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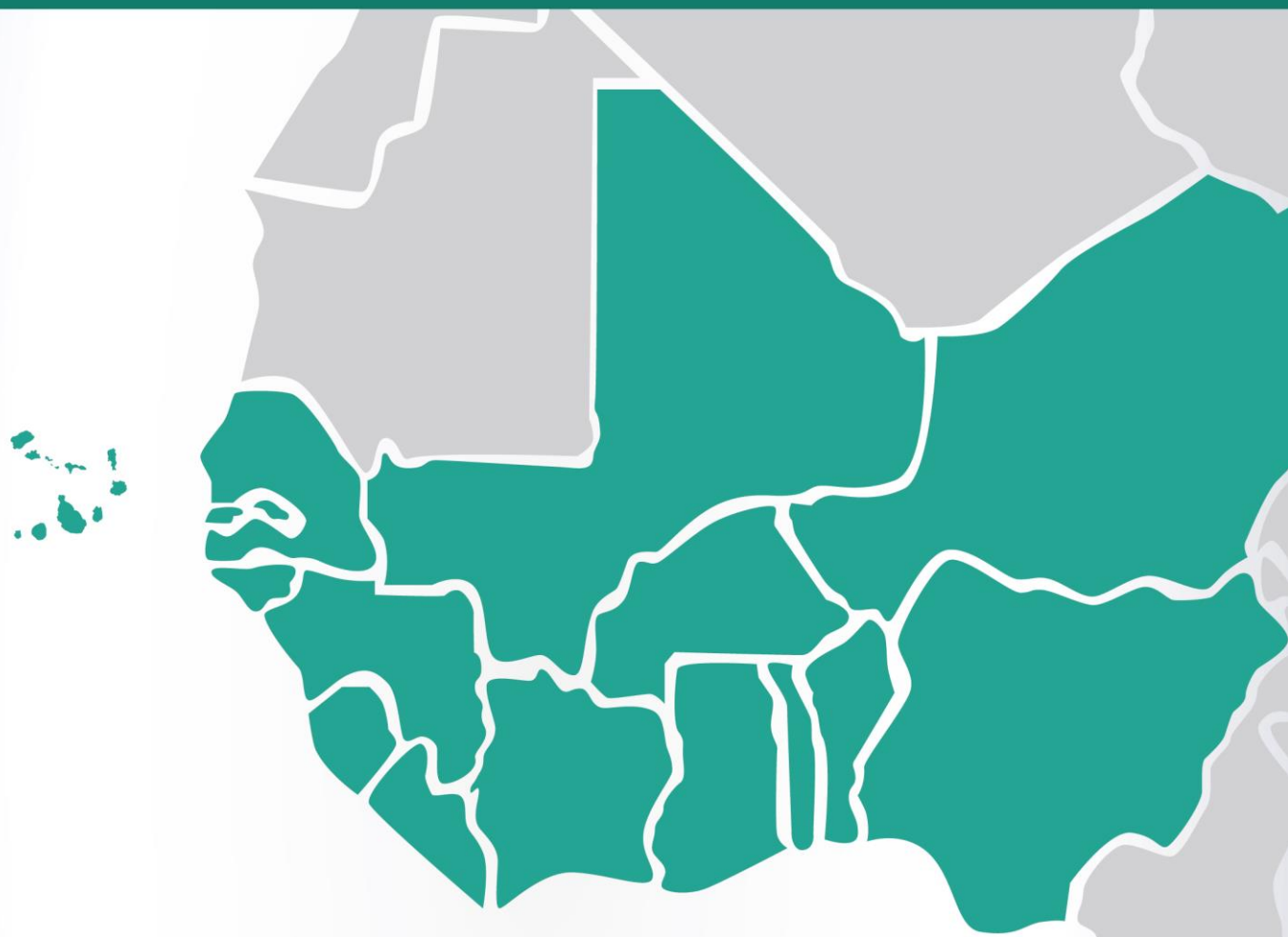
Towards Sustainable Energy

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

MONITORING YEAR: 2020



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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 fifth 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 2020, 55.5% of households had access to the electrical grid, a slight increase compared to 2019, but still below the regional target for 2020. Over 566,000 households were served by 486 operational CEMGs. Medium and large hydropower remains the major renewable source of electricity supply in the regions, contributing about approximately 23% of electricity generated. while small hydropower, solar PV, wind, and biomass, contributed 1.2% of installed capacity. Electricity generated from renewables (including large, medium and small hydro) slightly increased to 24,035 GWh, that is 23.9% share of generation in 2020. This is still far from the target of 35% in 2020.

The aggregated losses in the electrical distribution system remains high at 31% compared to regional target of 10% by 2020. Though these losses is decreasing over the years, reducing the technical losses in transmission and distribution networks is increasingly important to cover the Gap.

Few countries have adopted Minimum Energy Performance Standards for electrical appliances, and except for Ghana (who reported a total number of efficient A/Cs and refrigerators in 2020 as 534,434 and 170,472 respectively), a robust framework is yet to be in place for collecting and reporting on the import and export.

The penetration rate of some indicators in the region, such as the market share of energy-efficient appliances, could not be precisely estimated because some member states have not been able to provide quantitative data. A qualitative data was used where no quantitative data was available. Relevant framework and processes needs to be put in place in the member states, to help collect and analyse data for these indicators

No doubt, regular updates on renewable energy, energy efficiency and energy access are required at national and regional level to make informed decisions This Progress Report serves as an important tool for policy makers and other stakeholders by providing annual snapshots and trends along the three axes[2] covered.

[2] Renewable Energy, Energy Efficiency and Energy Access

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

1.1 Access to electricity grid

In 2020, the overall population of the ECOWAS region was approximately 395 million people living in 74 million households. Just over half the population (**52.0%) which translates to 55.5% of households, had access to the electrical grid. This is a little increase compared to 2019, and its still below the regional target for 2020**. For most Member states, even with the increase in access rate, they are yet to attain the access targets in their national action plans. This could be attributed to the rapid increase in population compared to the slow increase in electricity access rate and coupled with the lack of updated national household surveys some countries.

The Comparism of the population's electrification rate across the region in 2019, 2020 and the 2020 national electrification access targets is displayed in Figure 1. Below

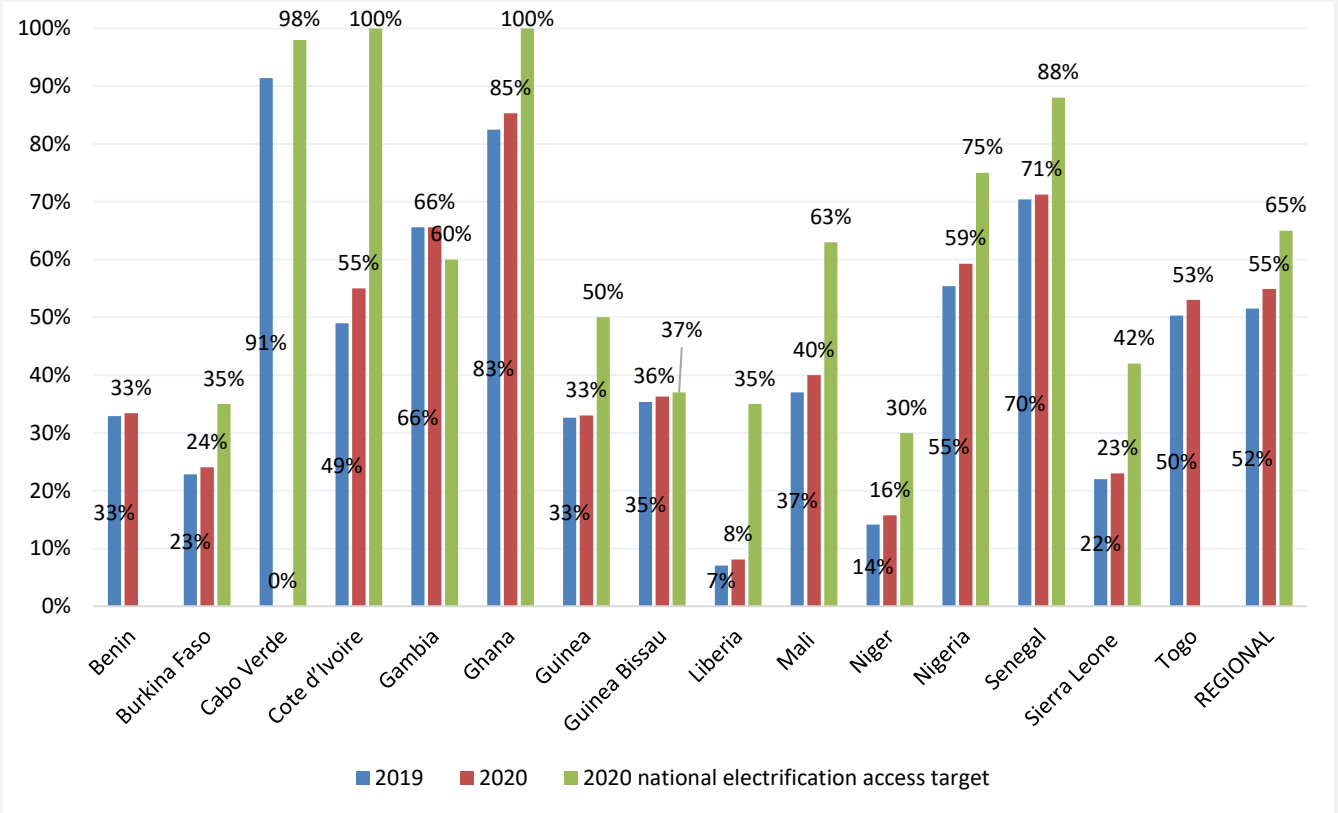


Figure 1: Share (%) of population connected to an electricity grid in 2020[3]

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

[3] *Source: national monitoring reports 2019 (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 2020)*

1.2 Share of households served by clean energy mini-grids

In 2020, just over 566,000 households were connected to 486 operational CEMGs. These numbers given in the table below (comparing 2018 and 2019) are generated from the best available data collected from the private operators and companies, and other relevant energy institutions. **This is far from the regional target of promoting 60,000 CEMGs by 2020.** Given that this target was not achieved, the region would need to make giant steps in the coming years to drive the deployment of CEMGs for rural electrification, in order to meet the 2030 targets.

Table 1: Existing CEMGs in 2020

Country	Existing CEMGs 2020	Operational CEMGs 2019
Benin	66	66
Burkina Faso	36	31
Cabo Verde	7	7
Côte d'Ivoire	7	7
Gambia	1	1
Ghana	13	13
Guinea	3	3
Guinea-Bissau	6	4
Liberia	13	11
Mali	75	47
Niger	14	14
Nigeria	56	44
Senegal	162	133
Sierra Leone	23	14
Togo	4	4
Regional	**486**	**370**

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

In 2020, 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. With the unavailability of penetration rate in some countries, it was not possible to quantify the penetration rate at regional level. The lack of available information on the penetration rate shows there is no systematic way to collect relevant data and thus assess the share of access from these systems.

The increase in the number of standalone systems deployed in the region from 833,606 in 2019 to 1,363,595. In 2020 is notably noticed in Sierra Leone, Benin, Mali and Nigeria.

Table 2: Share of households connected to renewable energy stand-alone systems.

	Share HH stand-alone system	Estimated number of stand-alone systems
Benin	0%	220,600
Burkina Faso	n/a	1,457
Cape Verde	n/a	n/a
Cote d'Ivoire	2%	54,604
Gambia	14%	583
Ghana	n/a	185,258
Guinea	n/a	n/a

Guinea Bissau	4%	3,126
Liberia	n/a	54,000
Mali	2%	131,918
Niger	n/a	39,643
Nigeria	n/a	493,826
Senegal	8%	67,195
Sierra Leone	2%	61,944
Togo	1%	49,441
Regional	----	**1,363,595**

Source: national monitoring reports 2002 (based on data provided by national directorates of energy, national Energy Information Systems)
The estimated number of stand-alone renewable energy systems was based on available data and may over- or understate the real number.

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

Table 5 displays census or survey results from the ECOWAS countries conducted in different years between 2004 and 2018.

Table 3: Share (%) of households using modern cooking solutions in ECOWAS Countries

	Share of HH using modern cooking solutions (2020)	Share of HH using modern cooking solutions (2019)
Benin	8.1%	8.1%
Burkina Faso	10%	10%
Cabo Verde	CVD19	81.9%
Cote d'Ivoire	22.0%	22.0%
Gambia	59.0%	59.0%
Ghana	24.8%	24.8%
Guinea	0.1%	0.05%
Guinea Bissau	5.0%	5.0%
Liberia		
Mali	28.9%	28.9%
Niger	2.9%	2.9%
Nigeria	26.0%	26.0%
Senegal	43.5%	43.5%
Sierra Leone	3.1%	3.10%
Togo		3.3%

Source: national statistical services, national directorates of energy and/or national Energy Information Systems
Notes:

The national censuses report 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.

1.3.2 Share of ECOWAS households using improved cookstoves

The penetration rates of ICS in the region ranged from 0.009% in Cabo Verde to 24.8% in Ghana. Table 6 presents the penetration rate for all countries that reported information. Liberia reported a total of 11, 575 distributed in 2020.

Table 4: Share of households with improved cookstoves in the ECOWAS countries

	Share of HH with ICS (2019	Share of HH with ICS (2020)
Benin	10.7%	10.7%
Burkina Faso	23.0%	23.0%
Cabo Verde	0.009%	
Gambia	63.0%	63.0%
Ghana	24.8%	24.8%
Guinea	0.5%	0.5%
Guinea Bissau	2.0%	2.0%
Mali	20.0%	20.0%
Niger	2.0%	2.0%
Senegal	13.5%	13.5%
Sierra Leone	6.30%	6.3%

Source: national monitoring reports 2020 (based on information provided by the national statistical services, national directorates in charge of energy and national REAs)

Note*: the reference year was not the same in every country.*

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.

2 RENEWABLE ENERGY

2.1 Installed Capacity

The total installed capacity in the region was 23,447 MW. Renewable energy capacity including LMSH, accounts for approximately 24% (6,255 MW) of total capacity, and 795 MW without LMSH. It is clear that target by 2020 to have renewable energy share of the regional electricity mix to 10% excluding LMSH and 35% including LMSH was not achieved.

Table 7 presents the total on-grid installed capacity and the installed on-grid renewable energy capacity in 2020 in the ECOWAS region.

Table 5: On-grid installed electricity capacity (MW) in the ECOWAS region, 2020[4]

	Total Installed Capacity	RE installed capacity in MW (including LMSH)	RE installed capacity in MW (excluding LMSH)
Benin	348	3	2
Burkina Faso	419	67	35
Cape Verde	178	35	35
Cote d'Ivoire	2,229	879	55
Gambia	147	1	1
Ghana	5,328	1,679	99
Guinea	942	593	53
Guinea Bissau	26	5	5
Liberia	134	66	22
Mali	901	401	95
Niger	136	7	7
Nigeria	13,500	1,948	31
Senegal	1,484	401	326
Sierra Leone	202	103	27
Togo	228	67	2
Regional	26,203	6,255	795
Renewable energy share in 2020 (%)		**23.9%**	**3.0%**
Renewable energy share – target 2020 (%)		**35%**	**10%**

Notes:
LMSH: Large and Medium Scale Hydropower.

2.2 Renewable energy generation

At regional level, renewable energy generation including Large and Medium Scale Hydropower (LMSH) comprised approximately to 23.9% or 24 million MWh of total generation. Renewable energy excluding LMSH accounted for approximately 1.2% or 1 million MWh of total generation. Note that Nigeria and Liberia could

[4] *Source: national monitoring reports 2020 (based on the 2020 utility and electricity regulator reports and the national directorates of energy and energy commissions), ECOWREX and EREP.*

not report on the renewable generation excluding LMSH. Table 8 displays total on-grid electricity generation and renewable energy generation by country.

Table 6: Total on-grid energy generation and renewable generation (MWh) in the ECOWAS region in 2020[5]

	Total generation MWh	Renewable energy generation in MWh (including LMSH)	Renewable energy generation in MWh (excluding LMSH)
Benin	817,455	7,434	7,434
Burkina Faso	2,193,800	174,800	62,400
Cape Verde	452,947	82,809	82,809
Cote d'Ivoire	11,204,000	5,273,300	184,900
Gambia	433,000	3	3
Ghana	20,170,277	7,350,087	57
Guinea	4,013	2,966	266
Guinea Bissau	115,627	55	55
Liberia	15,849,339	109,900	0
Mali	5,269,978	1,622,501	116,527
Niger	269,051	11,822	11,822
Nigeria	35,720,001	7,612,736	0
Senegal	4,814,000	810,998	455,478
Sierra Leone	1,768,031	900,528	236,520
Togo	1,638,410	75,130	3,200
Regional	**100,719,929**	**24,035,068**	**1,161,471**
Share of renewable energy generation 2020		**23.9%**	**1.2%**
Share of renewable energy generation 2019		**24.8%**	**5.9%**

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

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 7. Number of existing and/or installed SWH[6]

	Number of HH SWH	Number of SWH in public institutions	Number of SWH in SMEs, hotels and industries
Burkina Faso	n/a	181	n/a
Cabo Verde			984

[5] *Source: national monitoring reports 2020 (based on the 2020 utility and electricity regulator reports and the national directorates of energy and energy commissions).*

[6] *Source: national monitoring reports 2018; ECREEE 2016.*

Gambia	n/a	n/a	1
Ghana	1	1	3
Guinea Bissau	n/a	25	n/a
Liberia	n/a	n/a	45
Mali	10	17	n/a
Nigeria	n/a	68	n/a
Senegal	n/a	200	n/a
Sierra Leone	455		

2.4 Bioethanol production

The Table 11 below presents bioethanol and biodiesel production in from 2016 to 2020. Except for Mali (using Jatropha seeds), no Member States reported production from in 2020. This highlighted the need for an effective baseline assessment and data collection framework.

Table 8: Bioethanol and biodiesel production[7]

	Bioethanol production (L)	**Biodiesel production (L)**
Liberia	n/a	8701
Mali	8,975,770	15,630
Niger	n/a	27360
Senegal	500,000	n/a
Sierra Leone	4,000,000	n/a

[7] *Source: national monitoring reports 2020, Agence Nationale du Développement des Biocarburants (Mali), Compagnie Sucrière Sénégalaise (Senegal), SUNBIRD (Sierra Leone)*

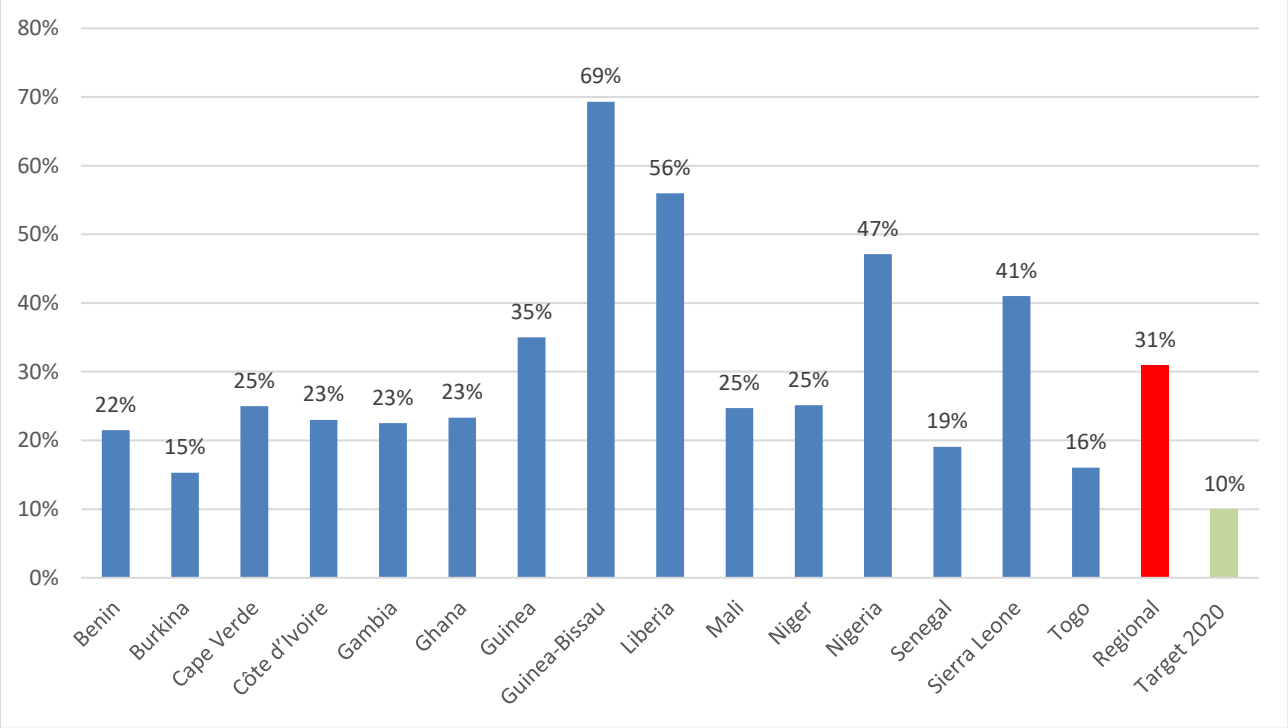
3 ENERGY EFFICIENCY

3.1 Electricity distribution losses in the region

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 because some utilities reported overall losses or technical losses of the distribution system and differentiating between technical and non-technical or commercial losses.

Country reports and information provided by the utilities show that 31% of the electricity produced (26,207 GWh) was lost in the ECOWAS region in 2020 (Figure 3). Though the trend shows a reduction compared to 2018 and 2019, it is still far from the 10% regional target by 2020 as defined by the EEEP.

Figure 2. Aggregated electricity losses[8]



3.2 Energy-efficient lighting

This report aims to monitor at country level the penetration rate of efficient lighting for both private and public purposes. However, **a regional assessment of efficient lighting penetration rates in 2020 was not possible. In summary, countries reported a total number of 10,508,001 efficient lights (Table 12).** Burkina Faso, Mali, and Togo also reported on the penetration rates. However, some countries such as the Gambia, Ghana, and Senegal, have had increased penetration rates due to the implementations of some donors funded projects.

[8] *Source: national monitoring reports 2020*

Table 9. Existing number of efficient lights in the ECOWAS region[9]

	Number of Efficient lamps	Number of efficient public lamps	Number of Solar Street lights	Penetration rate efficient lamps	Penetration rate efficient public lighting
Benin	832,444	18,062	16,759	n/a	n/a
Burkina Faso	1,500,000	20,295	1,924	5%	18%
Cabo Verde	n/a	10,067	n/a	n/a	n/a
Cote d'Ivoire	4,463,368	n/a	116,942	n/a	n/a
Gambia	5,000	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	31,512	n/a	n/a
Guinea Bissau	n/a	30,730	1,484	n/a	n/a
Liberia	n/a	4,000	n/a	n/a	n/a
Mali	2,065,649	8,000	8,394	18.11%	22.17%
Niger	37,320	3,011	1,541	n/a	n/a
Nigeria	n/a	n/a	20,000	n/a	n/a
Senegal	n/a	38,620	1,835	n/a	n/a
Sierra Leone	n/a	n/a	8,471	n/a	n/a
Togo	420,320	n/a	13,540	n/a	38.18%
Regional	**10,508,001**	**142,200**	**222,402**	**N/A**	**N/A**

Notes:
Solar streetlights could be considered efficient public lights. However, it has been preferred to separate this information in a different column.

3.3 Energy-efficient electrical appliances

The penetration rates of energy-efficient appliances, such as air conditioners and refrigerators, was mainly reported and updated by Ghana. Ghana reported the number of efficient A/Cs and refrigerators in 2020 as 534,434 and 170,472 respectively. The absence of data in some Member States could be attributed to lack of baseline data or reporting by the national custom agencies (import & export). And the national household surveys do not generally include questions on the use of energy-efficient appliances.

EEEP promotes the introduction of energy efficiency labelling throughout ECOWAS. Benin, Cabo Verde, Ghana, Nigeria and Senegal have all adopted MEPS for electrical appliances.

3.4 Energy efficiency in buildings

Countries with Energy Efficiency measures in buildings include:

1. Côte d'Ivoire approved a decree in 2016[10] that lays down the terms, conditions and obligations for implementing energy control in buildings.

[9] *Source: national monitoring reports*
[10] Décret n°2016-862 du 03 novembre 2016.

2. Nigeria adopted a Building Energy Efficiency Guideline and Building Energy Efficiency Code (BEEC) in June 2016.[11] In addition, the NESP programme reported on six energy-efficient buildings.

3. 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.

4. With the approval and implementation of the energy management system and the Code of energy conservation in buildings in Cape Verde, the country reported a total of 2 energy-efficient buildings.

5. Ghana also reported an increase from 32 to 42 Number of Energy Efficient Buildings

3.5 Energy efficiency in industry

With a slight increase in Nigeria, Cabo Verde, the table below shows a reported a total number of 69 companies that implemented energy efficiency measures by 2020. Cabo Verde reported a total of 11 hotel that implement EE measures.

Table 10: Total number of Energy Efficiency measures in buildings

BFA	CBV	CIV	GIN	NER	NGA	TGO	Total
9	43	1	2	1	10	3	69

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

4 RECOMMENDATIONS

The year 2022 is a major milestone for the Renewable Energy and Energy Efficiency policies. The targets set to be achieved by 2020 is far from the being achieved. This can be attributed to several factors, including, lack of adequate policy, regulatory framework and structures in place, lack of standardization, poor data management framework, adequate financing mechanism, private sector involvement and more.

The member states would need to take giant steps in the coming years to meet the targets in 2030. Approach such at the promotion of off-grid systems such as clean energy mini-grids (CEMGs) and stand-alone technologies can serve to boost access to electricity in rural area, where most of the population have no electricity. We acknowledge the various efforts that are underway in the member state, to cover the huge gap in the Energy Efficiency sector, and the marginal development, particularly in buildings and industries. This can go a long way to improve the sector if properly implemented.

Efforts should also be directed towards developing the baseline data and relevant framework for data collection, which hinders proper reporting in some of the member states. Most member states could not to provide quantitative data for some indicators and data such as energy efficiency indicators, data on improved cookstoves (ICS), etc., which makes it difficult to estimate their penetration rates in the region.

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