-grid installed capacity were commissioned in Sal island (Central Solar Fotovoltaica de Ponta Preta). The project was led by the utility Aguas de Ponta Preta, and was funded by the utility and a local commercial bank.

Côte d'Ivoire
The following on-grid renewable energy plants were under construction: Korhogo PV (25 MW) in Binguebougou; the Aboisso biomass Biokala (46 MW) project, and a formal agreement was signed to commence the construction of the Poro Power 1 solar plant (50 MW).

The Gambia
The Gambia received around USD 41 million as grant from the World Bank, for electricity restoration and modernization of the country.[28] The first component of this project will finance a solar on-grid plant of 10-20 MW in Brikama, located 20 km from Banjul.

Ghana
The country commissioned a 20 MW of solar on-grid installed capacity, installed 60 Km southwest of Accra, near to Winneba.

Mali
The following PV plants were under development or construction: Kita (50 MW), Sikasso (50 MW), Segou (33 MW) and Koutiala (25 MW).

Niger
2018 was a remarkable year because solar energy contributed for the first time to the installed on-grid capacity and production when Malbaza (7 MW) was commissioned. The target of the national utility (NIGELEC) is to have about 100 MW of solar energy installed by 2021.

Senegal
2018 was a remarkable year in terms of new operational solar on-grid power plants in the country. The year started with the official commissioning of Ten Merina Ndakhar (30 MW) plant, although the facility started injecting electricity into the grid at the end of 2017. Two new power plants were commissioned during the year: Sakal (20 MW) and Kahone (21.2 MW). Furthermore, construction officially started for the first utility-scale wind farm in the country, the 158.7 MW Parc Eolien Taïba N'Diaye, that will be commissioned by 2020.

[28] http://documents.worldbank.org/curated/en/171661526614264416/pdf/GAMBIA-PAD-05042018.pdf

3.2.2 Renewable energy generation

Table 8 displays total on-grid electricity generation and renewable energy generation by country.

Table 8: Total on-grid energy generation and renewable generation (MWh) in the ECOWAS region in 2018

Country	Total generation MWh	Renewable energy generation (including LMSH) MWh	Renewable energy generation (excluding LMSH) MWh
Benin	83,020	72	72
Burkina Faso	1,053,000	145,600	145,600
Cabo Verde	493,356	99,979	99,979
Côte d'Ivoire	9,997,000	2,962,000	216,500
The Gambia	351,817	33	33
Ghana	16,246,000	6,050,000	33,000
Guinea	2,577,730	1,840,730	n/a
Guinea-Bissau	86,800	0	0
Liberia	201,052	181,716	0
Mali	2,192,000	809,495	39,337
Niger	250,934	1,921	1,921
Nigeria	33,817,609	7,744,301	n/a
Senegal	3,541,710	212,470	212,470
Sierra Leone	300,000	262,700	29,800
Togo	576,605	200,270	4,050
Regional	**71,868,642**	**20,511,287**	**782,762**
Share of renewable energy generation		**28.5%**	**1.1%**

Source: national monitoring reports 2018 (based on the 2018 utility and electricity regulator reports and the national directorates of energy and energy commissions).

Notes:

The share of renewable energy generation (excluding LMSH) is based on the weighted average of the countries for which information was available.

At regional level, renewable energy generation including Large and Medium Scale Hydropower (LMSH) comprised approximately 28.3% or 20.6 million MWh of total generation. Renewable energy excluding LMSH accounted for approximately 2.8% or 1 million MWh of total generation.

3.2.3 Solar water heaters

Solar water heating to meet domestic, commercial and industrial requirements is one of the most important tools for mitigating electricity demand in West Africa. Despite high demand for heat and the presence of abundant solar resources, SWH use for this purpose is still extremely low in ECOWAS countries. This is abundantly clear from the limited information on SWH penetration in the national monitoring reports (Table 9).

Table 9. Number of existing and/or installed SWH

Country	Number of SWH in households	Number of SWH in public Institutions	Number of SWH in SMEs*, hotels and industries
Burkina Faso	n/a	191	n/a
Cabo Verde	984		

Ghana	1	1	3
Guinea Bissau		25	
Liberia	n/a	n/a	66
Mali	n/a	18	n/a
Nigeria	1	73	3
Senegal	n/a	273	n/a
Sierra Leone	455		

Source: national monitoring reports 2018; ECREEE 2016.
SME = small and medium-sized enterprises*
Notes:
In Mali, the Achievements, Challenges and Opportunities report published in 2012[29]compiled by AfDB with support from the National Directorate of Energy, under the Scaling-Up Renewable Energy Program (SREP) in Low Income Counties states that more than 1,500 SWH systems had been installed in different facilities including hotels, hospitals and homes. Cabo Verde and Sierra Leone reported aggregated numbers.
In Nigeria, in addition to the 68 SWH installed by GIZ-NESP, there have been several research projects on the design, modelling, simulation and performance-testing of SWH in universities and research centres such as the Usman Danfodio University Teaching Hospital in Sokoto and Ahmadu Bello University in Kaduna State.
In Ghana, according to the Solar Heat Worldwide (SHC, 2019), it was estimated a number of 125 systems that could be installed in the country. The same report, estimates 353 systems in Nigeria, 455 in Senegal and 218 in Burkina Faso.

ECREEE developed market studies for five ECOWAS countries in 2015 to evaluate the market for heating and drying agricultural products using solar thermal water technology.[30] Table 10 presents the main results on installed capacity in 2015.

Table 10. SWH catchment area and installed capacity, 2015

Country	Catchment area (m^2)				Capacity (KW_{thm}*)			
	Total	Residential sector	Public institutions	Hotels, SMEs and industry	Total	Residential sector	Public institutions	Hotels, SMEs and industry
Cabo Verde	1,183	n/a	n/a	n/a	828	n/a	n/a	n/a
Burkina Faso	1,070	557.8	200	342.1	n/a	n/a	n/a	n/a
Ghana	1037	86.4	4.1	946.6	725.9	60.4	2.8	662.6
Nigeria	200	n/a	n/a	n/a	140	n/a	n/a	n/a
Senegal	1,611	n/a	n/a	n/a	1,127.7	n/a	n/a	n/a

Source: ECREEE 2016
**kilowatt-therm*

3.2.4 Bioethanol production

Table 11 presents bioethanol and biodiesel production in 2018. Countries not appearing in the table reported no available data, except Benin, Cabo Verde and Guinea who reported zero production.

Table 11: Bioethanol and biodiesel production

Country	Bioethanol production (litres)	Biodiesel production (litres)

[29] Direction Nationale de l'Energie du Mali (2011).
[30] www.ecreee.org/page/soltrain-west-africa-ecowas-solar-thermal-capacity-building-and-demonstration-program

Liberia	n/a	8,701
Mali	10,000,000	5,121
Senegal	10,000,000	n/a
Sierra Leone	85,000,000	n/a

Source: national monitoring reports 2018, Agence Nationale du Développement des Biocarburants (Mali), Compagnie Sucrière Sénégalaise[31] (Senegal), SUNBIRD (Sierra Leone)[32]

In Mali, production of bioethanol decreased as compared to 2017 due to the low collection rate of Jatropha seeds. Capacity building and raising awareness activities were organized to revitalize the collection of Jatropha seeds in order to increase the production of biofuel to the desired level. In Sierra Leone, the Mabilifu renewable energy project has an annual production capacity of 85 million litres. It uses sugarcane as primary source and cassava as a secondary source. The ethanol is sold to the domestic Sierra Leone biofuel blending program and shipped to customers in Europe. In Senegal, the sugar company - Compagnie Sucrière Sénégalaise has a nominal production capacity of 60,000 liters per day, and consumes approximately 240 tons per day of molasses with a productivity of approximately 242 liters of pure alcohol per ton of raw material.

3.3 Energy efficiency

Energy efficiency is an integral part of regional and national energy policies. Energy efficiency measures aim to free up 2,000 MW of power generation capacity, hence reducing the need for further power generation investments and avoiding the negative environmental impact of current energy practices. In each country's NEEAP, clear energy efficiency goals have been set in accordance with regional targets to promote a viable environment and hold member states accountable. The following section thus provides information available on the status of energy efficiency indicators, measures and actions in the region. These concern the following issues: electricity distribution losses, energy-efficient lighting, energy-efficient refrigerators, energy-efficient air conditioning, energy-efficient buildings and energy efficiency in the industrial sector.

3.3.1 Electricity distribution losses in the region

Utilities employ different measures to reduce electricity losses at both technical and commercial level. However, in most cases, losses remain high, putting utilities under considerable financial strain. Technical losses stem from inefficiencies in transformers and links in distribution cables. Non-technical losses include illegal connections (bypassing meters and manipulating connection lines), the malfunction or absence of meters,[33] [34] and low collection rates.

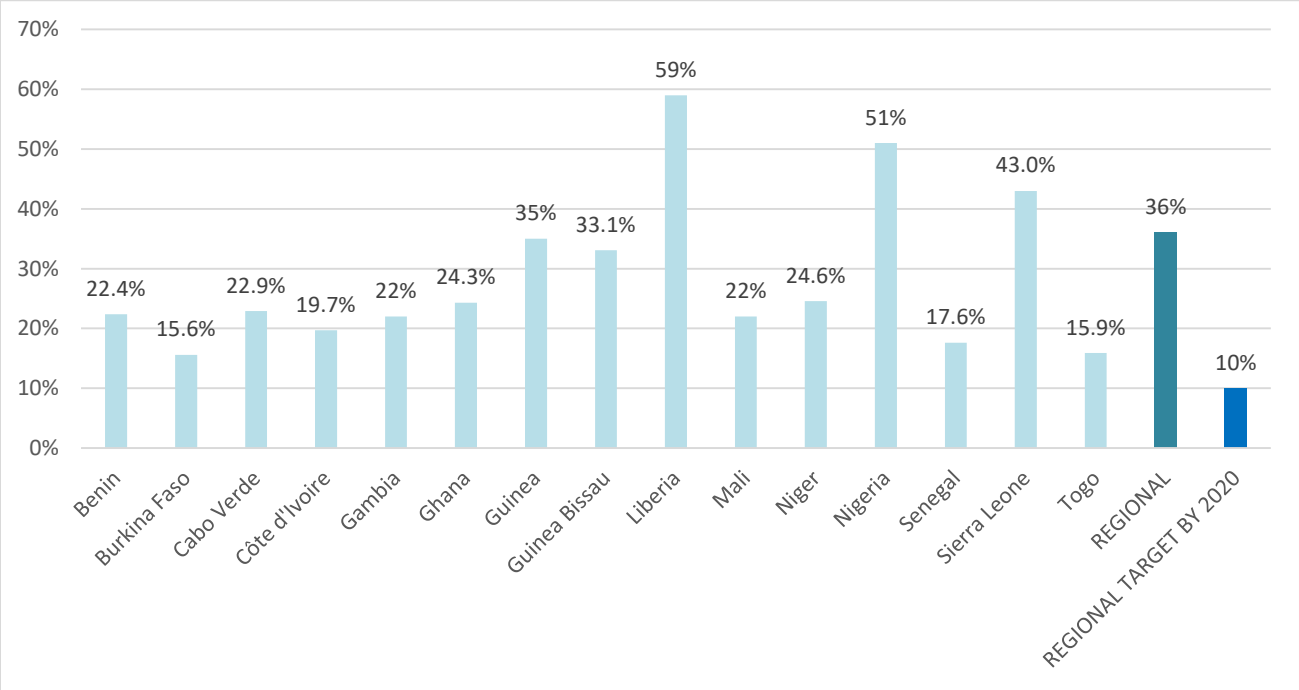
Country reports and information provided by the utilities show that 36% of the electricity produced (26,207 GWh) was lost in the ECOWAS region in 2018 (Figure 3), which shows a reduction when compared to 2017, which had an overall percentage of electricity losses of 39.5%.[35]

This report aims to monitor the technical and non-technical losses in the electricity distribution system. However, this has not been possible for each country as in general utilities reported overall losses or technical losses of the distribution system without differentiating between technical and non-technical or commercial losses.

[31] www.css.sn/index.php/fr/2018-11-07-21-17-20/production-d-%C3%A9thanol.html
[32] www.sunbirdbioenergy.com/projects/sierra-leone-makeni/
[33] GIZ (2017).
[34] According to the Nigerian Electricity Regulatory Commission (NERC), 3.8 million of the 8.7 million customers in Nigeria were metered in 2018.
[35] ECREEE (2019)

Liberia, Nigeria, Sierra Leone, Guinea and Guinea Bissau stand out as the countries with the highest electricity losses.

Figure 3. Aggregated electricity losses



Source: national monitoring reports 2018 (based on information provided by the 2018 national utility and electricity regulator reports and the national directorates of energy), EEEP.

As compared to 2017,[36] significant reductions in the overall electricity losses are observed in Burkina Faso, Côte d'Ivoire, Ghana and Mali. However, the regional percentage of 36% in 2018 is still far from the 10% regional target by 2020 in the reduction of the average losses in the electricity distributions systems that was defined by the EEEP.

The degree of network losses may correlate with the initiatives undertaken by the utilities as well as government action to fight energy fraud and limit the percentage of losses allowed to energy producers and distributors. The introduction (or increased use) of prepaid meters and better distribution networks has been the main source of improvement.

3.3.2 Energy-efficient lighting

This report aims to monitor the penetration rate of efficient lighting for both private and public purposes, at country level. However, a regional assessment of efficient lighting penetration rates in 2018 was not possible. In general, countries reported on the total existing number of efficient lights (Table 12). Burkina Faso, Côte d'Ivoire, Mali, Senegal and Togo also reported on the penetration rates.

Table 12. Existing number of efficient lights in the ECOWAS region

Country	Estimated number of	Estimated number of	Estimated number of	Penetration rate efficient lamps (%)	Penetration rate efficient public lighting (%)

[36] ECREEE (2019).

	efficient lights	efficient public lights	solar street lights		
Benin	832,440	35,800	16,760	n/a	n/a
Burkina Faso	n/a	34,570	3,628	13.1	18.6
Cabo Verde	n/a	10,067	n/a	n/a	n/a
Cote d'Ivoire	4,463,370	n/a	116,942	1	40.2
The Gambia	n/a	5,000	n/a	n/a	n/a
Ghana	n/a	n/a	n/a	n/a	n/a
Guinea	1,183,900	4,415	37,512	n/a	n/a
Guinea Bissau	n/a	34,630	2,500	n/a	n/a
Liberia	500	2,000	n/a	n/a	n/a
Mali	2,161,859	8,954	8,394	n/a	23.1
Niger	37,320	n/a	1,541	n/a	n/a
Nigeria	n/a	n/a	20,000	n/a	n/a
Senegal	n/a	38,620	16,500	68	n/a
Sierra Leone	n/a	n/a	8,880	n/a	n/a
Togo	420,320	317	13,242	n/a	37.5
Regional	**9,099,713**	**174,373**	**245,898**	**-**	**-**

Source: national monitoring reports 2017 (based on information provided by the national directorates in charge of energy, donors and national utilities)

Notes:

Solar street lights could be considered efficient public lights. However, this information has been presented in a different column.

The values reported are mainly based on the information provided by specific country programmes led by the governments. Alternatively, they are generated by donor programmes such as the PRODERE project funded by Union Économique et Monétaire Ouest-Africaine (West African Economic and Monetary Union) (UEMOA); the African Biofuel & Renewable Energy Company (SABER-ABREC) programmes on energy efficiency and the GIZ EnDev activities. Thus, the existing number of efficient lights may be greater, especially as far as on-grid lighting is concerned.

The existing data gap in the penetration rates is due to different possible factors. Examples include the absence of national studies to assess the number and type of lights used for private and public purposes, or the lack of data collaboration and sharing between national stakeholders. In addition, there is a lack of organised data collection systems and reporting by the custom agencies (import & export) while national household surveys conducted periodically by countries do not usually include questions on efficient lighting.

Additional relevant information from 2018 is presented below in Box 6.

Box 6. Country highlights on energy-efficient lighting

Burkina Faso

The company Lagazel, inaugurated in Burkina Faso, is one of the first manufacturing solar lamps factory on an industrial scale in the African continent. The factory is located in the city of Dédougou. The factory is expected to produce about 1,500 solar lamps per week and has the goal of producing one million by 2020.

The manufactured solar lamps are certified under the World Bank standards of the Lighting African program.

Cabo Verde

The national utility, ELECTRA, in 2018 started a national program to replace all sodium vapour lamps for public lighting by LED lights. The project kicked-off in Praia (Santiago island) and Santa María (Sal island) and will cover the whole country in the next years. The costs of the project, estimated in 3,772,729 €, will be cover 80% by the savings in the electricity consumption for public lighting and the rest 20% will come from the national tourism fund. In relation to the energy efficiency savings, all sodium vapour lamps will be replaced by LED lights, which means savings of around 55% as compared with the conventional public lighting system.

Côte d'Ivoire

In the context of the ENERGOS project (programme d'appui au secteur de l'électricité en Côte d'Ivoire), signed in 2018, and funded by the European Union, for the installation of about 1 million LED lamps were. The installation of the LED lamps will start in 2019 and it is expected that by middle of 2020, all public lighting points in the country will be equipped with LED lamps.

Ghana

The MoE announced the distribution of 12 million LED lamps to the population in a project funded by a local commercial bank. Apart from the savings in electricity consumption, it will also contribute to improve the exploitation of the national grid system.

Guinea

The World Bank funded project "Projet d'Amelioration de l'Acces a l'Électricité (PAEEG)" will reinforce the public lighting system in the country and by 2020 should have installed energy efficient lights in villages, main communication roads, schools and households.

Nigeria

The Nigerian Building Energy Efficiency Code (BEEC) specifies requirements for the improvement of lighting efficiency for new and retrofitted offices and residential buildings. The Government of Lagos State signed a contract for the installation of 10,000 LED lamps in 300 Km of roads in Ikoyi, Ikeja and Victoria Island.

Senegal

The company Fonroche Éclairage signed a contract with the Government to install 50,000 solar lamps by 2021, to cover a third of the country needs for public lighting.

In addition to the Efficient Lighting Strategy at regional level,[37] a regional Minimum Energy Performance Standard (MEPS) for efficient on-grid and off-grid lights was developed under the ECOWAS Standards Harmonization Model (ECOSHAM). Ministers in charge of quality adopted MEPS at a meeting in Niamey in October 2017. Since then, MEPS have been implemented at national level in the form of national energy efficiency standards for electric lights (Table 13).

[37] www.ecreee.org/news/west-africa-nations-phase-out-incandescent-lamps

Table 13. Countries that have introduced national energy efficiency standards for electric lights

Country	Status
Benin	Adopted
Cabo Verde	Under development[38]
Ghana	Adopted, approved; MEPS and labels implemented
Nigeria	Adopted, approved; implementation was in process with the support of the GIZ-NESP II
Senegal	Adopted

Source: ECREEE

3.3.3 Energy-efficient electrical appliances

The promotion of energy-efficient electrical appliances such as refrigerators and air conditioners has been addressed at regional level. However, the penetration rates of energy-efficient appliances, such as air conditioners and refrigerators, was not reported by most countries in 2018. This may be due to lack of baseline data or absence of data collection and reporting by the national custom agencies (import & export). In addition, the national household surveys do not generally include questions on the use of energy-efficient appliances.

Additional relevant information from 2018 is presented below in Box 7.

Box 7. Country highlights on energy-efficient electrical appliances

Benin

The Decree nº 2018 – 563 du 19 decembre 2018 officially published, fixes the MEPS and the energy labelling system for lights and air conditioners. Awareness raising activities and specific manuals were developed for importers and distributors supported by the Millennium Challenge Account Benin II project.[39]

Burkina Faso

Burkina Faso reported a penetration rate of 44% for energy-efficient air conditioners and refrigerators.[40]

Ghana

Ghana reported imports of 124,995 efficient air conditioners and 373,656 efficient refrigerators in 2018. Considering the reported imports in 2017, the country had imports of 273,518 efficient air conditioners and 585,994 efficient refrigerators in the period 2017-2018.

Nigeria

The Standards Organization of Nigeria in cooperation with GIZ-NESP developed MEPS and labels for air conditioners and harmonized with the regional standards developed for the ECOWAS region. GIZ-NESP supports the country to match-make interested private developers and the public institutions to manufacturers/suppliers of energy efficient air-conditioners in order to promote the market supply and

[38] Cabo Verde has not developed MEPS but has developed regulations that specify the minimum energy efficiency required for importation and sale of each product.

[39] www.mcabenin2.bj

[40] Projet Régional d'Etiquetage des Equipements Electriques Domestiques dans les Etats Membres de l'UEMOA.

demand of energy efficient electrical appliances. Furthermore, awareness raising activities for different stakeholders were designed in cooperation with GIZ-NESP.

Senegal
Senegal reported a penetration rate of 19% for energy-efficient air conditioners and 64% for energy-efficiency refrigerators.[41]

Sierra Leone
The GIZ EnDev project installed 1,001 solar fridges, each with a capacity of 370 Watt-peak (Wp) in 2017. Since 2003 the Ministry of Health has installed around 900 solar powered fridges donated by UNICEF, the United Nations Children's Fund. These are employed to cool vaccines across the country in the context of the Expanded Program on Immunization.

Togo
Dulas, the British manufacturer of solar-powered vaccine refrigerators, delivered and installed 113 solar powered fridges to support the immunization initiatives of the country's Ministry of Health and the Vaccine Alliance.

EEEP promotes the introduction of energy efficiency labelling throughout ECOWAS. MEPS also included standards for energy-efficient refrigerators and air conditioners. Table 14 lists the countries that have introduced national MEPS for electrical appliances.

Table 14. Countries that have introduced national MEPS for electrical appliances

Country	Appliance	Status
Benin	Air conditioners	Adopted, implementation was in process with the support of MCA Benin II
Cabo Verde	Air conditioners, refrigerators, TVs, water heaters, washing machines	Under development[42]
Ghana	Air conditioners, refrigerators	Adopted and implemented
Nigeria	Air conditioners, refrigerators	Adopted, implementation was in process with the support of the GIZ-NESP II[43]
Senegal	Air conditioners, refrigerators	Adopted[44]

Source: ECREEE

[41] Etude de marché Sénégal Programme d'étiquetage des appareils électroménagers UEMOA/IFDD.
[42] Cabo Verde has not developed MEPS but has elaborated regulations that specify the minimum energy efficiency required for the importation and sale of each product. It has also developed measurement and testing mechanisms to establish the necessary and obligatory conditions applicable for the technical documentation process, equipment data sheets, as well as inspection and verification of equipment energy efficiency.
[43] The Nigerian Energy Support Program (NESP) supported the Standards organisation of Nigeria (SON) in developing MEPS for air conditioners and refrigerators.
[44] Programme pour la promotion des énergie renouvelables, de l'électrification rurale et l'approvisionnement durable en combustibles domestiques (PERACOD) helped the Agence pour l'economie et la maitrise de l'energie (AEME) develop standards for three group of products: grid lights, refrigerators and air conditioners. Twelve standards were approved in 2014 in partnership with AEME and the Association Sénégalaise de Normalisation (ASN).

Ghana introduced mandatory energy efficiency labels for electric appliances as early as 2005. Cabo Verde developed the National Program Document on equipment labelling under the framework of Projeto Eficiência Energética em Edifícios e Equipamentos (Energy Efficiency in Buildings and Equipment Project).[45] This document is in line with the ECOWAS Energy Efficiency Initiative on Standards and Labelling, which will regulate labelling for products that meet minimum energy efficiency standards, as well as creating a comparative label.

3.3.4 Energy efficiency in buildings

The adoption of regional standards and labels and the development of energy-efficient building codes are two major EEEP targets[46]. The ECOWAS Ministers of Energy approved the regional Energy Efficiency in Buildings (EEB) Directive at their 11th meeting in Guinea in 2016. Some ECOWAS member states are already implementing activities to promote energy efficiency in buildings.

Côte d'Ivoire approved a decree in 2016[47] that lays down the terms, conditions and obligations for implementing energy control in buildings. This introduces mandatory and periodic energy audits for establishments that consume large amounts of electricity, including public buildings and institutions.

Nigeria adopted a Building Energy Efficiency Guideline and Building Energy Efficiency Code (BEEC) in June 2016.[48] In addition, the NESP programme reported on six energy-efficient buildings. The Federal Ministry of Power, Works and Housing has committed to ensure that all its new buildings are compliant with the BEEC. GIZ-NESP supports 6 states to adopt the BEEC minimum energy requirements to their existing state building regulations. In addition, 7 private developers are supported in the review of their building designs and subsequent construction to achieve and promote energy efficiency.

In Senegal, a Franco-Senegalese ministerial agreement on low-carbon buildings was signed in December 2016 between Agence Française de l'Environnement et de la Maîtrise de l'Energie (French national agency for energy efficiency), Agence de l'Environnement et de la maîtrise de l'énergie du Sénégal (ADEME), and the Senegalese Environment Ministry. Consequently, the eco-construction industry has grown, as evidenced by the emergence of local actors and new jobs.

In Cabo Verde, implementation of energy efficiency measures in the building sector is supported by the energy efficiency in buildings and equipment project. For further decision-making and energy efficiency measures as well as for the Code of energy conservation in buildings, the country has already developed the framework for the energy management system to measure buildings energy savings, water use and emissions reductions. The Code of energy conservation in buildings will set the minimum requirements for energy efficiency in the design and construction of buildings. It will also define the requirements needed to achieve energy efficiency levels above the minimum requirements and will provide intervention guidelines for existing buildings to meet the minimum energy efficiency requirements. With the approval and implementation of the energy management system and the Code of energy conservation in buildings, the country expects to increase the number of energy-efficient buildings. In 2018, the energy-efficient buildings reported were the same as in the 2017 regional progress report.[49]

In Ghana, the Energy Commission installed capacitor banks in 36 hospitals and public institutions to reduce their electricity demand.

[45] www.peee.cv

[46] UEMOA has also planned the development of a regional code of energy efficiency in new buildings that would be applicable to Benin, Burkina Faso, Cote d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal and Togo.

[47] Décret n°2016-862 du 03 novembre 2016.

[48] Federal Ministry of Power, Works and Housing of Nigeria (Housing) (2016).

[49] ECREEE (2019).

3.3.5 Energy efficiency in industry

The NEEAPs highlighted energy efficiency improvement in the industrial sector as a way to liberate energy generation capacity and create a more competitive industrial sector by reducing operational costs. The action plans also reported and quantified energy efficiency efforts and targets in this sector.

This progress report aims to monitor the number of industries, companies etc. that have implemented energy efficiency measures. Several activities would indicate the consideration and implementation of energy efficiency measures. These include, for example, energy audits, replacement of incandescent lamps by efficient lights, replacement of inefficient refrigerators and cooling systems, and implementation of international standards like ISO 14001 and 50001. However, the ECOWAS countries have not generally reported on these measures.

Burkina Faso, Cabo Verde, Côte d'Ivoire, The Gambia, Guinea, Nigeria and Togo reported that 41 companies in total had implemented energy efficiency measures by 2018. Among these 40 companies, 13 are hotels in Cabo Verde, The Gambia and Nigeria.

In Burkina Faso the Ministry of Energy's General Directorate for Energy Efficiency reported that nine companies had implemented energy efficiency measures. In Cabo Verde, the National Directorate of Industry, Commerce and Energy reported 5 industries involved in electricity production and water desalination, food and drinks production, plastics and paints, and one of the national ports, with implemented energy efficiency measures. The national utility in Côte d'Ivoire, CIE, achieved the following certifications: ISO 9001, OSHAS 18001, ISO 14001 and ISO 45001. Guinea reported that one industry[50] implemented energy efficiency measures. In Togo, 3 companies involved in sheet metal and metallurgical products, construction materials, gas and plastics production, implemented energy efficiency measures in the context of a project funded by the French Development Agency.

In Nigeria, eight companies had already implemented energy efficiency measures as pilot projects with the support of the GIZ NESP program. Two of these – one in the steel industry and other in the food production industry – implemented an Energy Management System based on ISO 50001. In addition, seven companies[51] also supported by GIZ NESP implemented energy audits and retrofitted some of their equipment based on identified energy saving opportunities. Six of these companies also participate in the energy efficiency network developed for Nigerian Industries – a learning platform for companies to exchange ideas on energy efficiency issues. The Government of Nigeria estimates that the industrial sector could save 30-50% of energy by implementing energy efficiency measures.

[50] The Topaz Group : www.topazgroup.com

[51] These companies operate in the following industrial activities: chemicals and pharmaceuticals, domestic and industrial plastic, rubber and foam, food, beverages and tobacco, pulp and paper products, printing and publishing.

4 HIGHLIGHT OF 2018: SOLAR ON-GRID BECAME THE MAIN RENEWABLE ENERGY TECHNOLOGY IN TERMS OF INSTALLED CAPACITY

The year of 2018 was an historical year in terms of solar on-grid installed capacity in the ECOWAS region. For the first time, PV on-grid became the main renewable energy technology in terms of installed capacity in the region (excluding medium and large hydropower installed capacity).

With 234 MW of on-grid installed capacity, PV passed small and mini-hydropower that remained with 192 MW of installed capacity. 27 MW of wind energy and 16 MW of bioenergy completed the 469 MW of renewable energy on-grid installed capacity excluding medium and large hydro. Altogether, this renewable energy installed capacity represented the 2% of the total on-grid installed capacity in the region.

This remarkable milestone is explained by the commissioning of new on-grid solar plants in Cabo Verde, Ghana, Niger and Senegal.

Cabo Verde commissioned 1.3 MW of on-grid installed capacity through the inauguration of the PV plant Ponta Preta in Sal Island. The project was led by the utility Aguas de Ponta Preta, and was funded by the utility and a local commercial bank.

In Ghana, 20 MW were commissioned 60 Km southwest of Accra, near to Winneba, and added to the already existing solar facility of Onyaadze.

In Niger, 2018 was a remarkable year because solar energy contributed for the first time to the installed on-grid capacity and production when Malbaza (7 MW) was commissioned. The project provides electricity access to about 30,000 households.

Finally, in Senegal, the tendency of commissioning new solar on-grid plants continued in 2018, a year that started with the official inauguration of Ten Merina Ndakhar (30 MW). Additionally, two new power plants were commissioned: Sakal (20 MW) and Kahone (21.2 MW). Apart from solar on-grid, it is also remarkable that the country officially started the construction of the first utility-scale wind farm, the 158.7 MW Parc Eolien Taïba N'Diaye, which is expected to be commissioned by 2020.

This tendency will continue in the next years, reaffirming solar on-grid installed capacity as the main renewable energy technology in terms of installed capacity in the ECOWAS region, as several solar on-grid power plants will be commissioned in almost all ECOWAS member states in the next three years.

Apart from PV on-grid installed capacity, it was also remarkable the official commissioning of the world's largest isolated hybrid thermal-PV plant. The Essakane gold mine in the northeast of Burkina Faso officially inaugurated 15 MWp of solar PV capacity to add to an existing isolated Heavy-Fuel Oil (HFO) power plant. The resulting 72 MW hybrid solar-HFO power plant became the largest of its kind in the world, and it will contribute to decrease the mine's fuel consumption by approximately 6 million liters per year and reduce its annual CO_2 emissions by nearly 18,500 tons. However, it could be relegated in the next years if a similar project in Mali commissions 40 MWp in the next years at the Synama Gold mine in Mali.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The ECOWAS region aims to provide 65% of its population with access to electricity by 2020. The region is moving towards this target; 52.3% of the population had access to grid electricity in 2018. However, the percentage of access in terms of population was probably higher. This is because the Regional Monitoring Framework does not monitor access provided by conventional mini-grids and stand-alone systems such as diesel generators, which were still an important source of energy for rural areas.

About 2.5% of the rural population had electricity access provided by decentralized renewable energy solutions such as CEMGs and stand-alone renewable energy systems. The number of existing CEMGs was too far from the target of 60,000 installed by 2020, which seems to be unattainable. Even though the solar off-grid sector had a fruitful year in 2018 in terms of fundraising, and several donor projects contributed to increase electricity access by providing SHS, a percentage of 2.5% fell far from the regional target of 2020, which establishes a share of rural population served by these type of systems to 22%.

Nevertheless, some countries, such as Senegal, Burkina Faso, Ghana and Niger made considerable steps to increase installed renewable energy capacity (RE on-grid installed capacity and CEMGs). ECOWAS countries will need to continue their efforts towards attaining the regional target of 10% of on-grid electricity from renewable sources by 2020 (excluding medium and large hydropower). Indeed, the share in 2018 only amounted to 2%. The region aims to have about 2,425 MW of on-grid installed renewable energy capacity by 2020 (excluding LMSH). However, capacity amounted to 469 MW in 2018. The situation is different if LMSH are included. The share of on-grid renewable energy capacity in 2018 including LMSH plants installed in the region amounted to 24% with an installed capacity of 5,612 MW. However, the 2020 target is 35%. New medium and large hydropower power projects in Guinea and Côte d'Ivoire will contribute to achieving this target.

About 36% of the electricity produced at regional level in 2018 was lost due to a combination of technical factors and non-technical losses. No clear trend from the past few years visibly indicates that the region is advancing towards its target of 10% of electricity losses by 2020. However, the identified reduction of losses in the ECOWAS region as compared to 2017 will need to be confirmed in the next few years to verify whether national efforts are moving the region towards its target.

In terms of energy efficiency, member states should also increase efforts to promote SWH considering the competitiveness of these systems and the amount of reduction in electricity consumption. The assessment of these systems faces a challenge due to lack of data.

A remarkable reality on EE in 2018 is the fact that the region was moving forward into EE lighting solutions both for private and public demand, and thanks to both national programs and donor funded projects. Also the region welcomed the first manufacturing solar lamps factory on an industrial scale in the African continent.

5.2 Recommendations

Each individual ECOWAS country should have updated knowledge of where it stands in terms of renewable energy, energy efficiency and energy access. This will benefit both the country and the region, helping each make effective plans and decisions. The Regional Monitoring Framework could become an important tool for policy makers and other stakeholders by providing annual snapshots and trends along the three axes covered.

It was not possible to monitor the regional share of access to ICS and modern cooking solutions because of a lack of updates in periodic national surveys on household living conditions by the national statistical services. Even though these censuses evaluated access to modern cooking solutions such as LPG, it was not possible to calculate regional access because the reference year differs considerably between countries. Moreover, it was not possible to monitor ICS access because these systems were not generally included as an indicator in national censuses. It is therefore highly recommended that the national statistical services update their national censuses on household living conditions to incorporate the use of ICS.

The ECOWAS countries should generally put more effort into collecting distributed electricity generation data such as the installed capacity and production of solar systems. Some countries such as Ghana, Mali and Cabo Verde have started quantifying the installed capacity. The Regional Progress Report could also include a section on distributed installed capacity and generation in future editions to complete the monitoring exercise on total installed renewable energy capacity.

Monitoring energy efficiency targets was also a considerable challenge in most countries due to the lack of properly functioning data collection systems. Some initiatives in the region have made progress on systematic data collection and processing. For instance, the EU is supporting UEMOA in re-establishing the UEMOA member state energy information system (Système d'Information Énergétique) (SIE). ECOWAS member states require technical and financial support to improve collection of RE and EE data. This will allow them to monitor their progress at the national level and supply the information to regional and international institutions such as UEMOA, ECREEE, IEA, IRENA and AFREC.

Energy efficiency in industry should be measured against international benchmarks such as how much energy is required to produce one tonne (or relevant unit) of product by different economic sectors. In the future, it could be worth carrying out an energy efficiency benchmarking exercise for industries in the ECOWAS region.

Finally, the monitoring framework exercise should be aligned with the member state Energy Information System (EIS) data collection process. To achieve this, the EISs should incorporate into their data collection the indicators lacking from the monitoring framework. Aligning and enhancing national data collection systems would facilitate collaboration and information sharing between countries, further benefitting the region as a whole.

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ANNEX 1: ON-GRID RENEWABLE ENERGY POWER PLANTS IN THE ECOWAS REGION IN 2017

Table below present grid connected renewable energy power plants for 2018 in ECOWAS region. They are classified by country and technology with their installed capacity. Medium and large hydropower plants are excluded.

Country / renewable energy on-grid power plant	Technology	Installed capacity (MW*)
BENIN		
Yéripao	Small hydropower	0.5
Djougou	PV	1.5[1]
	Total	**2**
BURKINA FASO		
Kompienga	Small hydropower	14
Bagre	Small hydropower	16
Tourni	Small hydropower	0.5
Niofila	Small hydropower	1.5
FasoBiogaz	Bioenergy	1.3
Zagtouli	PV	33.7
Ziga	PV	1.1
	Total	**70**
CABO VERDE		
Cabeolica Santiago - Monte São Filipe	Wind	9.35
Cabeolica São Vicente - Selada do Flamengo	Wind	5.95
Cabeolica Sal - Lajedo da Ribeira de Tarrafe	Wind	7.65
Cabeolica Boa Vista - Morro da Vigia - Ponta do Sol	Wind	2.55
Parque Eolico de Santo Antão	Wind	0.5
Murdeira (Sal)	PV	2.5
APP (Sal)	PV	1.24
Praia (Santiago)	PV	4.75
	Total	**34.5**
CÔTE D'IVOIRE		
Ayamé 1	Small hydropower	20
Ayamé 2	Small hydropower	30
Faye	Small hydropower	5
	Total	**55**
THE GAMBIA		
Gamwind	Wind	0.9
Batokunku	Wind	0.15
	Total	**1.05**
GHANA		
Navrongo	PV	2.5
Onyaandze	PV	20
Gomoa onyaandze	PV	20
Safisana Biogas	Bioenergy	0.1
	Total	**42.6**
GUINEA		
Grandes Chutes	Small hydropower	27.6
Donkea	Small hydropower	15
Baneah	Small hydropower	5

Kinkon	Small hydropower	3.4
	Total	**51**
MALI		
Sotuba	Small hydropower	5.7
	Total	**5.7**
NIGER		
Malbaza solar	PV	7
	Total	**7**
NIGERIA		
Ankwil 1 (Bagel 1)	Small hydropower	1
Ankwil 2 (Bagel 2)	Small hydropower	2
Bakolori	Small hydropower	3
Challawa Gorge	Small hydropower	3
Ouree	Small hydropower	2
Tunga	Small hydropower	0.4
Kwall (Kwali Falls)	Small hydropower	2
Ngell	Small hydropower	2
Jabi	Small hydropower	n/a
Jekko 1	Small hydropower	4
Jekko 2	Small hydropower	4
Kurra (Kurra Falls)	Small hydropower	8
	Total	**31.4**
SENEGAL		
Bokhol (Senergy 2)	PV	20
Malicounda (N.B.: 11 MW were operational in 2016)	PV	20
Diamniadio (CICAD)	PV	2
Senergy PV, Santhiou Mékhé	PV	30
Ten Mérina, Mérina Dakhar	PV	30
Sakal	PV	20
Kahone	PV	21.2
	Total	**143**
SIERRA LEONE		
Goma 1	Small hydropower	6
Charlotte	Small hydropower	2
Makali	Small hydropower	0.64
Port Loko (Bhanka Soka)	Small hydropower	2
Addax Bioenergy	Bioenergy	15
	Total	**25.6**
TOGO		
Kpime	Small hydropower	1.6
	Total	**1.6**
	Total ECOWAS region	**469**

Source: national monitoring reports 2018 (based on the 2018 utility and electricity regulator reports and the national directorates of energy and energy commissions) and ECOWREX.

[1] The total planned capacity of the Djougou solar PV plant in Benin is 5 MW, but only 1.5 MW were installed in 2018.

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