Workshop

**RENEWABLE COLLECTIVE SELF-CONSUMPTION: ENERGY COMMUNITIES AND MINI GRIDS**

October 14, 2025 | Ankara, Türkiye

ENERGY REGULATORS REGIONAL ASSOCIATION

# Increased Electricity Access through Sustainable Mini-grids

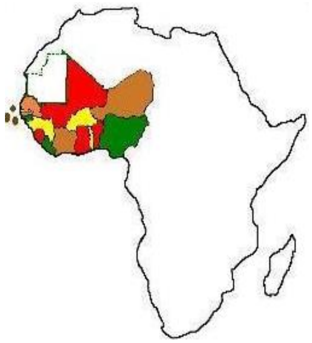

Ing. Kocou Laurent R. Tossou

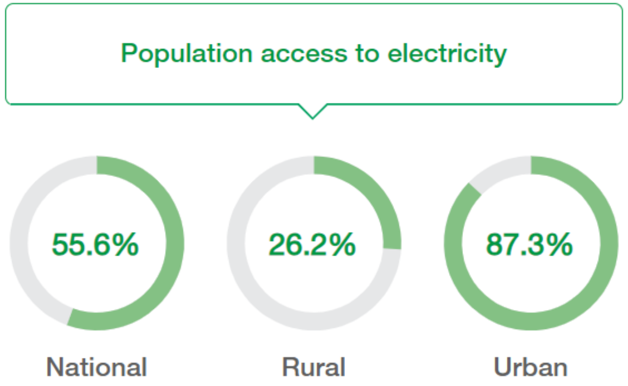
Chairman, ERERA

# Outline of Presentation

1. Introduction on the ECOWAS energy sector and the Regional Electricity Market (REM)
2. Integration of RE in ECOWAS Energy Sector
3. RE Policies: targets and prospects
4. RE Auctions at regional and national levels
5. Energy Communities & Mini-grids – Global Benchmarks
6. ECOWAS– Regional Framework Status
7. Implementation Survey– Selected ECOWAS Countries
8. Contributions from New Regulation
9. ECOWAS Success Stories on Community Programs
10. ERERA's Role
11. ERERA's Future Actions to support Mini-grids
12. Conclusion and Key Takeaways

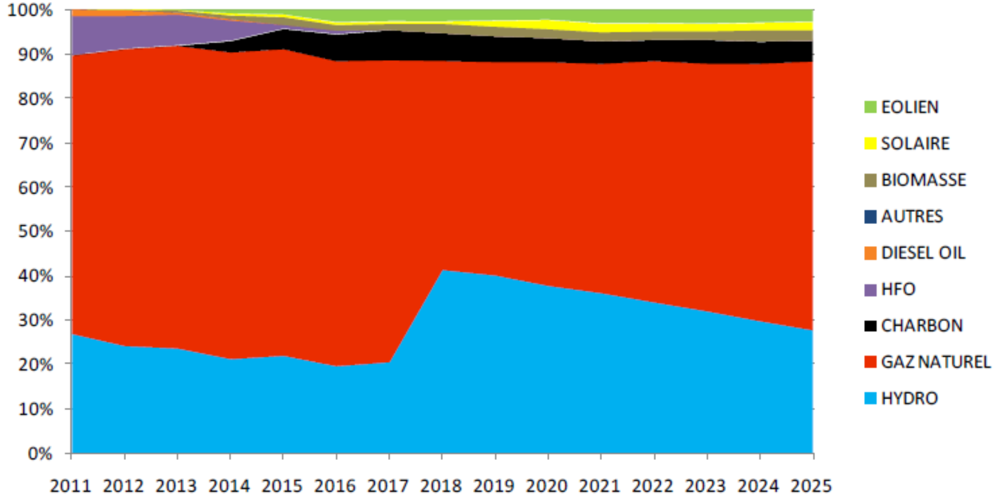
# 1. Introduction on the ECOWAS Energy sector and the REM





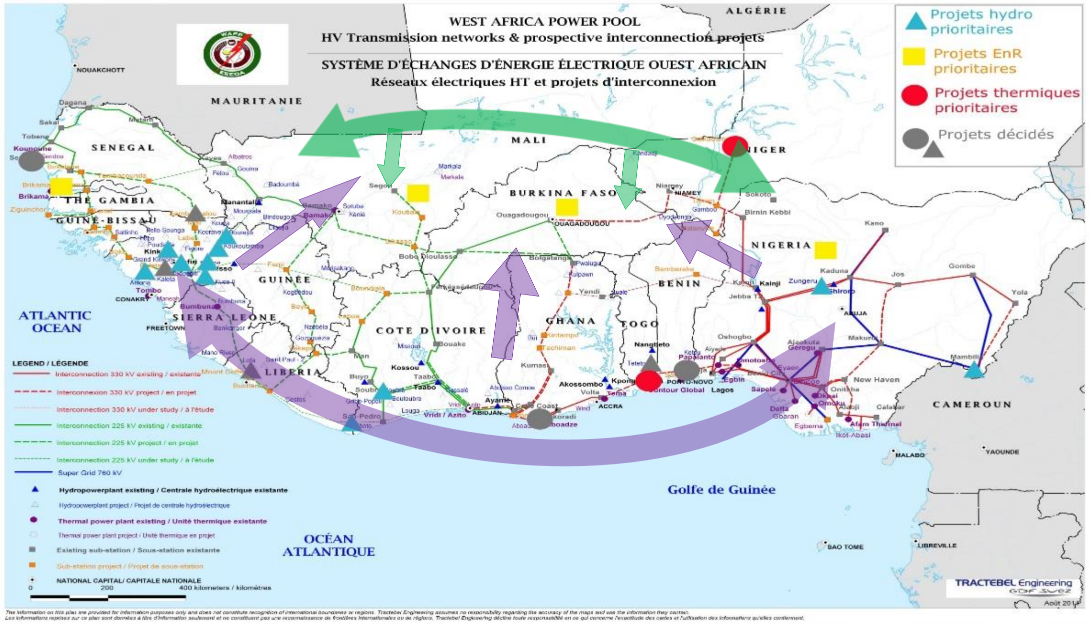

Source: africa-energy-portal.org

Energy Mix in terms of energy produced

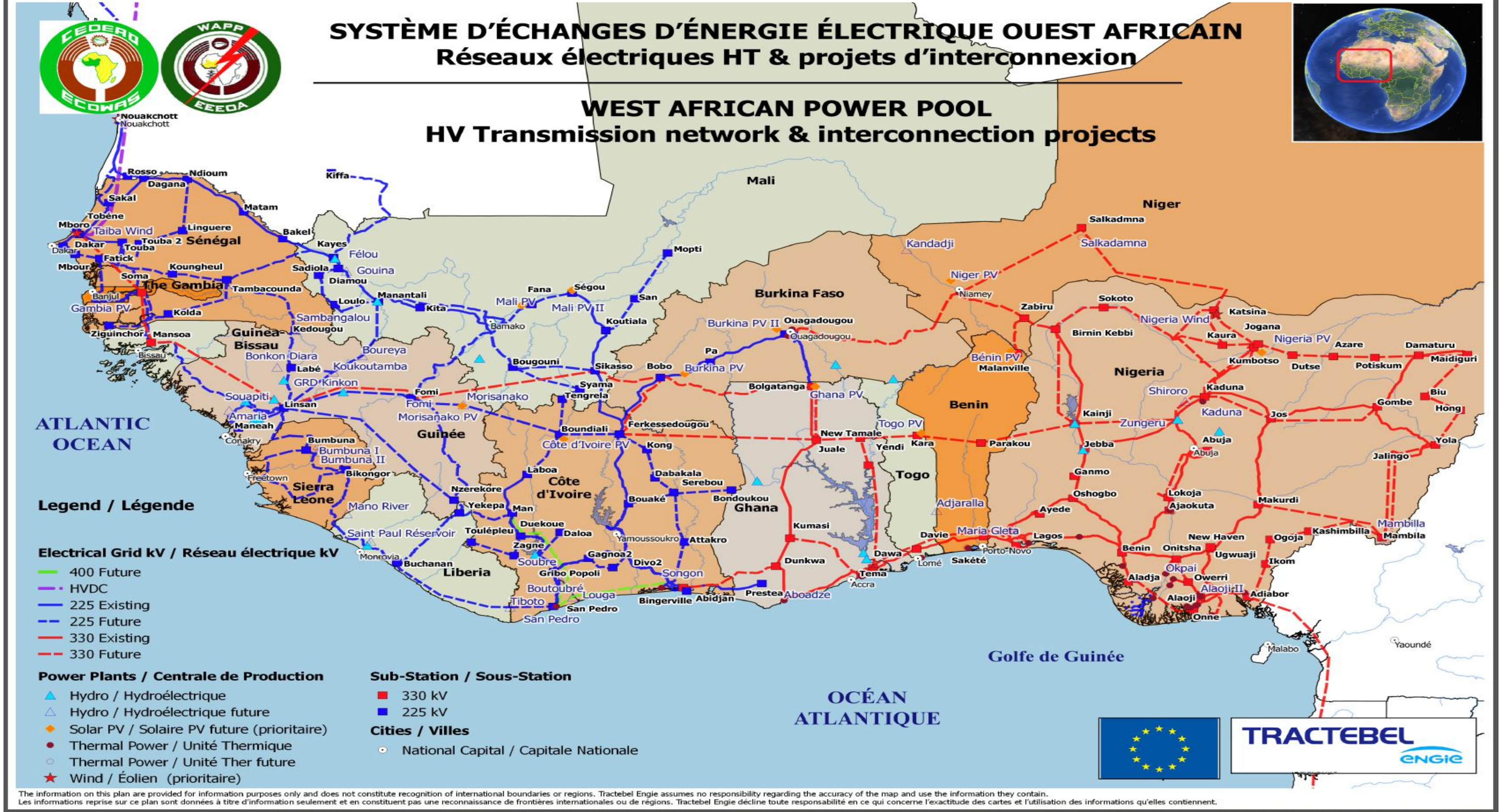



Source: Updated WAPP Master Plan

- 15 Member States
- Area: 5,112,903 $Km^2$ ($7^{th}$ in the World)
- Population (2022): 420 millions ($4^{th}$ in the World)
- 30% of proven crude oil reserves and 31% for Natural Gas
- 546 million tons of coal – 225,459 UT Uranium
- 23,900 MW hydroelectricity but only 16% exploited
- Sunshine > $5kWh/m^2$/jour; Wind speed 5-6 m/s some places
- Huge biomass potential
- Electricity demand growth rate of 7% p.a.



# 1. Introduction on the ECOWAS Energy sector and the REM




Source: WAPP

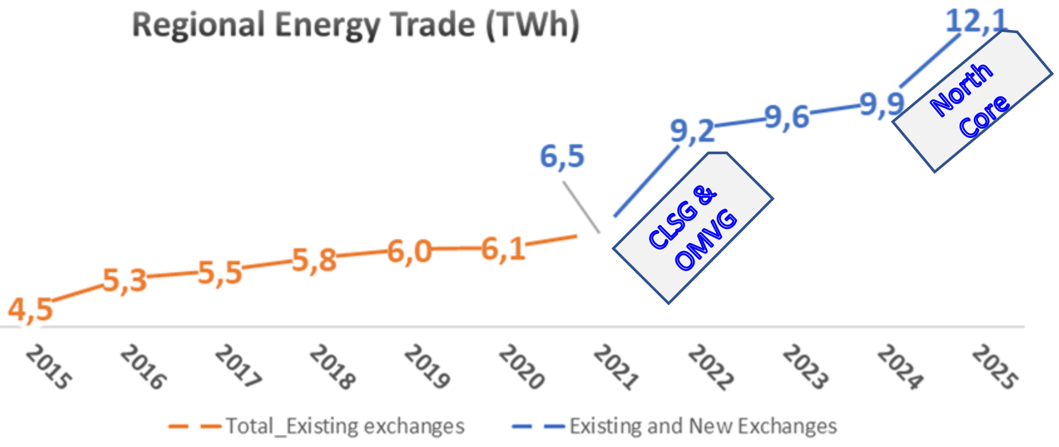
# 1. Introduction on the ECOWAS Energy sector and the REM

- **The ECOWAS Regional Electricity Market**

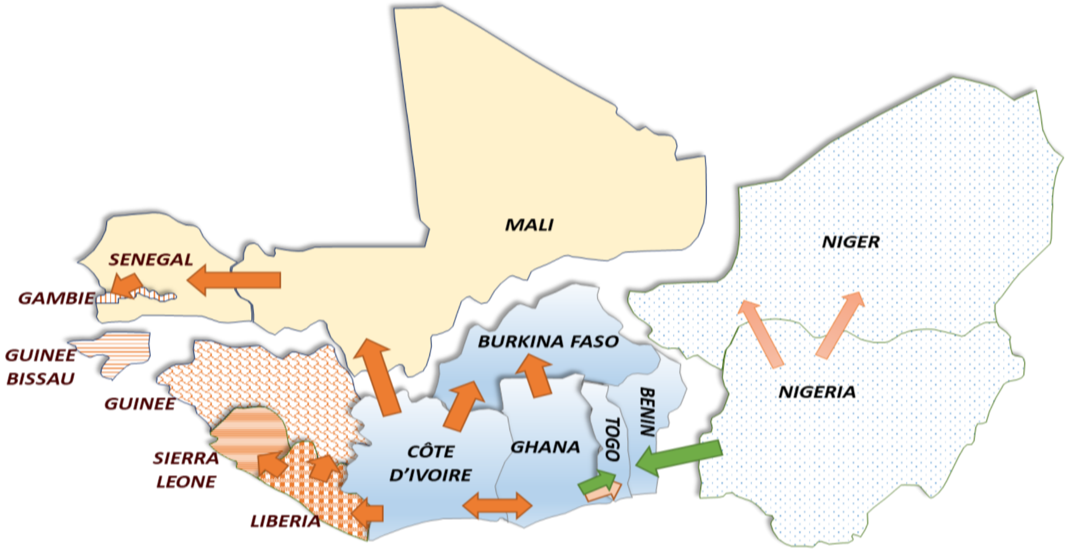
**Annual Data 2024 (Interconnected)**

- Power installed : 23,7 GW
- Available Power : 13,0 GW
- System Peak : 12,0 GW
- Generation : 79,6 TWh
- Exchanges* : 9,2 TWh (7,0%)

* Les Echanges représentent 7.0% de l'Energie Produite

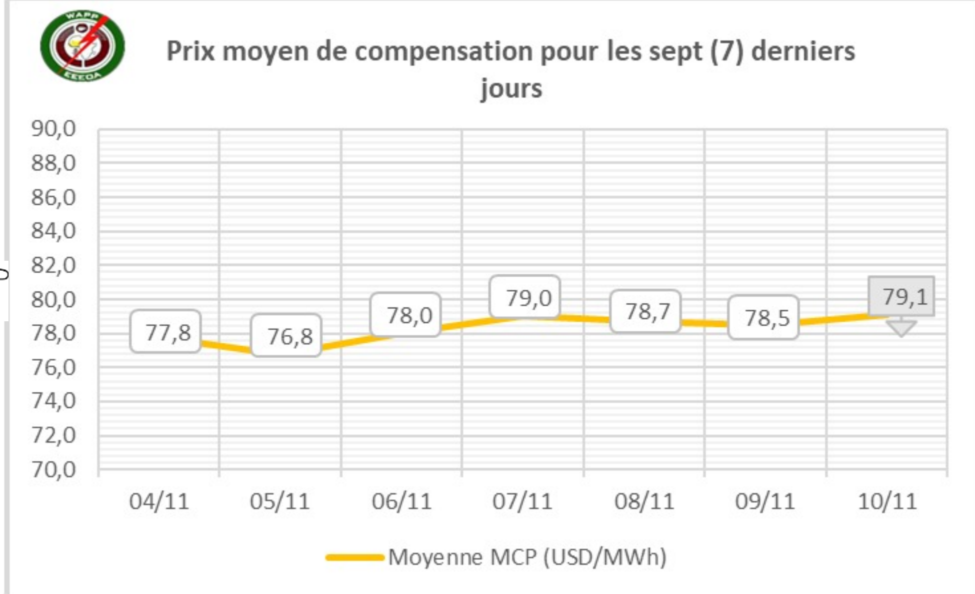



Evolution of growth in energy exchanges with peak in 2021 and peak expected in 2025




Map of WAPP Synchronous Networks and exchanges

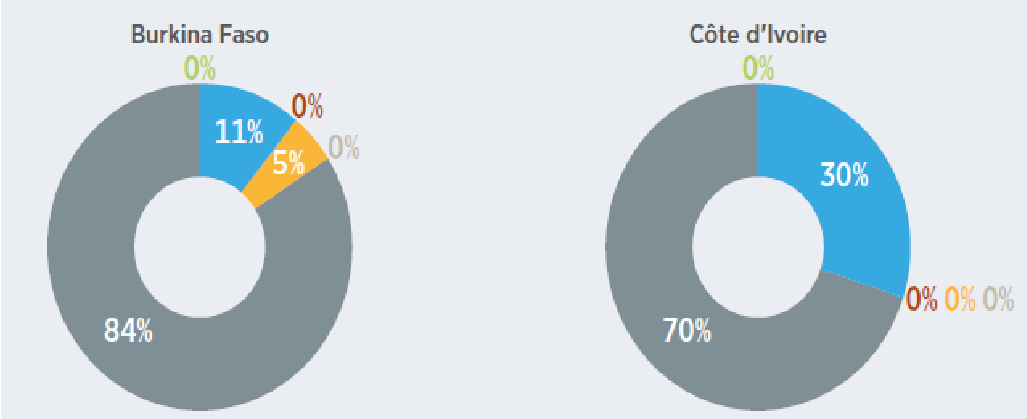
Average price of 76 USD/MWh during the MRE trial phase

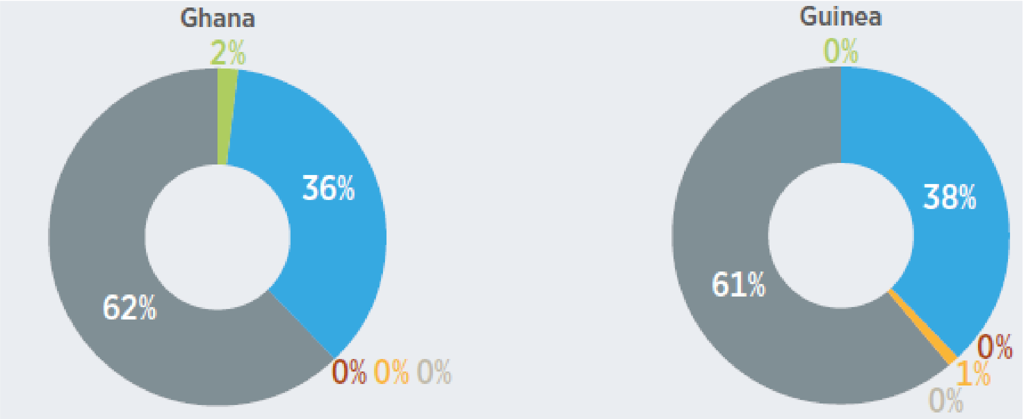


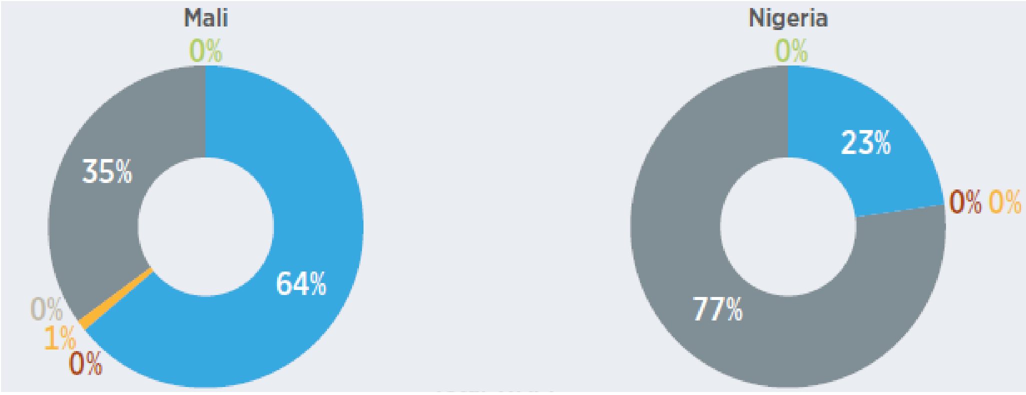

Source: WAPP (ICC)

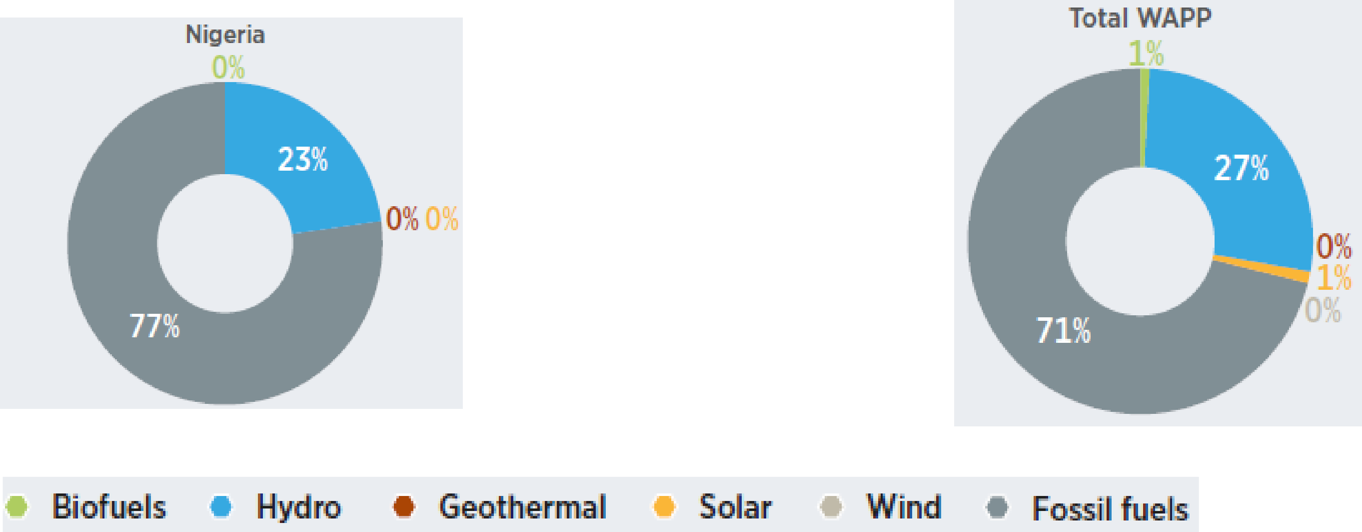
# 1. Introduction on the ECOWAS Energy sector and the REM

Electricity generation mixes in WAPP and in selected ECOWAS countries




Source: IRENA (2021)

# 2. Integration of RE in ECOWAS Energy sector

- West Africa has abundant renewable energy resources – including solar, wind and hydropower –
- Across West Africa, the potential renewable resource capacities are estimated by IRENA and AfDB, (2022) at:


1 956 GW for solar


106 GW for wind


162 GW for hydropower

- The West African energy sector is transforming rapidly with the deployment of large-scale renewable energy capacities, including four 150 megawatt (MW) regional solar parks in some countries supported by doners with aim to achieve a cumulative capacity of 600 MW.
- Integration of these projects into the regional power pool (WAPP) highlights the commitment to renewable energy expansion  in ECOWAS (ECOWAS et al., 2018).
- Integration of these projects into the regional power pool (WAPP) highlights the commitment to renewable energy expansion  in ECOWAS (ECOWAS et al., 2018).

# 2. Integration of RE in ECOWAS Energy sector

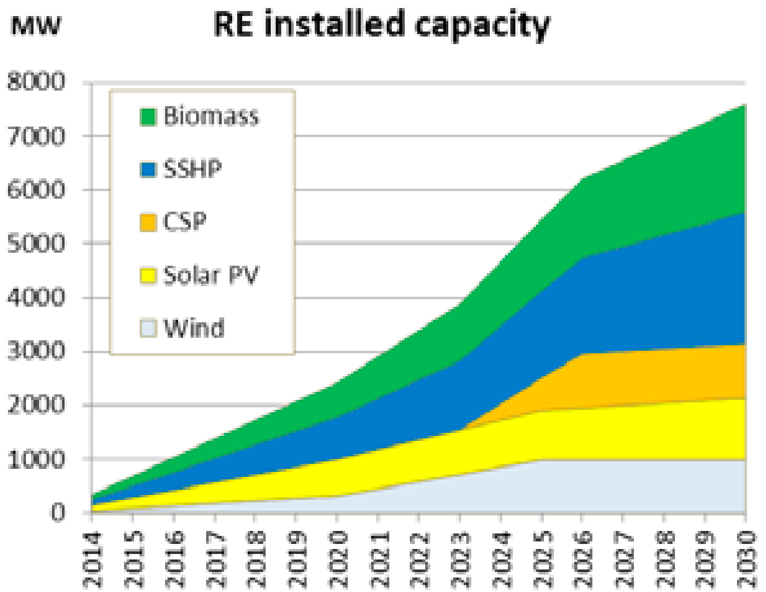
- The ECOWAS RE Policy (EREP) adopted in 2013 covers 2 strategies:

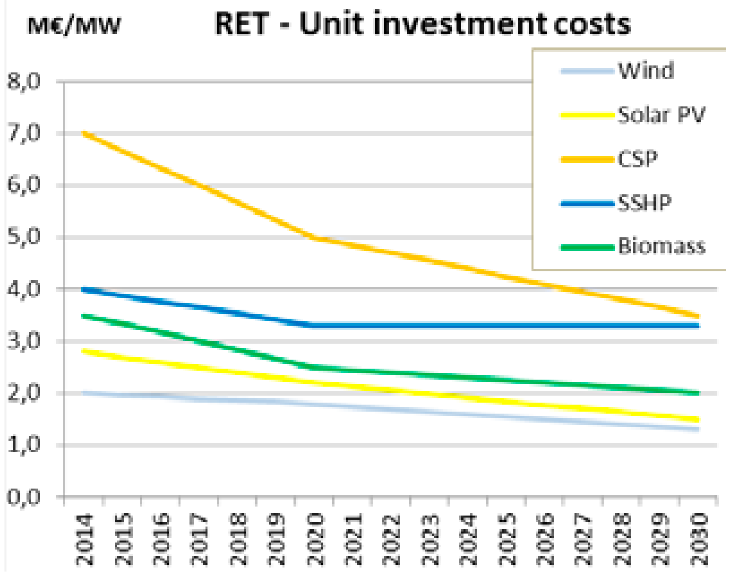
  1- Development of large RE power plants : most are Solar PV and Wind

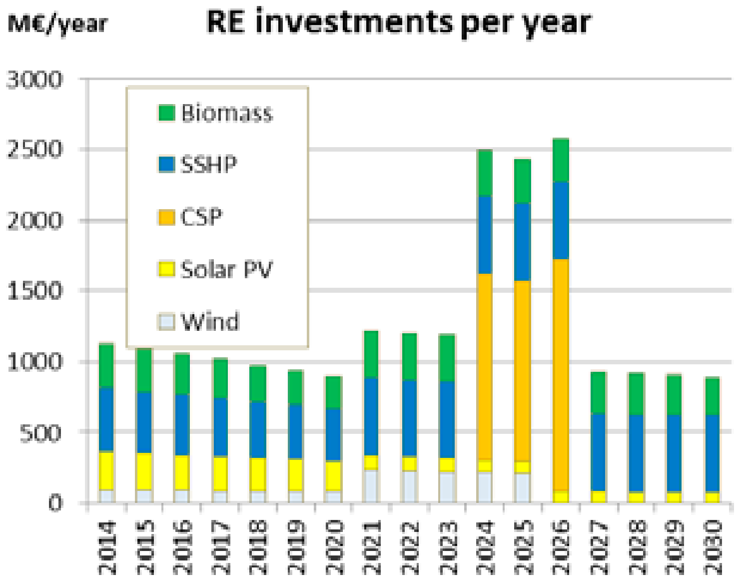
  2- Mini grids projects: Off-grid solutions have gained momentum in recent years with the installation of increasingly cost-competitive solar home systems and mini-grids in rural and remote areas.

- As of 2023, around 385 mini-grids with a combined capacity of nearly 0.03 GW were operating in the region, with 95% of them powered by solar photovoltaics (PV).
- The market for mini-grid start-ups that provide energy access grew from **USD 19 million in 2013 to USD 339 million in 2018** (Antonanzas and Blanco-Fernandez, 2021).

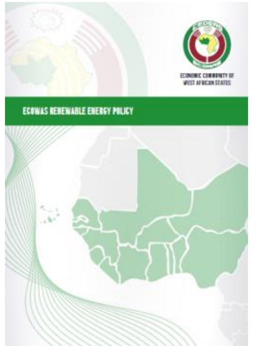
Source: ECOWAS Renewable Energy Policy (EREP)



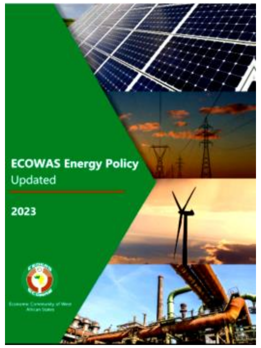



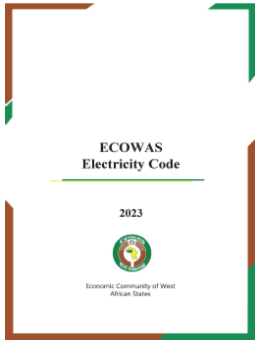



# 3. RE Policies in ECOWAS: targets and prospects




- The purpose of the ECOWAS Regional Renewable Energy Policy (EREP) is to ensure increased use of RE sources such as solar, wind, small-scale hydro and bioenergy for grid electricity supply and for the provision of access to energy services in rural areas. The EREP define targets for 2030.
- Progressive policy and regulatory measures are required to generate greater benefits from the energy transition through RE deployment of RE.
- In addition to the ECOWAS Renewable Energy Policy (EREP) and an ECOWAS Energy Efficiency Policy (EEEP), adopted in July 2013 , ECOWAS recently introduced two new instruments to encourage private investments in the energy sector, with a focus on renewable energy deployment and the development of a regional electricity market:
  - – the Updated Energy Policy 2023 and
  - – the ECOWAS Electricity Code (Act) 2023.




- ERERA and ECREEE are working to prepare green regulations in order to build a policy and regulatory framework favorable to the deployment of RE in the region and its integration into the REM.

# 4. RE Auctions at regional and national lev

- IRENA's (2021) analysis for West Africa estimates that combined investment needs between 2015 and 2030 is
  - ✓ $67 billion for RE production
  - ✓ $52 billion for transmission and distribution infrastructure.

- Partnerships between IRENA, WAPP and ERERA led to the creation of the West Africa Clean Energy Corridor (WACEC), aimed at strengthening “the development and integration of RE on a large scale in West African electricity systems”.

- WACEC is focused on supporting the first objective of the WAPP Energy Master Plan, by pursuing the optimal integration of variable RE resources into West Africa's power systems.

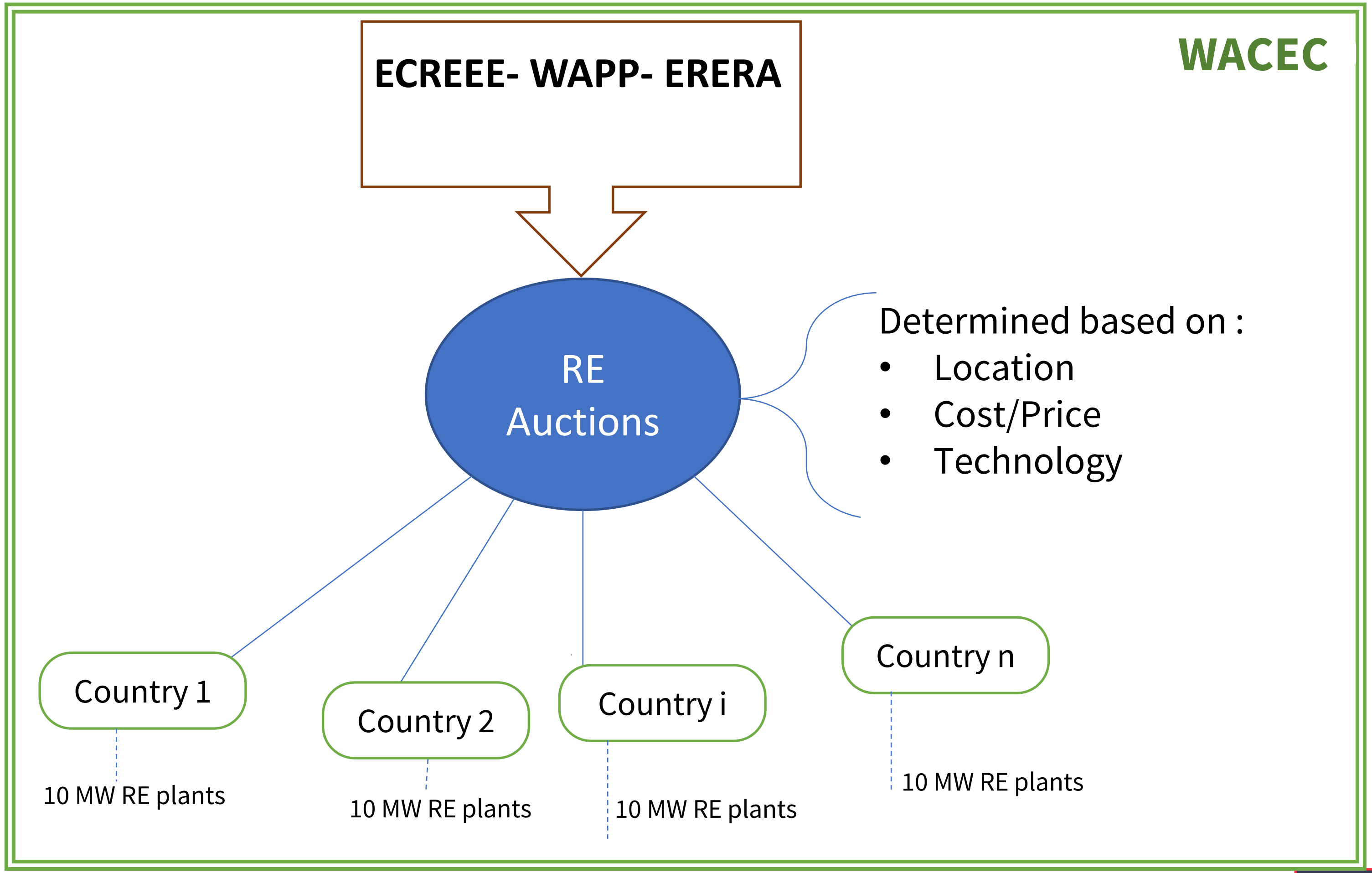
- The WACEC action plan guides IRENA and ECOWAS cooperation on:
  - ✓ resource assessment and zoning,
  - ✓ regional and national energy sector planning,
  - ✓ creation of an enabling environment for facilitating investments in RE in the region, and
  - ✓ capacity building: since 2018, several trainings have been delivered on : bankable PPAs, battery storage, etc.

# Regional level (1): under WACEC

- WAEC aims to connect many 10-15 MW solar PV plants, as well as many other technologies such as wind and hydropower, with a combined capacity of 2 GW.

- All projects are auctioned under a common system.

- ECREEE has been working to identify which countries will have projects, where the most suitable locations for photovoltaic parks are and how to distribute the projects.



# Regional level (2): Under the WAPP Master plan

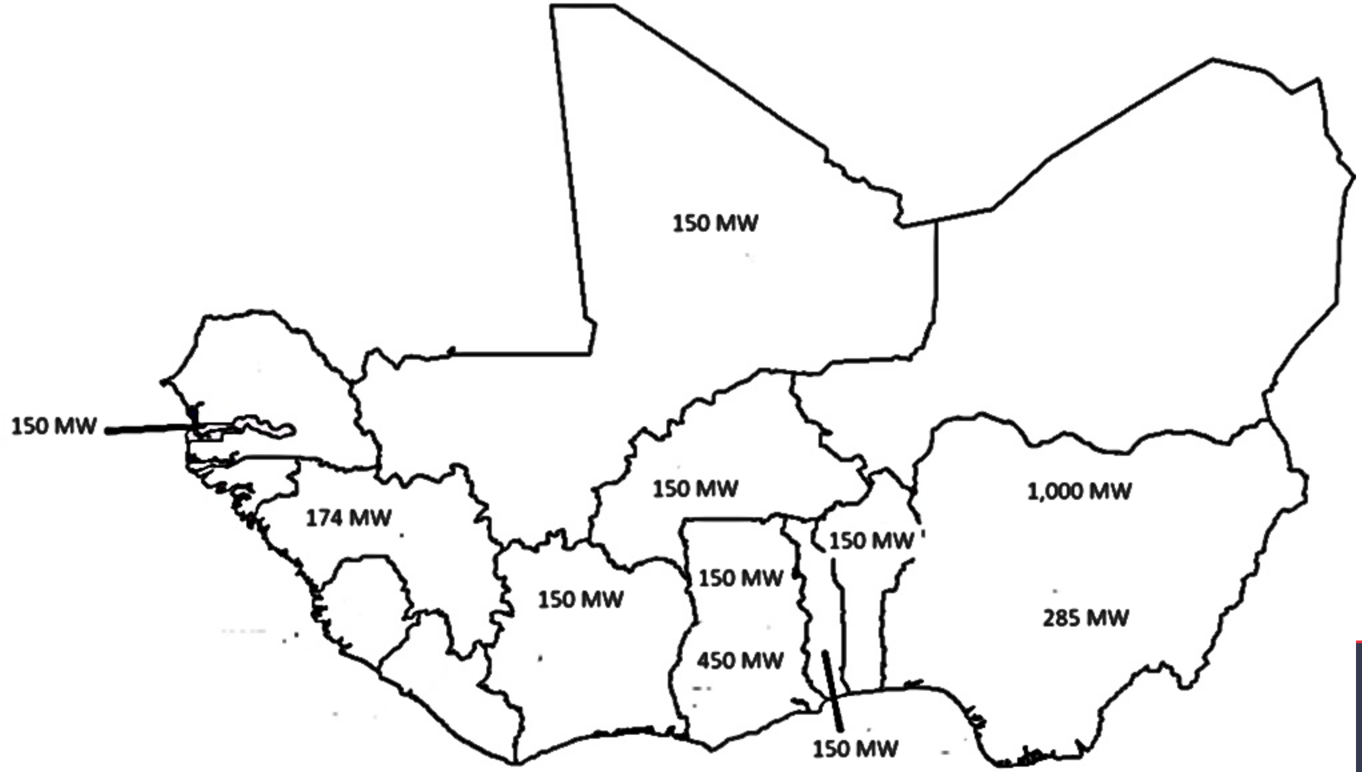
47 generation projects with a total capacity of approximately 15.49GW:

- 68.9% renewable energy projects(10.67 GW) of which 29.5% involve Variable Renewable Energy (VRE) projects (3.15 GW solar, wind)

- For 2023-2029, WAPP plans to implement 10 solar power plants with a capacity of 150 to 1,000 MW in 9 Member States through RE auctions.

**WAPP**
**WAPP Master Plan 2019-2033**

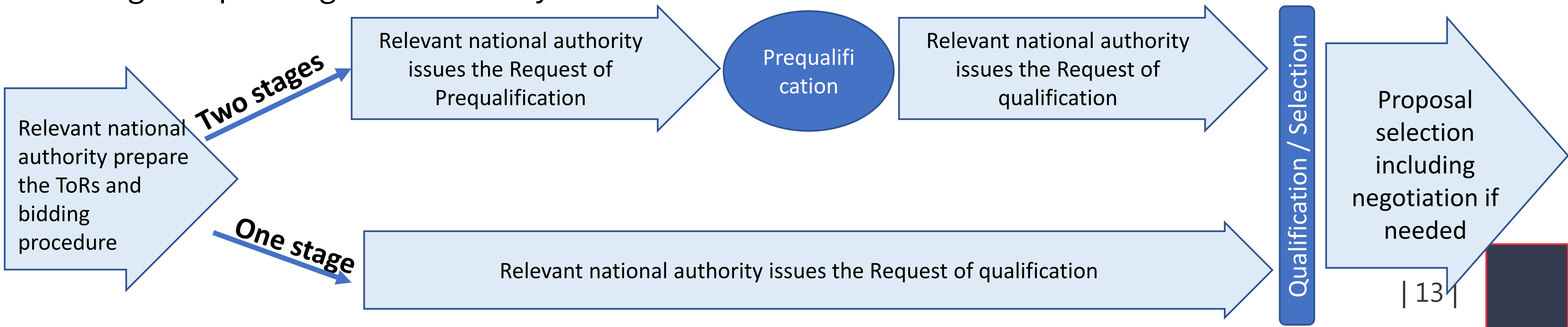
Solar PV Auctions according to REM development plan



# National level (1): the framework

Several ECOWAS Member States such as Burkina Faso, Côte d'Ivoire, Gambia, Ghana, Nigeria, and Senegal have designed RE auctions which consider:

- A defined pipeline of RE projects based on country targets related to RE transition objectives and Nationally Determined Contribution (NDC),
- The political and regulatory framework which allows relevant authorities such as Ministries in charge of Energy, Regulators to conduct RE auctions with negotiations with IPP, investors,
- The implementation by Authorities of a competitive procurement/bidding which follows one or two stages depending on the country.



# National level (2): Burkina Faso’s case stud

**Actual RE IPP :**

As of August 2022, the total capacity awarded in tenders was 164 megawatts, but only 60 megawatts had reached financial close.

**Planned RE projects**

Three (3) solar projects for 33.5 MW

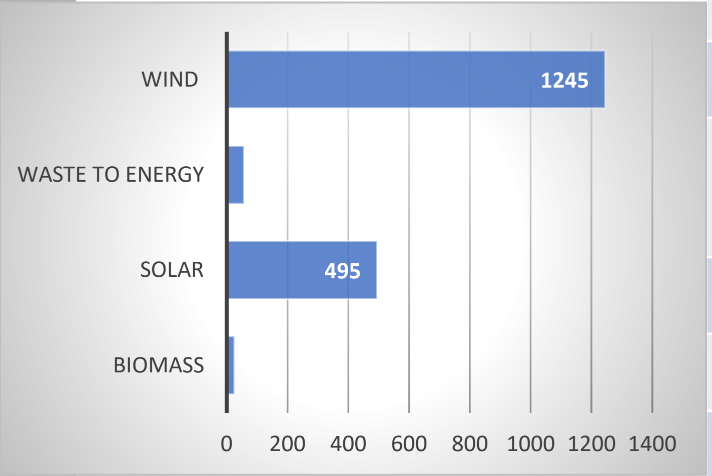
| CHARACTERISTICS OF AUCTIONS IN BURKINA FASO | |
|---|---|
| Legal basis | Energy sector policy 2014-2025<br>Public private partnership policy, 2021<br>National renewable energy action plan, 2015 |
| Authorities in charge | Ministry in charge of Energy<br>National agency for renewable energy and energy efficiency |
| Eligible technologies | Solar PV, CSP |
| Selection process | Selection in one stage based on price, following the “lower price wins”, or weighted score from price and local content. |
| Agenda of auctions | From 2019-2022 |
| Duration of tariff | 25 years |
| Compliance rules | No clear rules, no clear penalty for non-compliance |

# National level (2) : Ghana's case study

**Actual RE IPP :**

1. Meinergy Solar PV, 20 MW
2. Onyandze Solar PV, 20 MW

**Planned RE projects**




Source: from Africa-energy-portal data

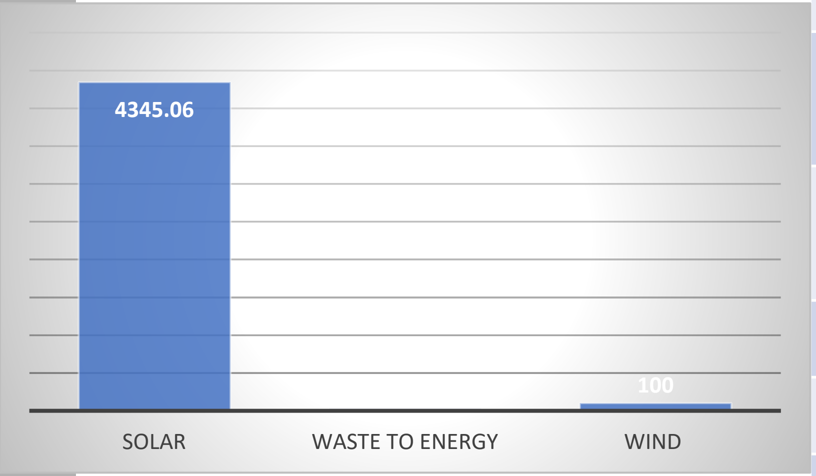
| CHARACTERISTICS OF AUCTIONS IN GHANA | |
|---|---|
| Legal basis | National Energy Policy 2010<br>Renewable Energy Act, 2011<br>National Renewable Energy Action Plans (NREAPs) 2015<br>Ghana Renewable Energy Master Plan, 2019<br>Ghana Renewable Energy Policy Handbook, 2022<br>National Energy Transition Framework, 2022-2070 |
| Authorities in charge | Ministry of Energy<br>Energy Commission & Public Utilities Regulatory Commission (PURC) |
| Eligible technologies | Solar PV, CSP, Wind |
| Selection process | Selection in one stage based on price, following the "lower price wins", or weighted score from price and local content. |
| Agenda of auctions | From 2019-2030 |
| Duration of tariff | 20 years |
| Compliance rules | Penalties for delay and underperformance determined in PPA.<br>Guarantee paid at signature of PPA.<br>Termination of PPA as last resort. |

# National level (2) : Nigeria's case study

**Actual RE IPP :**

Some Solar IPP have been implemented and run

**Planned RE projects**




Source: from Africa-energy-portal data

| CHARACTERISTICS OF AUCTIONS IN NIGERIA | |
|---|---|
| Legal basis | Renewable Energy Master Plan (REMP) 2005<br>Renewable Energy Policy Guidelines 2006<br>National Renewable Energy and Energy Efficiency Policy 2015<br>National renewable energy action plan, 2015<br>Feed-in Tariff (FiT) Regulation 2015<br>Electricity Act, 2023 |
| Authorities in charge | Ministry of Energy<br>Nigerian Electricity Regulatory Commission (NERC) |
| Eligible technologies | Solar PV, CSP, Wind |
| Selection process | Selection in two stage based on price "lower price wins", and economic development |
| Agenda of auctions | From 2015 |
| Duration of tariff | 25 years |
| Compliance rules | Penalties for delay and underperformance determined in PPA.<br>Guarantee paid at signature of PPA.<br>Termination of PPA as last resort. |

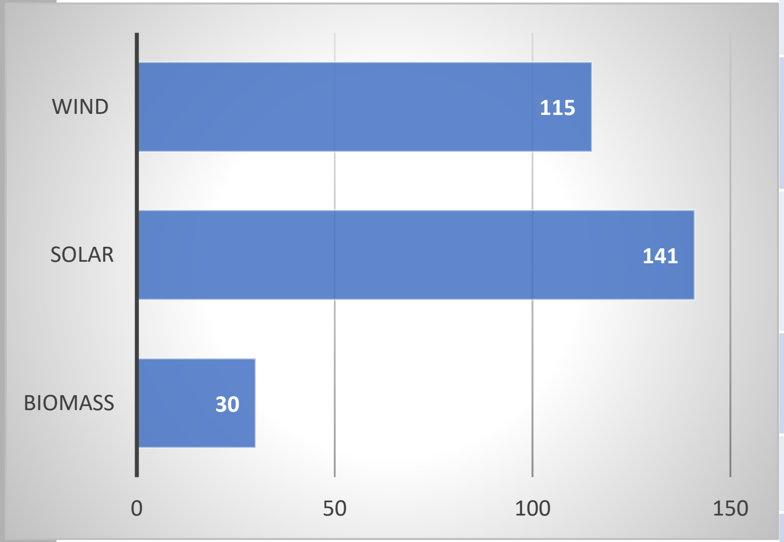
# National level (2) : Senegal's case study

**Actual RE IPP :**

8 Solar projects, 190 MW

1 Wind project, 159 MW

**Planned RE projects**




Source: from Africa-energy-portal data

| CHARACTERISTICS OF AUCTIONS IN TOGO | |
|---|---|
| Legal basis | Energy sector policy 2014-2025<br>Public private partnership policy, 2021<br>National renewable energy action plan, 2015 |
| Authorities in charge | Ministry in charge of Energy<br>National agency for renewable energy and energy efficiency |
| Eligible technologies | Solar PV, CSP |
| Selection process | Selection in one stage based on price, following the "lower price wins", or weighted score from price and local content. |
| Agenda of auctions | From 2019-2022 |
| Duration of tariff | 25 years |
| Compliance rules | Penalties for delay in PPA.<br>Guarantee paid at signature of PPA.<br>Termination of PPA as last resort. |

# National (3) : the World Bank Scaling Solar program

"Scaling Solar program" offers services aimed at creating viable markets for solar power in several countries, including 4 ECOWAS Member States and creating a new regional market for solar investment.

The 5-step "one-stop shop" program aims to operationalize privately financed grid-connected solar projects within two years and at competitive rates.

| COTE D'IVOIRE | NIGER | SENEGAL | TOGO |
|---|---|---|---|
| Design, financing, construction, and operation of two grid-connected solar PV plants on an IPP basis with a total installed capacity of at least 60 MWp,<br>***In 2021, 9 bidders were been pre-qualified*** | *Following a PPP procedure -*<br>Design, financing, construction, and operation of two grid-connected solar PV plants on an IPP basis with a total installed capacity of at least 50 MWp,<br>***In 2021, 6 bidders were been prequalified*** | Senegal **has implemented**, as part of a PPP, two solar photovoltaic (PV) plants with a total capacity of 60 MWac with ***tariffs of 3.98 and 3.80 Euro cents per kilowatt hour (≈26.24 FCFA).*** | *Following a PPP procedure -*<br>Design, financing, construction, and operation of grid-connected solar PV plants on an IPP basis :<br>- Two with a total installed capacity of at least 50 MWp,<br>- Two with a total installed capacity of 60 to 80 MWp<br>***In 2022, 9 bidders were been prequalified*** |

# 5-Energy Communities & Mini-grids – Global Benchmarks

- **EU:** Renewable Energy Communities (RED II) & Citizen Energy Communities (EMD) – collective self-consumption, sharing, DSO interface.
- **USA:** Community solar via virtual net metering/subscriptions; strong consumer-protection rules in leading states.
- **Australia**: Embedded networks & community batteries; microgrid trials with retail-exemption frameworks.

# Energy Communities & Mini-grids – Global Benchmarks

- **India:** National Mini-grid guidelines; state regulation enable developer–community concessions and service KPIs.
- **East- Africa:** Kenya & Tanzania Mini-grid regulations; clear licensing tiers and grid – arrival rules; clear licensing tiers and grid-arrival rules.
- **SE Asia**: Philippines QTP scheme for missionary electrification; Indonesia Village Mini-grids.

# 6-ECOWAS– Regional Framework Status

- **Policies:** ECOWAS Renewable Energy Policy and Energy Efficiency Policy
- **Institutions:** ERERA(Regional Market Rules, QoS), ECREEE(programs/ toolkits),WAPP(interconnections).
- Guidance: Regional mini-grid/model regulations and technical codes under development with DFIs.

# 7-Implementation Survey– Selected ECOWAS Countries

- **Nigeria:** NERC Mini-Grid Regulations;More than 100 operational sites; grid –arrival buy-out/asset transfer options.
- **Senegal:** ASER concession / PPP program; CRSE tariff approvals; 1,000- villages PV-battery scale-up.
- **Benin**: MCA-Benin II/OCEF blended-finance tenders; private developers operate rural solar mini-grids.
- **Ghana**: GEDAP pilots (5) and SRE[ (35 planned); PURC tariff oversight; Energy Commission technical standards.

# Implementation Survey– Selected ECOWAS Countries

- **Sierra Leone:** Tariff harmonisation pilot (smart subsidy) ~US$0.34/kWh; EWRC oversight.
- **Mali & Niger:** AMADER concessions (Mali); NESAP(Niger) with regulator-approved tariffs.

# Regulatory Benchmark at a Glance

| Jurisdiction | Instrument | Licensing tiers | Tariff method | Grid-arrival | Consumer protection |
|---|---|---|---|---|---|
| Nigeria | NERC 2016; 2023 | ≤100 kW; 100 kW–1 MW; >1 MW | Approved/permitted; PBG support | Buy-out/asset transfer | Contracts; QoS KPIs |
| Senegal | CRSE/ASER concessions | Concession areas | CRSE-approved; blended subsidy | Concession terms | Service standards |
| Benin | MCA-Benin II/OCEF | Tendered projects | Awarded tariffs; regulator oversight | CEB interconnection | Grant KPIs |
| Ghana | PURC/EC; Net metering | Permit/licence tiers | PURC tariff; net-metering | Grid code | Consumer charter |

# Individual Funding of Renewables – Regulatory Enablers

- Citizen/co-operative shareholding in projects (EU REC/CEC models).
- Net-metering / net-billing for rooftop PV; fair valuation of exports and self-consumption.
- Crowdfunding / retail investment with safeguards (licensing caps, disclosure).
- On-bill financing & PAYG with consumer-protection rules and interoperable smart meters.
- ECOWAS examples: Ghana net-metering; Senegal & Cote d'Ivoire auto-production; Nigeria distributed generation- mixed progress.

# Regulatory and Policy Implications

- **Clear licensing & permits** for Mini-grids
- **Tariff design** ensures affordability with investor confidence
- **Grid integration rules** ensure a smooth transition to the main grid.
- **Consumer protection** safeguards for quality and service reliability.

# 8-Contributions from New Regulation — Access for 450m People

- **Simplified licensing** (exempts very small projects, simplified registration for <100 kW, full permit for 100 kW–1 MW): reduces time & cost for developers and communities.
- **Harmonised regional tariff methodology & compensation rules** (predictable, transparent tariff tools; compensation formula for grid arrival): reduces investor/regulatory risk and enables cross-border financing.
- **Standardised technical & safety rules** (regional ECREEE standards): lower equipment/installation uncertainty and reduce O&M costs through common parts and quality assurance.

# Contributions from New Regulation — Access for 450m People

- **Market access & community legal forms**: allow cooperatives/associations to be license holders, enter PPAs, and aggregate demand. This enables local ownership models and community finance.
- **Consumer protection & social tariffs**: rules for transparent billing, dispute resolution, and lifeline tariffs/subsidies to protect the poorest consumers while keeping projects bankable.
- **Financial de-risking & incentives**: regulatory frameworks should enable (a) access to concessional finance (regional funds, donor guarantees), (b) tax/incentive clarity for individual and community investment, and (c) facilitation of PAYG/household financing and community investment vehicles.

# 9-ECOWAS Success Stories on Communi
# Programs

**Nigeria**: more than 100 private-led solar mini-grids operational under 2016/2023 NERC framework.

# ECOWAS Success Stories on Community Programs

- **Senegal** – Concession/PPP model via **ASER** targeting **~1,000 villages**; universal access push to 2029.

# ECOWAS Success Stories on Community Programs

- **Benin**: **MCA-Benin II / OCEF** blended-finance & tenders; **~20** rural solar mini-grids (~**1.2 MW**) underway.

# ECOWAS Success Stories on Community Programs

- **Ghana**: 5 community mini-grids supplying island communities under GEDAP.

# 10-ERERA’s Role

- **Harmonised Regulations**
- Promote harmonisation of regulatory frameworks across ECOWAS member states to facilitate mini-grid development and operation.

- **Stakeholder Engagement**
- Encourages regional cooperation between regulators, developers, communities, and international partners to accelerate deployment.

- **Capacity Building**
- Supports knowledge sharing and best practice dissemination among regulators.

- **Performance Monitoring**
- Establish robust monitoring systems to track mini-grid performance and impact on electricity access targets.

# 11-ERERA's Future Actions to Support Mi
# grids

- The 2026–2030 Strategic Plan is built on 5 pillars: consolidation of the market, **integration of renewables**, institutional strengthening, digitalization and international cooperation.
- Facilitate **cross-border rural electrification** pilots with WAPP/ECREE/DFIs.

# 12- Conclusion and Key Takeaways

- Progressive policy and regulatory measures are required to generate greater benefits from the energy transition through RE deployment of RE.

- There are many renewable energy auctions in the ECOWAS region launched by countries with similar strategies.

- Increasing the coherence and harmonization of policies/strategies and leveraging synergies between existing initiatives to support national policies and strategies will maximise the impact of existing allocations and RE projects and help to mobilise more private investors in RE sector.

A Solar PV Plant in Senegal

# 12-Conclusion and Key Takeaways

- Mini-grids are **essential for universal access** in West Africa.
- They combine **affordability, sustainability, and community participation**.
- Regulatory frameworks must evolve to **enable investment and protect consumers**.
- **ERERA** stands ready to guide and coordinate regional regulatory development.

# THANK YOU FOR YOUR ATTENTION!

**Ing. Kocou Laurent R. Tossou**

ktossou@erera.arrec.org