

ESMAP Hydropower Development Facility HYDRO 2023 Conference



Role of hydropower in West African Power Pool (WAPP) interconnected network



Speke Resort, Munyonyo, July 9, 2023

Presentation Outline

- 1. Establishment, Vision and Mission of WAPP**
- 2. West Africa hydropower Plants and their contribution to the WAPP interconnected network**
- 3. World Bank support for hydropower development in West Africa**
- 4. The future of hydropower in West Africa**



Establishment, Vision and Mission of WAPP



WEST AFRICAN POWER POOL
SYSTÈME D'ÉCHANGES D'ÉNERGIE
ÉLECTRIQUE OUEST AFRICAÏN

Establishment, Vision and Mission of WAPP

Establishment:

WAPP was created in 1999 by Decision A/DEC. 5/12/99 and established in 2006 through Decisions A/DEC. 18/01/06 and Decision A/DEC. 20/01/06 by the Authority of ECOWAS Heads of State and Government.

Vision:

To integrate the national power systems into an unified regional electricity market

Mission:

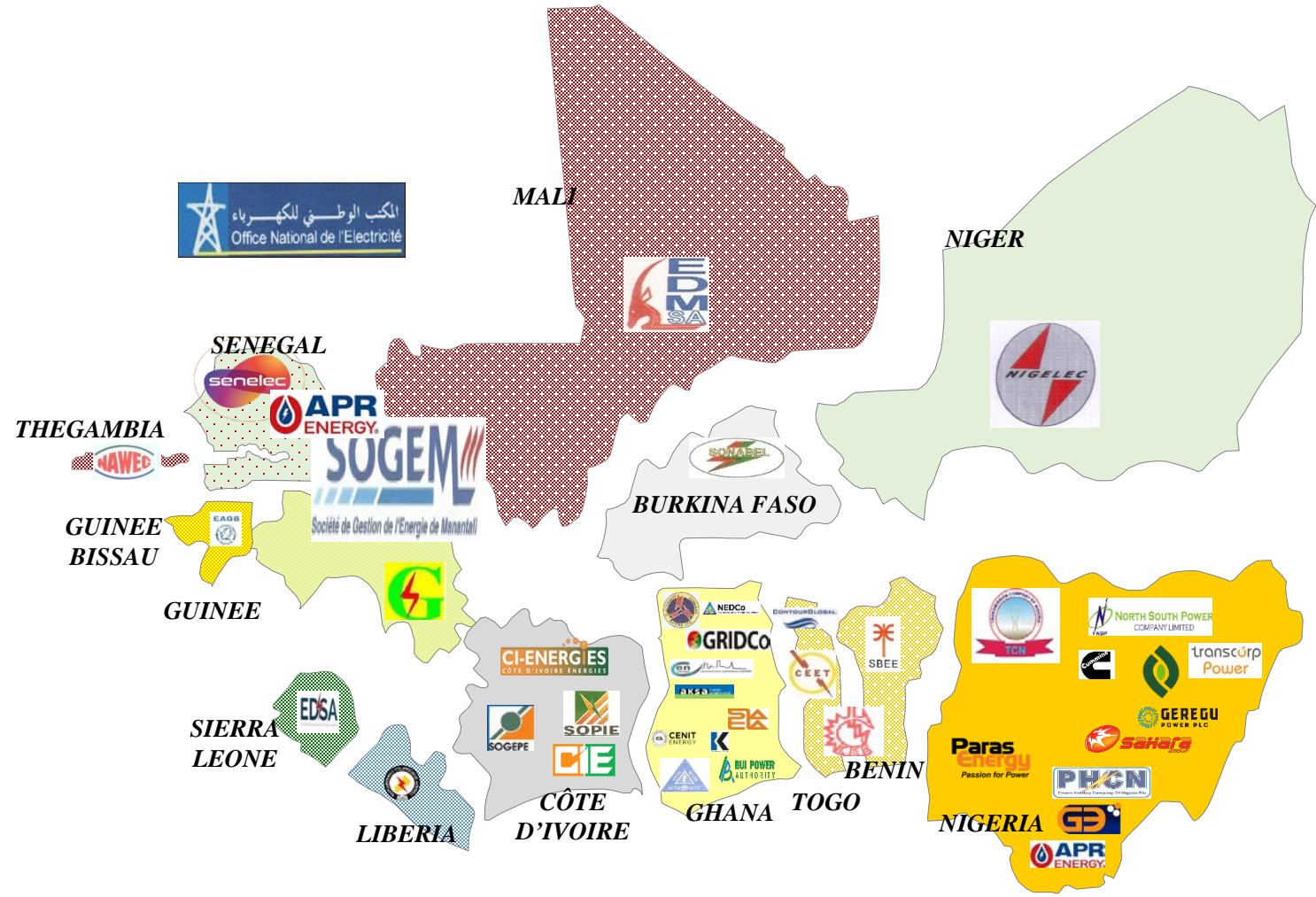
To promote and develop infrastructure for power generation and transmission, as well as, to assure the coordination of electric power exchanges between ECOWAS Member States



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Members of WAPP in July 2006 (13#)

Members of WAPP in July 2023 (39#)



West Africa hydropower Plants and their contribution to the WAPP interconnected network



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West Africa hydropower resources

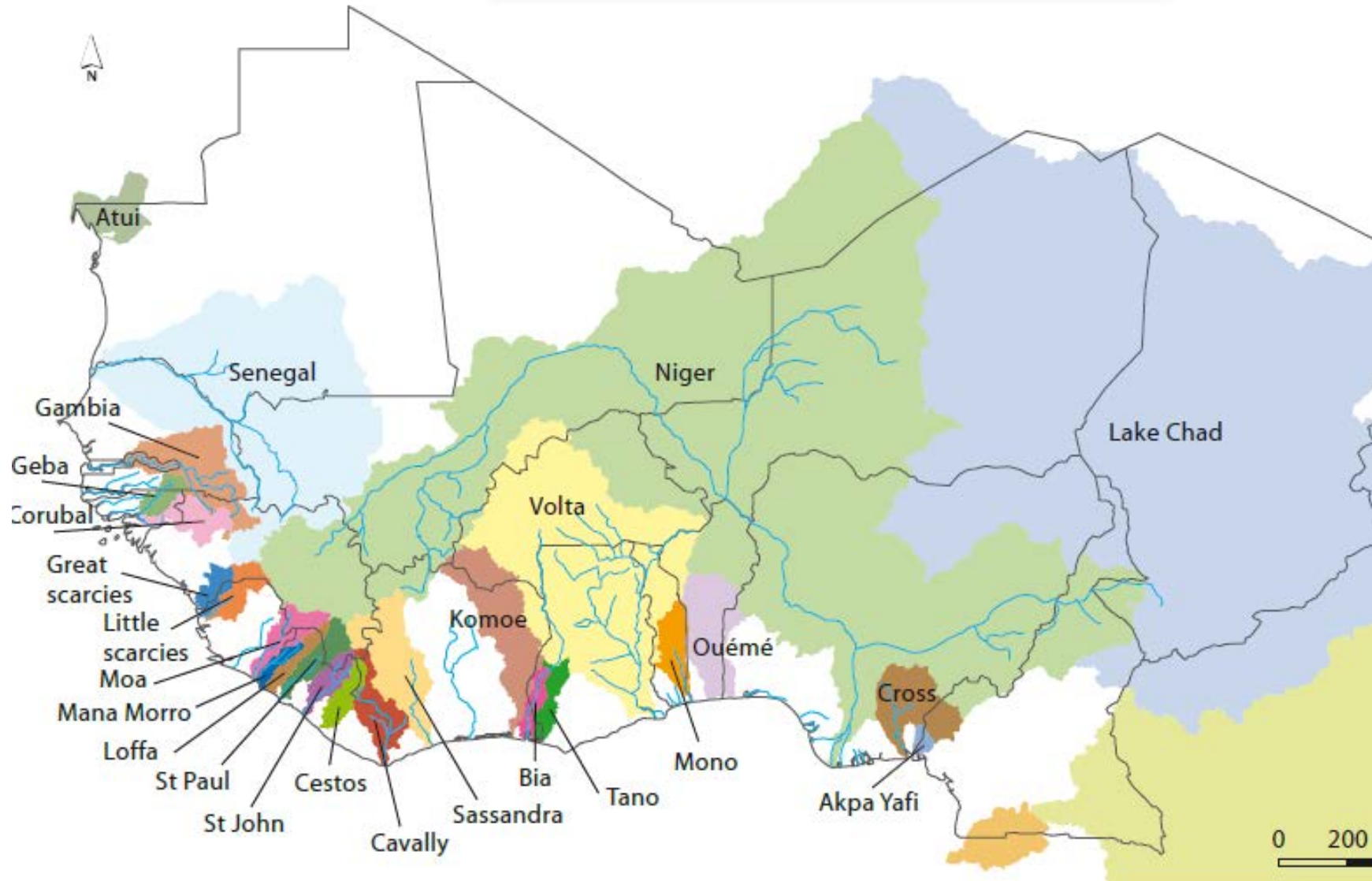
West Africa has 28 transboundary river basins.

- The most important of these are:
- the Niger (shared by 11 countries),
- the Senegal (4 countries),
- the Volta (6 countries),
- the Lake Chad and
- the Comoé (4 countries).

14 cross-border basins are listed in **Guinea**, where a large number of rivers originate.

8 in Côte d'Ivoire, **7** in Liberia, **5** in Nigeria and Sierra Leone.

In total, crossborder basins cover 71% of the total area of the region



Source : ESRI, Global GIS, WHY MAP Produced by : M. Niassé, C. Mbow (2006)

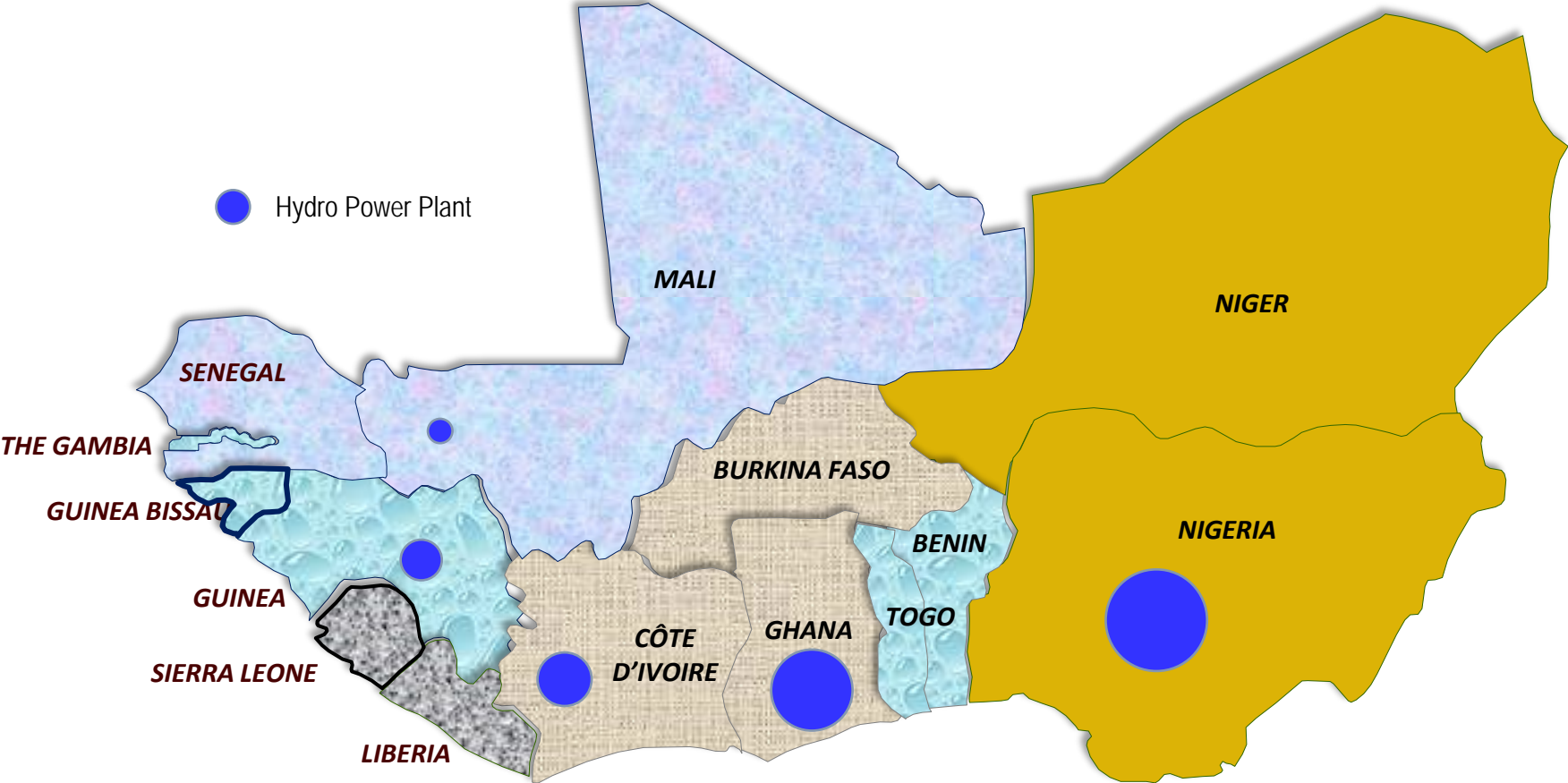
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Existing hydropower plants capacity (2018) in West Africa

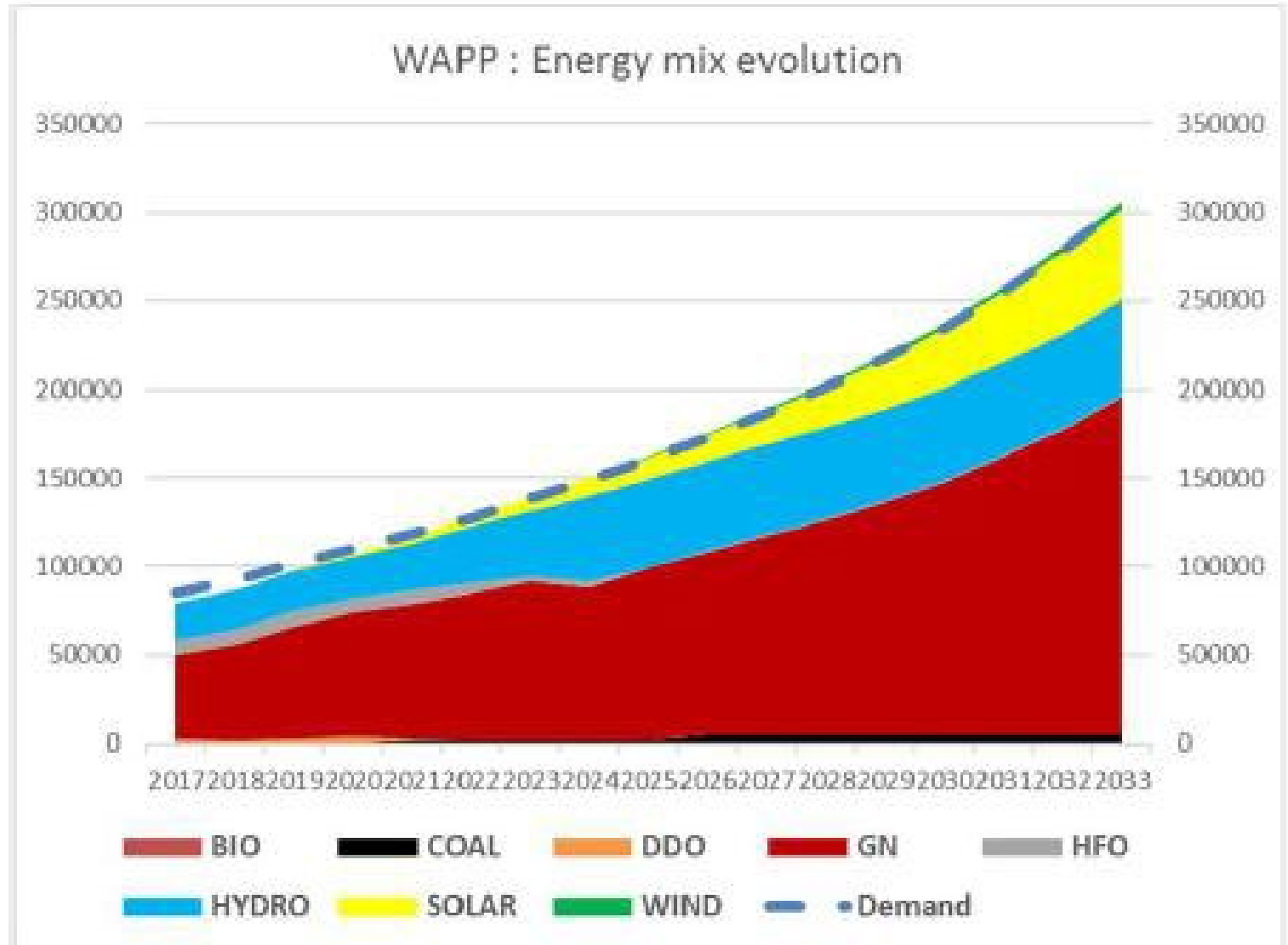
The ECOWAS Master Plan for the Development of Regional Power Generation and Transmission Infrastructure 2019 – 2033 shows that Hydropower is the second-largest source of power generation behind thermal and the leading source of renewable power in West Africa



♦ Nigéria	1 967 MW
♦ Ghana	1 496 MW
♦ Cote d'Ivoire	879 MW
♦ Guinée	365 MW
♦ Maïi	184 MW

Projected hydropower plants capacity up to 2033 in West Africa

By 2033, the ECOWAS Master Plan shows that in terms of installed capacity, to meet the peak demand of 2033 (50.8 GW), hydropower plants will cover 12.8 GW.

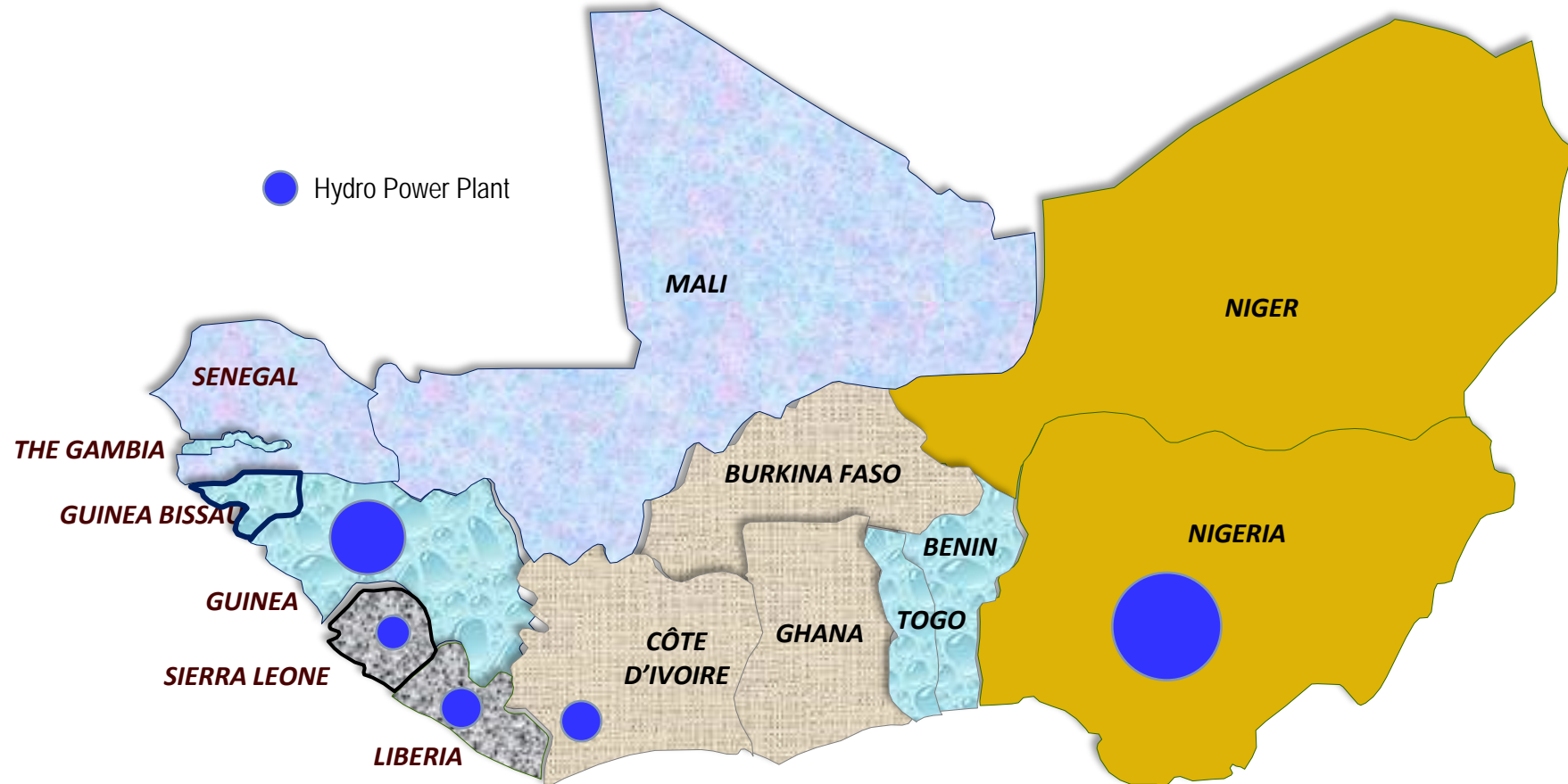


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Projected hydropower plants capacity (between 2019 and 2033) in West Africa

The current ECOWAS Master Plan has made the development of the region's hydropower potential a priority, in order to optimize the use of profitable hydropower resources.

The projects selected in the current master plan have been chosen not only for their economic interest, but also for their ability to compensate the variability of renewable energies (solar and wind).



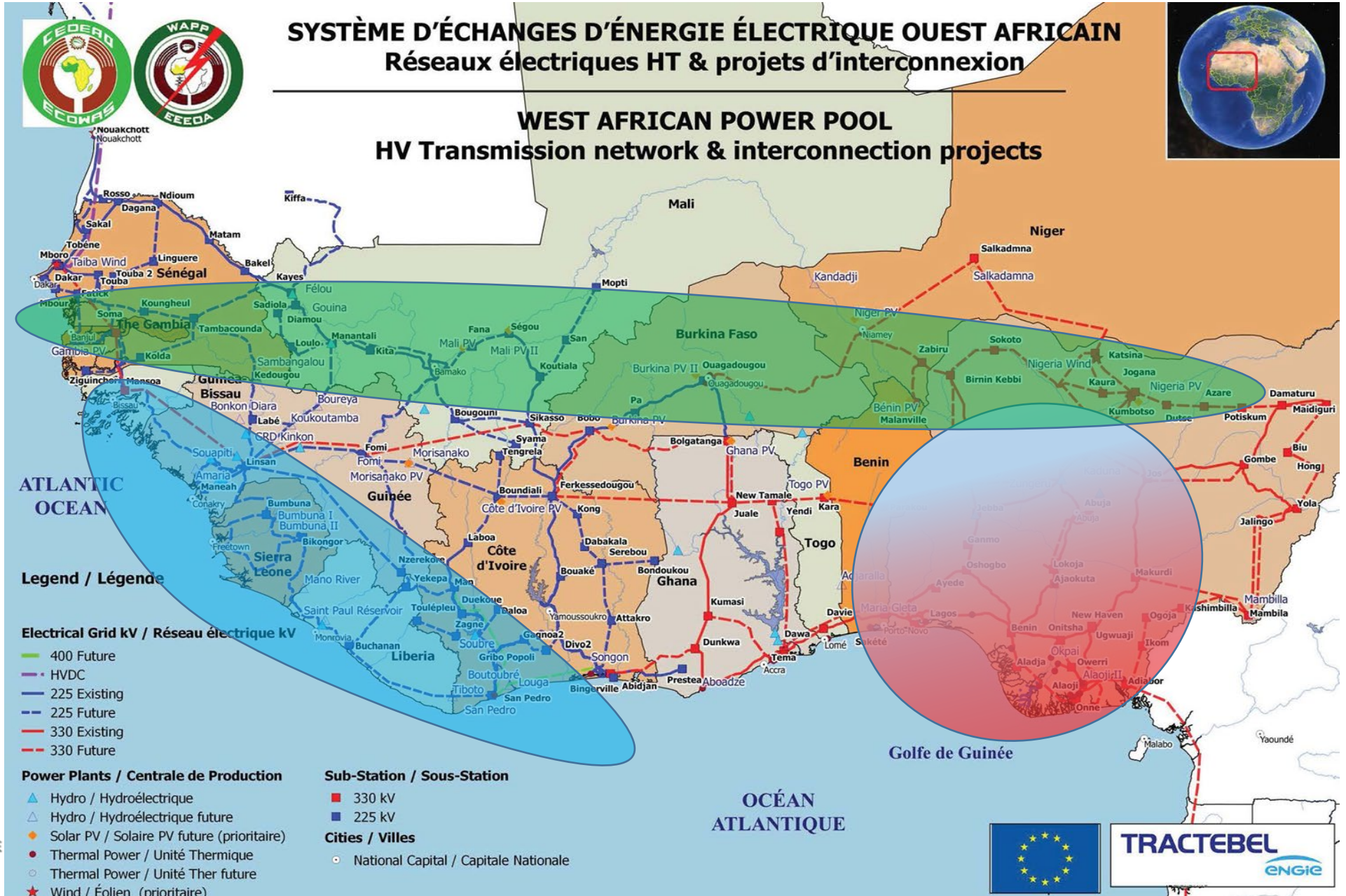
◆ Nigeria	3 401 MW
◆ Guinea	2 353 MW
◆ Liberia	765 MW
◆ Cote d'Ivoire	648.5 MW
◆ Sierra Leone	389 MW

ECOWAS Energy Resources

Large hydropower potential in Guinea, Liberia and Nigeria

Gas resources in Nigeria, Ghana, Côte d'Ivoire and Senegal

Favorable solar irradiation conditions for solar PV plants in Mali, Burkina Faso and Niger



WAPP in
2006

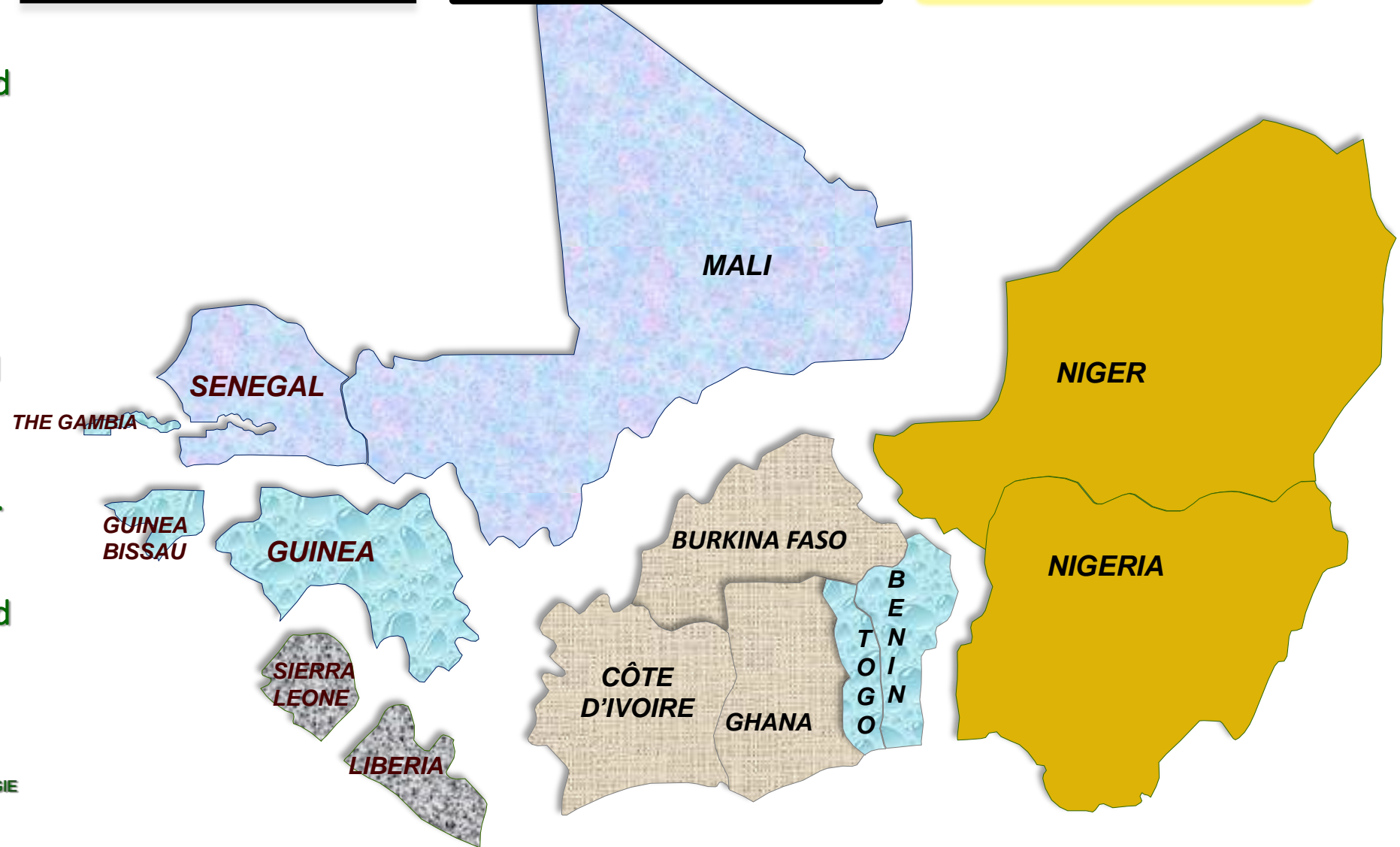
WAPP
Today

WAPP in
End of 2023

When WAPP was established in 2006, there were several interconnected and synchronous systems,

To date, with the support of WAPP technical and financial partners, 13 of the 14 continental states of ECOWAS are interconnected.

All 14 will be interconnected by 2023.



The role of the hydropower in WAPP interconnected network

For an interconnected network such as the WAPP, hydropower is an essential component of **network stability**.

It plays a vital role in ensuring a constant balance between consumer needs and the generation supplied to the network.

Dam reservoirs are batteries, a reserve of electricity that can be mobilized at any time. Hydropower plants with reservoir dams offer great operational flexibility, useful during periods of high demand or when other means of generation are insufficient. They enable electricity to be injected into the grid at very short times. **With the expected development of variable renewable energies, the flexibility of hydropower is an essential asset.**

World Bank support for the development of hydropower plants in West Africa



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World Bank support for the development of hydropower plants in West Africa

In the past, the **World Bank** was the **preferred partner for dam investments** in the West African region, such as the Akosombo HPP in Ghana

The last HPP commissioned in the region or due to be commissioned before the end of 2023 are financed by other sources, such as the Soubré (275 MW) and Gribo Popoli (112 MW) HPP in Côte d'Ivoire, the Zungeru HPP (700 MW) in Nigeria, the Gouina HPP (140 MW) in Mali, Kaleta (240 MW) and Souapiti (450 MW) HPP in Guinea.

World Bank support for the development of hydropower plants in West Africa

However, the World Bank's involvement in hydropower projects is regaining momentum through the financing of pre-investment studies, such as in Liberia, where the **World Bank**, after having **financed the pre-investment studies through WAPP**, is financing **the implementation of the extension of the Mt Coffee hydropower plant for an additional 44 MW**.

Also, through WAPP, **WB** is undertaking the pre-investment studies for the future **150 MW SP2 hydropower plant** on the St Paul River.

Future of hydropower in West Africa



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Future of hydropower in West Africa

With the **massive deployment** of **variable renewable energy** capacity in the WAPP interconnected network, the **challenges** of interconnected **network stability** are becoming more important.

The current **ECOWAS Master Plan** that has been developed is a **least-cost plan** taking into account the **primary resources** available in the region.

The **abundant solar integration** observed is due to the decreasing trend in the cost of solar and the **availability of hydropower to compensate for the variability of solar**.

Future of hydropower in West Africa

Given that **hydropower resources are limited**, the next revision of the Master Plan will probably not see the development of new hydropower plants, **but pumped storage** stations to compensate for the intermittency of solar PV power, which is certain to increase.

Dam reservoirs are batteries that can be "recharged" using reversible turbines that can pump water back into the reservoir. Thus, stored as "bulk" energy, the water in the reservoirs can be converted back into electricity when needed.

Future of hydropower in West Africa

Reservoirs can also be used to **deploy floating solar PV Plant** - a study is currently underway on the Manantali dam reservoir in Mali financed by the World Bank

Ghana through **Bui Power Authority (BPA)** Commissions **5 MW Pilot Floating Solar Project**, part of it's 250 MW PV Plans, As Country's 1st Hydro-Solar Hybrid Power Generating System.

Thus, through the **pumped storage** and **floating solar PV Plant** , the HPP of ECOWAS member countries still have potential to be deployed for greater **stability** of the **WAPP interconnected network**.



Thank you



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