



COUNTRY PRIORITY PLAN AND DIAGNOSTIC OF THE ELECTRICITY SECTOR

Guinea



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Abbreviations

AMP	Africa Energy Market Place
AFD	Agence Française de Développement
AfDB	African Development Bank
AGER	Guinean agency for rural electrification
AREE	Water and Electricity Regulatory Authority
BIDC	Banque d'Investissement pour le Développement de la CEDEAO
BOAD	West African Development Bank
CAGR	Compound Annual Growth Rate
CAPEX	Capital expenditure or capital expense
CIE	Compagnie Ivoirienne d'Électricité
CLSG	Côte d'Ivoire, Liberia, Sierra Leone and Guinea Interconnection
COP21	La Conférence de Paris sur le climat
CPP	Country Priority Plan
CWE	China International Water and Electric
DNE	National Energy Department
EBID	ECOWAS Bank for Investment and Development
ECREEE	ECOWAS Centre for Renewable Energy and Energy Efficiency
EDG	Electricity of Guinea
EIB	European Investment Bank
ERI	Electricity Regulatory Index
EU	European Union
FFEM	Fonds Français pour l'Environnement Mondial
GHG	Greenhouse Gases
GoG	Government of Guinea
GW	Giga Watt
GWh	Giga Watt hour
HV	High Voltage
IDA	International Development Association
IPP	Independent Power Producer
IsDB	Islamic Development Bank
KM	Kilometer
KPS	Karpowership
kV	Kilovolts
kWh	Kilowatt Hour
LV	Low Voltage
MEF	Ministry of Economy and Finance
MoE	Ministry of Energy

MV	Medium Voltage
MW	Mega Watt
OMVG	Gambia River Basin Organisation
OMVS	Organisation for the Development of the Senegal River
PNDES	National Economic and Social Development Plan
PPA	Power Purchase Agreement
PPP	Public Private Partnership
PROPARCO	A Subsidiary of AFD
PV	Photovoltaic
RBF	Results-Based Financing
RES	Renewable Energy Sources
SE4ALL	Sustainable Energy for All
SHS	Solar Home Systems
SOGEKA	Société de Gestion de Kaléta
T&D	Transmission & Distribution
TBEA	Chinese manufacturer of power transformers and other electrical equipment
TBI	Tony Blair Institute for Global Change
TP	La Guinéenne des Travaux Publics
TSO	Transmission System Operator
UNIDO	United Nations Industrial Development Organization
USAID	U.S. Agency for International Development
USD	United States Dollar
WAPP	West African Power Pool
WB	World Bank

Purpose of this document

The Guinea Country Priority Plan (“CPP”) will be the reference document adopted by the Government of Guinea (“GoG”) and the African Development Bank (“AfDB”) to summarize the priority reforms and projects that will be presented during the fifth edition of the Africa Energy Market Place (“AEMP”).

The AEMP is a flagship AfDB forum that is held every year and to showcase investment opportunities in the energy sector of selected African countries and facilitate dialogue on key policy and regulatory challenges. AEMP is an output focused event which leverages AfDB’s convening power to bring together the public and private sector along with development partners to propose solutions and advance funding to deliver priority investments and reforms.

In preparation for this event, the AfDB asked the Tony Blair Institute for Global Change (“TBI”) to coordinate the development of Priority Plans for the selected countries. These plans consist of two parts:

1. The **identification of AEMP Priorities** (investments and reforms) to be advanced through the AEMP process.
2. A **Sector Diagnostic** providing background on the sector including statistics, successes and challenges to ensure a common understanding across AEMP participants and provide for richer dialogue during the AEMP event.





Executive Summary

Guinea is at a turning point on the path to develop its energy sector. For a long time the country suffered continuous black-outs caused by insufficient supply and an aging and obsolete network, but in recent years, strong investments from the government and multilateral organizations are radically changing the situation. The country is about to become an exporter of electricity and finds itself at the centre of multiple regional interconnections: CLSG, OMVG, OMVS, Guinea-Mali, which, together with its hydro and solar potential, constitute an ideal basis to become a significant West Africa energy hub.

The construction of the twin dams of Kaleta (240 MW) and Souapiti (450 MW), the launching of the work of the Amaria dam (300 MW) and of the first solar IPP in the country (Khoumagueli, 40 MW) will allow Guinea to phase out its expensive and polluting Heavy Fuel Oil (HFO) power plants and become a fully renewable energy market. This generation plan will also significantly reduce kilowatt hour (kWh) costs, allowing the government to make EDG financially stable and at the same time reduce - and possibly eliminate - public subsidies that recently exceeded \$20 million per year.

Guinea's demand is growing at a sustained pace: ~ 9% CAGR in recent years and is expected to continue on a similar path as the country recovers from COVID-19. Indeed, Guinea's demand could in fact steeply increase in the near future if the government's plan to electrify the mining sector materializes. The country sits on huge reserves of mineral resources, such as bauxite, being exploited by energy intensive companies, which currently rely on diesel powered electricity generation. Connecting national to the grid would provide these mining companies with a much cheaper supply of energy. This win-win situation would provide EDG with higher electricity tariff revenues compared to domestic household tariff revenues, and deliver larger economies of scale in generation. On the other side, mining companies would benefit from a lower cost of electricity in

the range of 30-40% compared with what they are currently spending on diesel generation.

However, in order to deliver this important change of scenario, there are a number of urgent challenges that need to be addressed by the government and its partners:

Guinea's hydro generation is particularly expensive and this might prevent the country from becoming an exporter and also constitute an excessive burden for the final customers. This is due to a number of structural reasons:

- Lack of transparent and competitive procurement that pushes the government to rely on inefficient and opaque bilateral negotiations with IPPs, thus resulting in a high kWh cost,
- Political instability, which is negatively affecting investors perceived country risk,
- Lack of planning at the ministerial level, resulting in sub-optimal contracts, especially with thermal IPPs and in the planning of the network (eg. for the offtake of the Souapiti generation),
- Lack of creditworthiness of EDG (see below), thus resulting in a higher counterparty risk for the IPPs.

EDG's credit worthiness remains fragile and the company is still dependent on public subsidies. This is mainly due to:

- A large tariff deficit: according to the GoG, the current average cost of production is 1,631 GNF / kWh (~16.9 c\$), while the average end-user tariff is 635 GNF / kWh (~6.6 c\$), with an extremely low tariff for households (~3\$ cents per kWh),
- High technical and commercial losses (that

combined represent the ~ 40%)

- A very low deployment rate of electricity meters,
- Lack of control over the IPP negotiations, like in the case of the contracts for the PPP of Souapiti and Kaleta with China's CWE, whereby the financial structure determines that important dividends (including for the GoG) are extracted from the energy sector.
- The procurement process to formalize IPP contracts is opaque, complicated, slow and not competitive, which increases the cost of electricity for the consumers and the government.
- Despite some recent progress, the target of universal access is still far away, due to the slowness in delivering the national strategy presented at the International Round Table in 2017. In particular, a delay in the construction of the national backbone (the national strategy is mostly relying on grid extension) and the lack of a comprehensive off-grid program that goes beyond the pilot projects launched in 2020 and still in the planning phase.
- Public institutions in the energy space (MoE, AGER, EDG, AREE) lack planning capabilities, project management and financial analysis skills, often understaffed and require new HR approaches in order to reduce corruption, attract and retain higher quality workers and offer interesting career paths, specifically to youth and women.
- The support from bilateral and multilateral institutions is not always coordinated, thus leading to inefficient use of concessional funding..

Acknowledging these challenges, the GoG and EDG want to take advantage of the AEMP to present a list of priority projects and reforms to tackle these issues and achieve ambitious policy objectives to deliver the Copernican revolution of the Guinea energy sector. Proposed activities include:

- On the **supply side**, Guinea wants to presents

itself as a fully green electricity country, and continue the development of solar and hydro power. More in particular, the MoE is looking for donors' support to organize a competitive procurement scheme to deliver additional 100MW of solar in the most efficient way (both in terms of time to market and cost-effectiveness). On the hydro side, the Fomi project is of paramount importance, as it will not only produce clean electricity (90 MW), but will also regulate the waters of the Niger river and significantly enhance irrigation for boosting agriculture and fishing.

- Attached to the solar procurement program there is also the **reform of the PPP unit**. The Government of Guinea would like to take measures to ensure that all future investments are undertaken in a coordinated and least-cost manner. For this reason, it would like to take advantage of the launch of a competitive scheme for new solar generation to strengthen the capacity of its PPP Unit and across government institutions.
- As for **T&D, two main 225 kV lines have been identified**, that will contribute to consolidate the national transmission network of Guinea, connect the last main cities and allow for an acceleration of the electrification by grid extension. They are the "Boucle de Guinée", 100 Km long and the "Coastal backbone" that will facilitate the electrification of the mining sector. In addition, to better manage the energy balance in Conakry metropolitan area, EDG is looking to support for building a **LV distribution Dispatching Centre**.
- In order to achieve the ambitious target of **universal access** to electricity by 2030, the GoG needs to escalate its efforts, as the current access rate is 46%, according to the government. For this reason, AEMP is being positioned as the forum to coordinate donors and the private sector to raise funds for the next phase of the Energy Access National Strategy. In particular, the next round of funding is targeting two components:
 - A distribution grid extension program, aiming at 671,000 new households and small

businesses connected by 2025,

- An off-grid program able to cover the remaining 5-10% of population that will not be reached by the national grid and also to offer “pre-electrification” solutions for the consumption centres waiting for the grid to come.
- The GoG and EDG are aware of the need of **structural reforms** with the main target of enhancing the financial and operational performance of the sector to transition away from subsidies and help attract required investments for development. For these reasons, the GoG would like to use AEMP to present and consult on its **plans to achieve the financial sustainability of EDG**, that are centred around the following axes:
 - Tariff reform, to achieve cost-reflectivity at least on average terms,
 - Deployment of end-user meters, with a three-year plan aiming to increase the number of households with meters from 16% to 85% (with a total of ~ 400,000 smart meters deployed),
- A plan to reduce technical and commercial losses.
- Finally, the GoG is seeking for assistance in capacity building for the following institutions:
 - **Guinean agency for energy efficiency and demand management** (support for the operationalization of this newly-launched entity)
 - **Guinean agency for rural electrification (AGER)**
- Setting up of a **multidisciplinary research unit** within the Ministry of Energy to develop in-house feasibility studies on energy projects.



SECTION 1: Country Priority Plan



Country Priority Plan

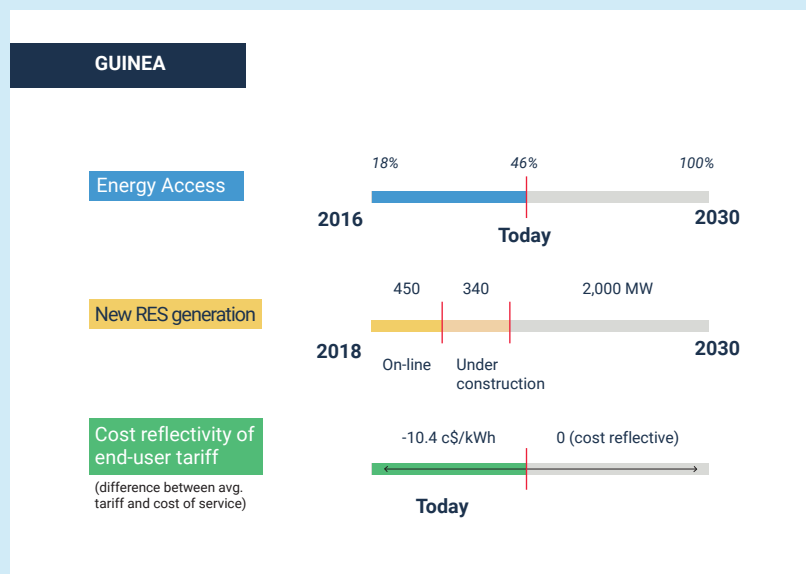
Government strategies and targets

The **GoG energy strategy** relies on a number of key documents, that have been published in recent years:

- Energy Sector Due Diligence (2021), which is the most comprehensive diagnostic of the energy sector in Guinea,
- Solar Integration Study (2019 updated in 2021), which identifies the capacity and conditions under which intermittent solar capacity can be safely integrated on the Guinean networks,
- Study on the electricity demand of the mining sector (2020),
- Integrated Master Plan (2018), for both generation and transmission and that includes the latest forecasts for the electricity demand growth,
- National Electrification Strategy (2017), as it was presented at the international round table in Paris in 2017,
- PNDES 2016-2020 (2016), which included some policy orientations for the electricity sector as well,
- National Determined Contribution (2015) for carbon abatement, issued for COP21 in Paris.

The main policy objectives - and their current progress as of today are reported in the following chart:

FIGURE 1 - GUINEA POLICY TARGETS



Source: TBI

More in detail:

- **Energy Access:** There is not a precise objective to reach universal access, but in 2017 Guinea raised funds with development partners to double its electrification rate in 5 years (from 18% to 36%). According to the national electrification strategy, the least-cost plan to reach universal access should rely on grid extension for ~90% of the consumption centres. The prominence of this option mainly stems from the huge investments already mobilized to extend the regional interconnections that will also serve as national backbone on the Guinean territory. This would facilitate the connections of towns and villages in the inland of the country through extension of the distribution grid starting from the substations already built along the interconnections. However, it would take time to complete such a plan, so the GoG wants to accelerate its efforts by deploying decentralized energy solutions also as part of a “pre-electrification” strategy, anticipating the arrival of the distribution network.
- **Increase generation capacity** In order to keep up with a growing demand and the plan to electrify the mining companies, the GoG plans to add 1,900 MW of hydro and solar capacity. Souapiti (450 MW) started operations in late 2020 and the GoG signed the contracts for the Amaria dam (300 MW) and the Khoumagueli solar park (40 MW), that sum up to 790 MW already. If Guinea wants to electrify its mining sector and become an electricity exporter, additional MW need to be developed and the cost per kWh be minimized.
- **RES Generation:** The objective is to be a 100% green generation country by 2025, with the thermal power plants only limited to supply reserves or as a back-up in case of breakdowns. This is likely to happen given the significant hydro and solar potential of the country and the fact that it seems very complicated to raise funds for upstream gas projects in a context where the international financiers are withdrawing from these operations.
- **Financial Viability:** The GoG wants to reach the cost reflective tariff for grid consumers in the next five years. The GoG had fixed an earlier target, but the COVID crisis and the necessity to support low-income customers have logically delayed the achievement of this important milestone. Alongside this, EDG plans to deploy 400,000 smart meters in the next three year, to reach a cover ratio of 85% and reduce the huge technical and commercial losses (up to 40% according to the audit).

Proposed priorities for discussion at AEMP

The table below sets out in detail the reforms and enabling environment activities along with specific investments that can be advanced through the AEMP process. It is on these proposals we are specifically seeking feedback.

#	Project and importance	Objective of AEMP presentation
Reforms and enabling environment		
1	<p>Establishing a clear and stable regulation through the new Sector Law.</p> <p>The government of Guinea has established two fundamental goals in the electricity sector, to provide access to energy for the entire population by 2030 and to become an energy hub in West Africa. To achieve those targets, it's crucial to update the sector law that clarifies the roles and responsibilities of all the actors involved: from the Ministry, to the rural electrification agencies, the regulatory authority and EDG. According to the sector audit of 2021, the reform of the sector architecture is essential to achieve the objective of the universal access to energy and integration into the regional market. For this, the terms of separation between the function of transport production and distribution and sale should be studied and discussed.</p>	<p>Policy dialogue on:</p> <ul style="list-style-type: none"> Optimal institutional arrangements to link planning to procurement Possible unbundling of EDG Orientations of a new "Lettre de Politique" Possible introduction of a new performance contract between EDG and the Government Balancing global climate needs with Guinea's needs to develop with a focus on issues such as Guinea's effective use of climate finance and launching of a clean cooking initiative. <p>Secure funding for:</p> <ul style="list-style-type: none"> New sector law - 0.3 m USD.
2	<p>Improvement of EDG Financial Performance.</p> <p>Improving EDG Financial performance is essential for the reform and sustainability of the electricity sector in Guinea, to reduce the perceived risk for investments and attract more public and private capitals.</p>	<p>Policy dialogue on:</p> <ul style="list-style-type: none"> How to tackle commercial losses? (collection, commercial systems, frauds)

Each of these priorities has been assessed for the impact they will deliver and the time it will take to deliver this impact in the table on the following page. This is intended to facilitate further prioritization conversations. A long list of potential capital investments and their current status along with the potential sector reforms is set out in the annex.

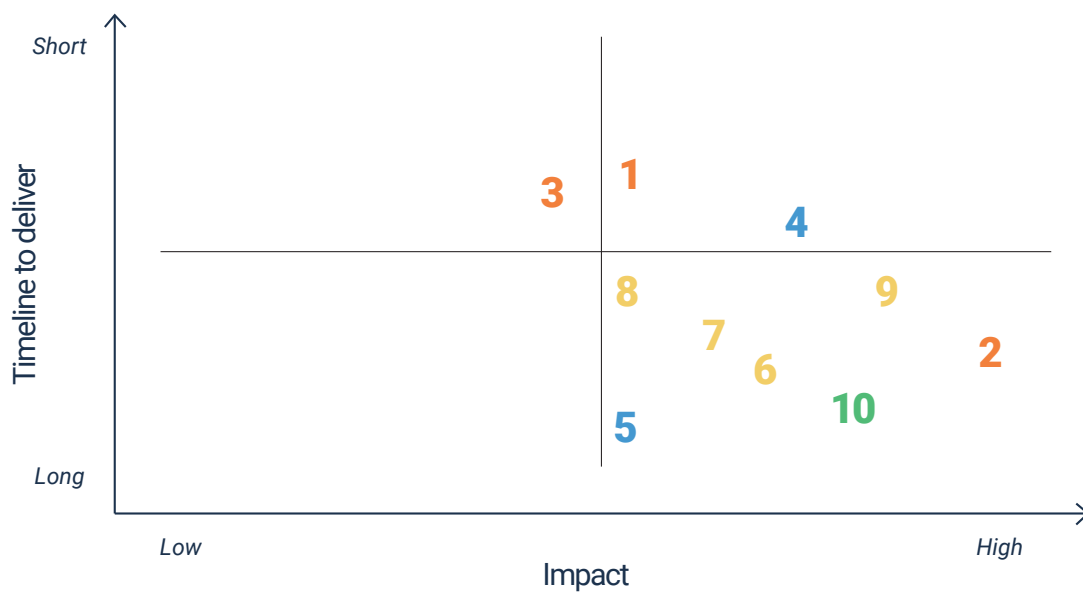
#	Project and importance	Objective of AEMP presentation
2	<p>This can be done through three main reforms that require the tight cooperation of EDG, GoG and Donors: a tariff reform, to make them cost-reflective, a plan to deploy 400,000 smart meters (250,000 of which have already the necessary funds) and a plan to halve the commercial and technical losses.</p> <p>The GoG must provide current and perspective investors some visibility over the future of EDG: whether it will remain Single Buyer or if and when the market will be liberalized. EDG will also assume the role of TSO within the WAPP zone 5 and thus it will be important to clarify which configuration it will adopt, ie. whether a form of unbundling will be proposed and third-party access to the grid granted to other companies.</p>	<ul style="list-style-type: none"> • How to ensure that there is an effective deployment of end-user meters with the support of the political authorities • How to accelerate the electrification of the mines to contribute to the financial turnaround of EDG • Government's commitment to make end-users tariffs cost-reflective. <p>Secure funding for a commercial loss reduction Program:</p> <ul style="list-style-type: none"> • Deploy 150,000 smart meters • Tariff reform • Increase revenue collection • Improve commercial systems.
3	<p>Strengthening of key institutional actors.</p> <p>The sector audit has highlighted the following needs:</p> <ul style="list-style-type: none"> • Ministry of Energy: enhancing the capacity to manage IPPs • AREE: currently understaffed and lacking key regulatory skills • AGER: establishment of its own budget allowing it to accomplish its mission in full autonomy. 	<p>Policy Dialogue on:</p> <ul style="list-style-type: none"> • Roles and responsibilities of each actor (ex. MoE vs EDG vs AGER) • Importance of the independence of the electricity regulator <p>Secure funding for:</p> <ul style="list-style-type: none"> • Capacity mapping and building

#	Project and importance	Objective of AEMP presentation
Generation Projects		
4	<p>Solar PV competitive procurement scheme.</p> <p>According to the solar integration study (2021) 103MW of solar could be developed by 2023 (of which 40 MW have already been committed). Additional 520 MW could be integrated in the network between 2023 and 2030 if the demand keeps growing at a sustained pace and the network is properly strengthened.</p> <p>At the same time, the GoG has accumulated an important number of unsolicited bids that are stuck at different level of advancement. In order to solve both issues, the GoG is looking to organize a competitive procurement process for 100 MW in the next years, to be located in the most ideal places for solar radiation and in order to minimize the cost of kWh. The additional solar capacity must be developed at the 2030 horizon to keep up with the demand.</p>	<p>Policy Dialogue on:</p> <ul style="list-style-type: none"> • Best approach to deal with all the IPPs that have proposed an unsolicited bid to build a solar power plan • Institutional and financial requirements to develop a competitive procurement process and roles • Competitiveness of EDG on the wider WAPP market to become an exporter (and actual surplus of power to sell) <p>Secure funding for a commercial loss reduction Program:</p> <ul style="list-style-type: none"> • Organizing the procurement process • Train the PPP Unit and EDG to run the process in the future
5	<p>Fomi 90 MW Hydro project.</p> <p>This project has multiple outcomes: to increase the generation capacity to strengthen the (clean) energy supply, better manage the waterway of the Niger river, increase irrigation for agriculture and fishing industry. As a result, its cost is higher than what it would be for a pure power plant, but the positive socio-economic externalities are also considerable.</p>	<p>Policy Dialogue on:</p> <ul style="list-style-type: none"> • Optimal approach to project development • How to exploit synergies with agriculture, fishing and navigation sectors <p>Secure funding for:</p> <ul style="list-style-type: none"> • USD 690m funding (grants, concessional funding) to build and deliver the Fomi multi-purposes dam.

#	Project and importance	Objective of AEMP presentation
HV Transmission Projects		
6	<p>225 kV Transmission Line "Boucle de Guinée".</p> <p>Project aiming to connect the main cities and towns in the Forest Guinea and High Guinea regions, increase power transmission capacity, grid stability and reliability.</p> <p>Status: Pre-Feasibility studies available.</p>	<p>Policy Dialogue on:</p> <ul style="list-style-type: none"> • Benefits of the line, and contribution to the objective of universal access • The scope for private sector investment. <p>Secure funding for:</p> <ul style="list-style-type: none"> • TBD musd (grants / concessional funding) for the construction of the line
7	<p>225 kV Transmission Line "Coastal Backbone".</p> <p>The project will increase the north-west system reliability, provide redundancy and allowing the connection of the mining companies to the national grid.</p> <p>Status: Pre-Feasibility studies available.</p>	<p>Policy Dialogue on:</p> <ul style="list-style-type: none"> • Benefits of the line, and contribution to the objective of universal access • The scope for private sector investment and in particular of the Mining sector. <p>Secure funding for:</p> <ul style="list-style-type: none"> • 250 musd (grants / concessional funding) for the construction of the line
8	<p>LV (distribution) Dispatching Centre.</p> <p>With the strong growth of the enduser demand especially in the Conakry metropolitan area and the increase of complexity of the distribution system of the capital, it is necessary for EDG to dispose of a dispatching centre for the LT operations.</p>	<p>Policy Dialogue on:</p> <ul style="list-style-type: none"> • The role of EDG as transport system operator (TSO), its functions and duties • Unbundling of the EDG activities as a possible way forward.

#	Project and importance	Objective of AEMP presentation
8		Secure funding for: <ul style="list-style-type: none"> 20 musd (grants/concessional funding) for the construction of the distribution dispatching centre.
National Electrification Programme		
9	On-Grid Electrification. As Guinea electrification strategy mostly relies on grid extension, this will be the most important component. The current phase of the strategy entails the launch of a project to connect 671,000 new households to the distribution grid of the inland cities by 2025. However, additional efforts must be put in place to reach the universal access.	Policy Dialogue on: <ul style="list-style-type: none"> How to unlock more funding to meet with the Universal Access 2030 target by delivering the national electrification strategy How to ensure that EDG is capable of keeping the pace of the increase of electrification rate via grid extension, especially in the inland regions Secure funding for: <ul style="list-style-type: none"> Complete the current phase of the Electrification project per grid extension: USD 268m.
10	Off-Grid Electrification. Off-grid solutions still have a role to play to accelerate the electrification rate of Guinea, with the national electrification strategy foreseeing about 50,000 households connected to mini-grids in the following five years. At the same time, the GoG intends to facilitate the entry of SHS distributors on the energy market.	Policy Dialogue on: <ul style="list-style-type: none"> Scaling up off-grid electrification The impact of tax incentives measures in the electrification of low-income population How to ensure a higher penetration of SHS in Guinea Accelerate mini-Grid programs. Secure funding for: <ul style="list-style-type: none"> Preparation and structure of tenders for mini-grid concessions in the priority areas – 2 musd Subsidize Mini-Grid and SHS Programs (RBFs), whose global market value is estimated at ~USD 150 m.

FIGURE 2 - PRIORITY PROJECTS PRESENTED AT AEMP 2021



Longlist of priority reform and projects
 1. New sector law | 2. EDG financial turnaround | 3. Institutional Strengthening | 4. 100MW Solar tenders
 5. Fomi 90 MW dam | 6. Boucle da Guinée HV line | 7. Coastal Backbone HV line | 8. LV Dispatching centre
 9. Distribution grid extension | 10. Off-grid access program

Key
 (1) - Reform
 (5) - Generation
 (7) - T&D
 (10) - Off-grid

Source: TBI elaboration

Summary of sector outlook

Demand Outlook

According to the 2018 Master Plan, Guinea's demand is expected to grow at a CAGR of 10% in the next decade, without considering the electrification of the mining sector and the export potential. In order to quantify the additional MW to keep pace with demand, TBI updated and amended "Scenario 2" of the Master Plan (meanwhile become obsolete) as follows:

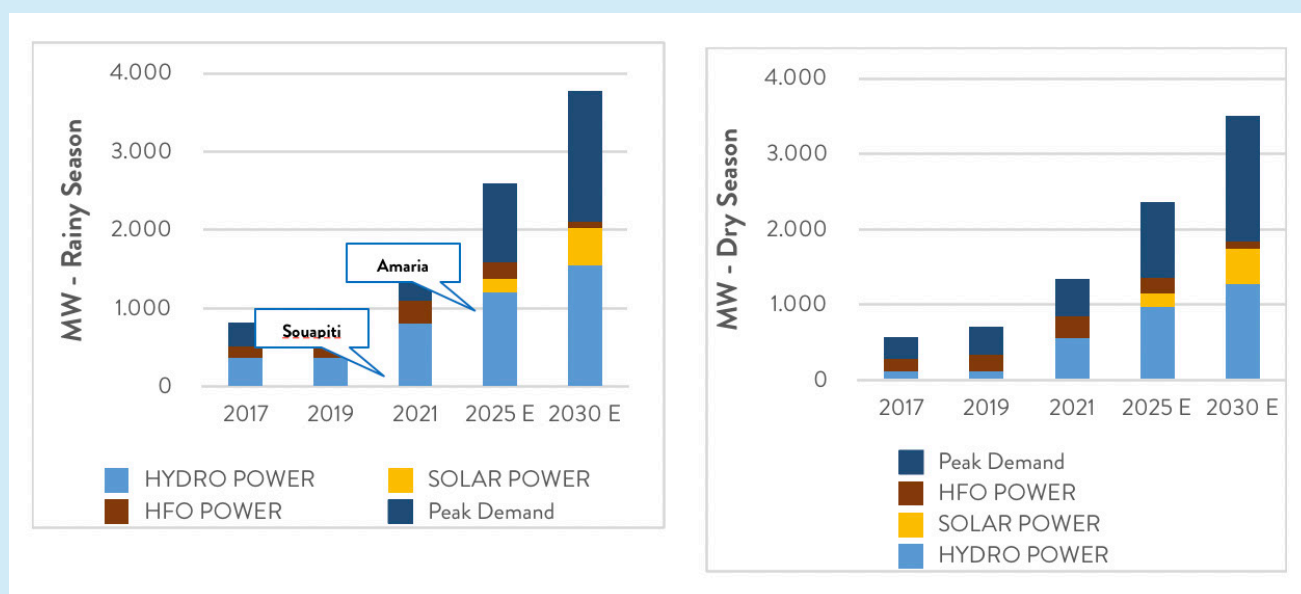
- Export of 1,174 GWh/year on the OMVG line from Q3 2022 until Q4 2023, then reduction to 750 GWh/year,
- Export of 200 GWh/y on the Guinea-Mali from Q1 2024 until Q4 2025, then 750,000 GWh/y,
- Import of a baseload of 27 MW from the CLSG from Q1 2022 until Q4 2023,
- Annual demand of the mining sector to be equal to the Low Scenario of the Master Plan but postponed by three years (so growing from 40 GWh in 2023 until 1,585 in 2030),
- All other things being equal.

It is important to note the high volatility of the demand forecasts, mostly due to the uncertainty over the mines' electricity load, which could span between 200 and 1,200 MW according to a recent study of the mining sector's power demand.

Generation Outlook

In order to keep up with the adjusted demand, the GoG will have the necessity to add about 800 MW of hydro power (in addition of Souapiti, which is already on-line) and 600 MW of solar capacity to the generation fleet by 2030, as shown in the chart below.

FIGURE 3 - EXPECTED EVOLUTION OF THE INSTALLED CAPACITY



Source: TBI elaboration on Master Plan and own data

To achieve this objective, the Government has identified two priority axes:

1. Development of the hydro potential

- Starting with the **Amaria dam, for 300 MW**, for which the developer (China's TBEA) is addressing the environmental challenges of the project. This power plant should go live in 2025, and 100 MW will be reserved by TBEA for its refineries. The negotiated price is about ~10.2 c\$ / kWh, with an annual indexation.
- The construction of the **Fomi 90 MW Multi-purposes dam** to be commissioned by 2026, is of particular importance for the Government as this project goes beyond electricity production, but also better manage the waterway of Niger river, increase irrigation for agriculture and fishing industry. As a result its cost is higher than what it would be for a pure power plant, but the externalities

are also way more positive: the estimated CAPEX (\$ 690 m) should be reviewed anyway and a PPP could be set up.

- Guinea is part of two basin organizations: OMVG, together with Guinea-Bissau, The Gambia and Senegal and OMVS (with Senegal, Mali and Mauritania). Each of these institutions is developing an hydro power plant whose output will be shared among the member states. In particular, OMVG is about to launch the works for the construction of **Sambangalou (128 MW, ~400 GWh/y) and the OMVS of Koukoutamba (294 MW, 890 GWh/y)**, whose contracts have been awarded, but the construction has not started yet. Guinea will benefit of a share (~25%) of their generation. Both contracts have been awarded, but their progress is slow, possibly due to difficulties in finding the financing and for environmental reasons (for the OMVS project in particular).
- **Additional hydro generation, estimated to be around 300 MW** to go live between 2026 and 2030, in order to keep the pace with the demand. This capacity might come from the following projects: Morisanako (100 MW), Kogbedou-Frankonedou (90 MW), Boureya (160 MW) or Tiopo (105 MW), that are all at a very early stage of development and could be further advanced at the AEMP.

2. Solar competitive tenders.

- As of today, only one IPP (Khoumagueli 40 MW) managed to secure the signature on the PPA and is close to financial close. However, being the result of a bilateral negotiation, the selling price of its kWh remains quite high (8 c\$/ kWh) for such a mature technology. The GoG wants therefore rely on competitive procurement for selecting the next IPPs, thus minimizing the cost of supply. Given the technical constraints for the integration of the intermittent generation on the Guinea grid, the grid integration study suggested to add up to 63 MW by 2023 (for a total of 103 MW considering the power plant already agreed), and the rest in the following years until 2030, based on the evolution of the demand. A competitive procurement scheme could be launched in different phases to expand the generation capacity while complying with the technical constraints.

For the success of the Guinea's generation plan, timing is of paramount importance. In fact, on one side, the GoG wants to play a central role in the regional market and become an exporter, but on the other, it is also keen to connect the mining sector to the national grid. In this sense it is key that the new generation capacity be connected at the right moment, to avoid a situation of oversupply (if new capacity goes online, but EDG is not able to connect the mining companies nor to export its excess) or losing those potential outlets (in case of delays in the commissioning of the new power plants). In particular, it seems complicated for EDG to supply 1,174 GWh/year on the OMVG grid and, at the same time, export power to Mali, at least until Amaria goes live.

Transmission Outlook

The Guinea transmission network is in a process of rapid extension, which is mainly due to the various interconnections that have been launched by the GoG with its development partners and the neighboring countries: OMVG, OMVS, Guinea-Mali, CLSG will not only connect countries but will also allow Guinea to complete its HV backbones, that could also be used for a further expansion of the distribution grid.

In addition to the four international projects, GoG has also launched four main fully national initiatives, that will serve to purposes of increase the access rate, stabilize the grid and integrate more intermittent energy sources, such as solar. The lines are:

1. **225 kV Line “Linsan-Fomi”**, that will connect the West provinces of the country, rich in hydro resources, with the West and the Guinea-Mali interconnection, passing by the site of the planned Fomi dam,
2. **225 kV Line “Linsan-Maneah”**, that will allow the full evacuation of the Souapiti dam to Conakry, that is currently curtailed to ~110 MW (out of 450 MW) ,
3. **225 kV Line “Boucle de Guinée”**, that will connect the remaining cities of the High Guinea and Forest Guinea regions, currently isolated from the national grid,
4. **225 kV Line “Coastal backbone”**, located in the North West of the country, where most of the mining companies are based.

While the funding of the first two lines have been already covered by EIB and AFD respectively, the GoG hopes to take advantage of the AEMP for raising the necessary funds to launch the Boucle de Guinée and the Coastal backbone.

Apart from these priority projects, EDG and the MoE have planned eight additional transmission projects, aiming at further strengthen the grid and that are listed in the summary table in annex of this document.

FIGURE 4 - GUINEA NATIONAL GRID



Source: STUDI Master Plan, 2018

Energy access and Off-grid electrification Outlook

The national electrification strategy was developed between 2016 and 2017 with the support of a consultant funded by the World Bank. This work led to the formal validation and appropriation of the strategy by the Ministers Cabinet and was officially presented at the International Round table that the GoG organized in Paris in 2017, with the objective of raising funds for its Economic and Social Development Plan (PNDES 2016-2020). To achieve universal access by 2030, the GoG must facilitate the connection of 1.7 million households.

This strategy relies on a geo-referenced model that takes into account a number of assumption and the precise location of the consumption centers (cities and villages) and their distance from the existing and planned network. The result of the modelisation is that in Guinea, given the (theoretical) low cost of supply (hydro and solar) and the multiple interconnection and transmission projects, the least-cost modality for increasing the access is rate is grid extension (which was indicated as optimal for >90% of the consumption centres).

In the following years, the GoG managed to secure important funding to launch the first phase of the strategy, aiming at doubling the connection rate from 18% (recorded in 2017) to 36% as target for the programme, thanks to 671,000 new connection by grid extension and 50,000 by mini-grids.

It must be noted that most of the planned interventions concern the legalization of unregistered clients, the densification and extension of existing distribution networks. In the off-grid space, only a pilot project, jointly funded by the WB and AFD, was launched in 2020 for the construction of 13 mini-grids, but it has not been awarded yet.

AEMP is then the ideal venue where the GoG can update its strategy to accelerate the achievement of the universal access, raise the necessary funds and clarify the role of decentralized energy solutions.

Summary of the main challenges to address

The power sector in Guinea is going through a few challenges that the GoG is committed to tackle. One overarching issue remains the perceived country risk, mostly due to the widespread riots driven by political and social reasons that affected the country in recent years.

At **institutional level**, it has been highlighted in the sector diagnostic a lack of clarity about roles, responsibilities and the modalities of interactions of the different entities (MoE, AREE, AGER, EDG). In particular, the need for a due diligence review of the **DNE** (national energy department) mapping its capacity is recommended, together with more support for further developing those capacities. The **AREE** appears understaffed and lacking the right skills to perform the important tasks that have been assigned to it. It would be better if its budget autonomy were effectively implemented, through the imposition of a fee on the turnover of the regulated companies, as foreseen by the law. As highlighted in the sector audit, the different parameters of action of EDG and **AGER** must be better outlined and the GoG should reflect on the necessity of a rural electrification agency in a country that mostly relies on grid extension.

However, the most pressing reflection concerns **EDG**. The company remains the core of the sector. Despite being the single buyer for the end-consumers and the only entity authorized to import or export power it still lacks sufficient autonomy to act as an efficient economic operator, rather than a mere extension of political power. From a financial standpoint EDG is not in a position of creditworthiness, given the extremely low tariffs that the GoG imposes on households. In addition, EDG plays a minor role in the choice and negotiations of IPPs, that are still politically driven. The most peculiar case concerns the PPAs for the hydro generation of Kaleta and Souapiti, that have been contracted by the GoG at a high kWh price (around ~11c in 2022, with an annual indexation of 1.44%). These tariffs allow the two SVPs managing the dams to earn profits that are then redistributed to their shareholders. The GoG owns 51% of shares of Souapiti (via SOGES) and 49% of Kaleta (via SOGEKA) and the annual dividend that the GoG are estimated to be around USD75m/year, about three times as much as the subsidies paid back to EDG (~ USD25m), making the company (or better: the energy sector) a net contributor to the GoG and not vice versa. It would therefore be of paramount importance to grant EDG the necessary financial and operational autonomy to act like a performing corporation - the entire energy sector would benefit from it.

The main question mark regards the **real demand evolution**. Projections from the 2018 Master Plan have already proven to be too optimistic, especially regarding the mining demand (no company has so far been connected) and the export (postponed due to construction delays with the transmission lines and financial risks given the high cost of the Guinean power sector). Should the demand growth be weaker than expected, Guinea might find itself in a situation of oversupply. Considering that all IPPs require the signature of Take or Pay clauses, EDG would be obliged to pay for electricity that it does not consume.

As for **power generation**, the two main challenges are the lack of creditworthiness of EDG as a counterpart for the IPPs and the lack of a transparent competitive procurement. Both conditions contribute to make the cost of supply of Guineans

IPPs relatively high. In the short term there is a third challenge, represented by the thermal IPPs signed in the past with Té Power, AISI and Karpowership (KPS). These contracts are particularly expensive and should not be renewed. The KPS contract will expire in February (if notice is given by August 2021 to avoid an annual renewal), while the other two have a length of 5 years and should expire by 2024 (AISI²) and 2025 (TP).

At the **network's level**, until recently the national transmission grid was extremely limited and not meshed, but the ongoing projects will change the outlook in the next years. More investments are required to increase the grid's stability and comply with international operational and safety measures.

EDG technical and commercial losses are still very high: according to the sector audit, distribution alone accounts for 30 to 40% global losses (technical and commercial), which represents a huge financial issue to be tackled to improve EDG's profitability. For comparison, Sonabel in Burkina Faso marks a global loss rate of 15%, Senelec in Senegal of 17% and CIE in Cote d'Ivoire of 19%³. The sector audit mentions that the meters between the transmission and distribution grids are not reliable and so there is no calculation of technical (and consequently) non-technical losses. In terms of metering, the previous management contract with Veolia failed to deploy the pre-paid meters (only 5,484 to date), and as of today, only 16% of EDG's client base has a meter (pre- or post-paid), while the others are invoiced based on gross estimations.

As for **energy access**, the situation is different according to the modality. When it comes to the **grid-extension**, the major issue is the need for additional funding to expand the network. In Conakry, given the complexity of the grid, the lack of a distribution dispatching centre makes it difficult for EDG to manage the demand and the maintenance of the network. And finally in the area around the capital there is always the concern about illegal connections, that contribute to the financial distress of the power utility.

The **off-grid** segment has traditionally received minor attentions, due to the focus on the grid extension. This area lacks proper guidance, given the weakness of the AGER (understaffed and with limited capacity) and the poor statistics available.



SECTION 2: Diagnosing the sector

Section 2: Diagnosing the sector

Institutional arrangement in the sector

Since the recovery plan adopted in October 2011, the energy's sector institutions in Guinea are undergoing a major restructuring. The current sector institutions include both public and private sector players.

The Ministry of Energy (ME) responsible for steering and implementing public policy in the energy sector plays an overarching custodial and supervisory role. The Guinean Rural Electrification Agency (AGER), framed by the decree D/2017/099/PRG/SGG, is a public institution under the supervision of the ME that oversees the development of rural electrification programs, including decentralized off-grid electrification solutions. Article 9 of Law L / 2013/061 on the rural electrification sub-sector specifies that local authorities also contribute to the electricity sector within the scope of rural electrification.

The Water and Electricity Regulatory Authority (AREE), is an independent institution attached to the Presidency of the Republic of Guinea and framed by law L / 0050/2017 / AN. As the regulatory authority for the electricity sector, whose mandate officially commenced in January 2020, AREE ensures the economic and financial balance of the sector, in particular by controlling operators and public and private companies in the sector. It also contributes to pricing policy, on which it is consulted and must submit an opinion. Its objective is also to look after the interests of users and to guarantee compliance with public service quality standards. Expectations are that AREE will also regulate off-grid tariffs and be involved in granting concessions (World Bank, 2019).

Electricity of Guinea (EDG) is the historical operator and state-owned electricity utility of Guinea's electric system created following the failure of attempted privatization in the 1990s. Following a 4 year management services contract with the consortium, -Veolia-Seureca- between October 2015 and 2019, EDG is now a public limited company with a board of directors. It exercises the de facto role of concessionaire for production, transport, distribution and sale of electrical energy in Guinea, although no concession contract has been signed. The company is under the technical supervision of the ME and under the economic supervision of the Ministry of Economy and Finance (MEF). The company is also governed by the provisions of Law L / 2017/056 / AN of 08 December 2017 on the Financial Governance of Companies and Public Establishments in the Republic of Guinea and its implementing decrees. Several independent power producers (IPPs), including China International Water and Electric (CWE) operating Kaléta and Souapiti hydropower plants under a public-private partnership (PPP), produce more than 80 percent of electricity generation, leaving less than 20 percent of the generation to EDG.

On a regional level, the country (via EDG) is a member of West African Power Pool. The country is part of three major regional interconnector projects; the Organisation pour la Mise en Vigueur du fleuve Gambie (OMVG The Gambia River Basin Organisation) and Energy Project (interconnexion of Guinea, Guinea-Bissau, The Gambia and Senegal); the Côte d'Ivoire, Liberia, Sierra Leone and Guinea (CLSG) Interconnector

Project; and the Guinea-Mali Interconnection Project.

With an Electricity Regulatory Index (ERI) of 0.422 in 2020, Guinea is ranked #24 out of 36 countries considered by the AfDB for this analysis and falls below the average ERI of 0.485 in Africa.

In particular, while Guinea performs well in the institutional setting appraisal (mandate, clarity of role, autonomy), it sits at the bottom of the chart for its capacity to implement regulation (0.302 against an African average of 0.545) and score particularly poorly on the impact of regulatory outcomes for utilities.

In the short-term Interventions (1-2 years) the Electricity Regulatory Index for Africa 2020 report recommends to Guinea to:

- Publish the rationale behind the regulatory decisions,
- Develop a clear tariff methodology,
- Approve a national grid code (in line with the forthcoming regional WAPP code)
- Develop simplified licensing framework for off-grid and small size systems,
- Develop and implement quality of service regulation,
- Develop model technology specific PPA,
- Develop technical standards for mini-grids and SHS,
- Develop energy efficiency legislation or policy.

In the medium-term (3-5 years), the report recommends the country creates a specialized and independent mechanisms/bodies to contest the regulator's decisions, modify the electricity law or adopt regulatory texts to enhance regulatory independence (vis-à-vis the executive and stakeholders).

Sector reorganization should be discussed as part of the development of a letter of sector policy, specifying the government's strategy for the electricity sector, which will then be translated into the new sectoral framework law. Based on the policy letter, this framework law will integrate all the provisions relating to the industry as a whole. It will clarify the framework state intervention and contextualize the reforms. It will define a series of objectives key indicators, with which target indicators will be associated: access rate, coverage rate, GHG footprint of the production mix, quantity of energy exported / sold to miners, energy efficiency objectives, average cost per kWh purchased from PPIs, etc., depending on identified axes. It will also indicate the main elements of institutional reform: diagram of unbundling of production / transport / distribution, network access principles, repositioning of the incumbent operator EDG, etc.

Generation

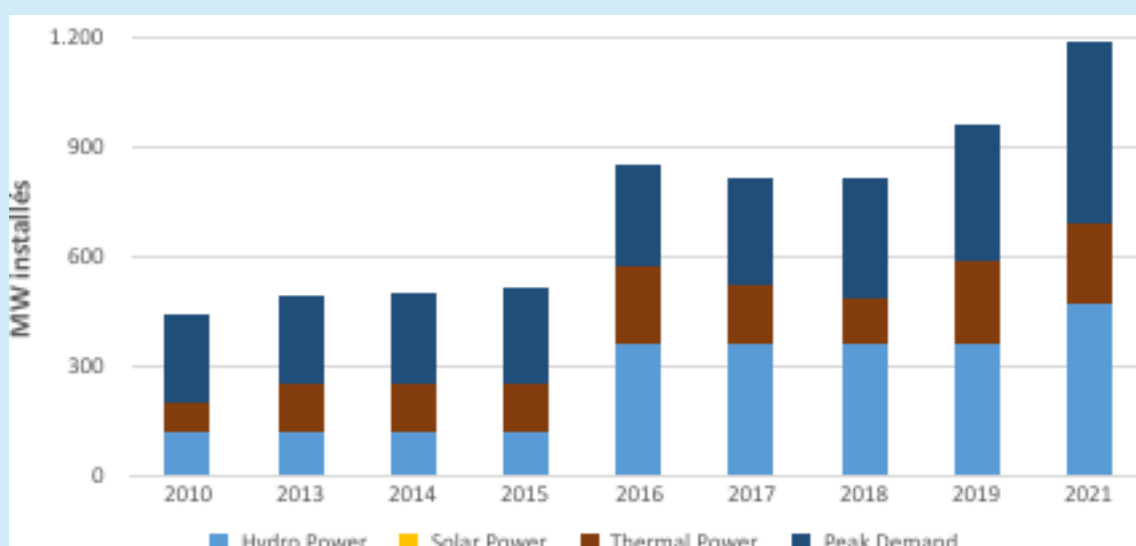
Overview

Guinea, which is known as “the water tower of Africa” has an energy potential estimated at more than 6,000 MW, most of it in Konkouré basin (World Bank, 2018), of which just about 15% is currently exploited. This potential could supply the entire West African sub-region with electricity if it were effectively tapped and make the country the main player in the electricity market in the region.

Guinea has sharply increased its electricity production capacity , with the gradual establishment of independent electricity producers from the middle to the end of the 2010’s, which culminated with the commissioning of Souapiti in 2020. Guinea’s installed capacity is dominated by hydroelectric and fossil fuel plants. The current government has made diversification of the energy mix a priority so far focused on increasing hydropower’s contribution. In 2021 the first solar IPP (Khoumagueli, 40 MW) was officially signed, and the government wants to increase the solar share of the generation mix even more.

The evolution of the nominal installed capacity in Guinea is reported in the chart below.

FIGURE 5 - EVOLUTION OF INSTALLED CAPACITY IN GUINEA



NOTES: nominal capacity. Souapiti in 2021 with only one turbine available. Source: MoE and EDG.

As of 2021, there are currently eight hydroelectric plants supplying the country's national grid⁴. Six are owned and managed by EDG:

- Garafiri 75MW;
- Baneah 5MW;
- Donkèa 15MW;
- Grandes Chutes 26 MW;
- Kinkon 3,5 MW;
- Tinkisso 1,65MW.

And two by China International Water and Electric (CWE), who also owns shares in both of the two SPVs owning the dams (51% and 49% respectively):

- Keleta 240 MW;
- Souapiti 450 MW.

There are 12 thermal power stations, of which only Kaloum 5 (32.5 MW) is operated by EDG on the interconnected network.

The units formerly managed by AON (an IPP) should be transferred to EDG although there are issues related to the capacity of the Guinean monopolist of operating them. Specifically these are:

- Kaloum 1 (24MW);
- Kaloum 2 (26MW);
- Kipé (50 MW).

There the following IPPs with short term contracts (one to five years):

- Karpowership (115MW);
- Tè-Power (50 MW);
- Kaloum 3 (44MW)⁵.

EDG also operates the power plants of the isolated grids of the inland cities: Kankan 18 MW, Nzérékoré 5.9 MW, Faranah 1.4 MW, Boké 12.6 MW.

All in all, in recent years production has changed significantly - with the connection of IPPs - to the point that out of 1,195 MW of installed capacity, EDG's assets produce only 196 MW.

Challenges

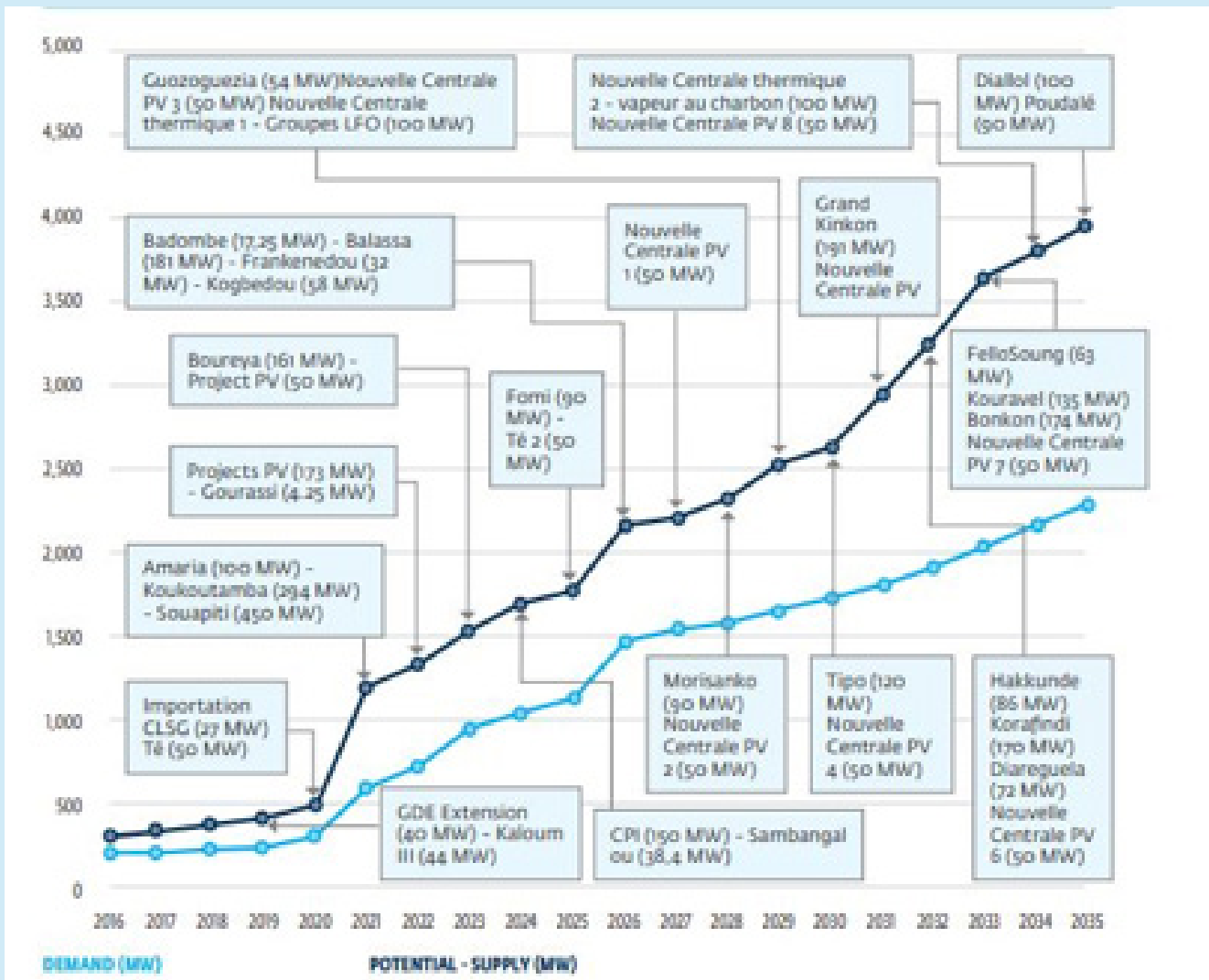
Rising investment in generation, especially hydropower, represents a key area of activity. Most of the new power production is projected to come from hydro sources, with solar opportunities to complement. However, the network must be able to offtake all the new generation capacity which is not the case with Souapiti, which, as of 2021, can only supply one quarter of its maximum output, due to insufficient transmission capacity. This capacity is due to be expanded in 2023/2024, when the new Linsan-Maneah and the Linsan-Fomi HV lines will be completed.

Other projects in the pipeline include the Amaria hydropower plant (300 MW), which is subject to a broader agreement with Chinese group TBEA and to finding a solution on the complex environmental issues.

In principle, current and committed new power generation should exceed the domestic demand, while the regional inter-connections under development will provide an outlet for Guinea to become a regional energy exporter. It is important that these proposed power sector developments are done so competitively to ensure a sale outlet for it, be it internal (mining companies or households) or external. The case of Kaleta and Souapiti and the difficulties that Guinea had to negotiate for an export contract, are a clear example of the need for greater transparent and competitive procurement process also for hydro generation.

Even in terms of solar investments, the main challenge remains the procurement process. The GoG has already engaged in many bilateral negotiations with IPPs which have presented unsolicited bids, but the bankability of these deals proved to be challenging, and the GoG was not able to implement a solid plan to steer the process. As a result after many years of multiple negotiations, no solar MW has been installed yet. In addition, there is the grid integration problem for this intermittent generation. While the government forecasts have up to 173 MW of solar PV planned within the next five years, recent World Bank Group studies suggest that only 103 MW of solar power may realistically be absorbed by the grid in the very short term, and 40 MW have already been committed.

FIGURE 6 - POWER GENERATION PROJECTS UNDER DEVELOPMENT AND AT CONCEPTUAL STAGE



Source: Updated Master Plan for the Development of Production and Transport Infrastructures, Government of Guinea, 2018

Energy demand by the extractives sector can be expected to broadly correlate growth in mineral extraction. Although most mining companies currently integrate their own power supplies, cheaper hydro or solar supply could prove attractive. The development of heavy resource-based industries (e.g., alumina production) would be a game-changer for energy demand, but this is only likely over the medium to longer term. It is of paramount importance to well synchronize.

Transmission and distribution

Overview

Guinea's transmission infrastructure is composed of two separate grid systems: the interconnected network, mostly centered around the Conakry metropolitan area (known as RIC) and a smaller isolated grid (known as Tinkisso system) in the centre of the country. The RIC system connects four main cities in Maritime Guinea and four other cities in Middle Guinea with an infrastructure composed of 116km of 225kV lines, 601km of 110kV lines and 82km of 60kV lines. The Tinkisso's system is a network of low voltage lines powered by small hydroelectric plants. The government's future plan is to extend high voltage lines to reach approximately 1,543km of HV lines in total with a USD479 million budget (Studi International, 2019).

FIGURE 7 - MAP OF THE HW TRANSMISSION NETWORK



Source: Africa Energy

For transmission and distribution, the national power utility EDG remains the monopolist. The quality of the transport network should be improved. Power cuts are often the result of production incidents, but also saturated lines unable to supply the resumption of load from one faulty plant to another. Technical and commercial losses are very large, at 18 and 25%, respectively, while regular outages result in significant productivity losses for industrial and commercial customers.

The network is now set to expand on the one hand to support electrification of the country, and on the other to allow interconnections between the countries of the sub-region. With the growth in demand and the strengthening of the production assets, it presents several congestion nodes limiting energy transit and preventing the use of power plants at their full capacity. Thanks to a management contract whereby Veolia Group managed EDG for a four-year period, improvements in operation and maintenance of grid infrastructure have been successful including a reduction in the duration of power interruptions. Between 2015 and 2017, the rate of non-planned outages of power plants decreased from 28% to 18%.

There is also a risk that transmission and distribution challenges will be amplified by the upcoming rapid increase in generation capacity. It is not clear whether power plant integration studies have been carried out, and if they have been, whether EDG has verified their compliance with the technical conditions. The protections in place do not follow EDG specifications and EDG has difficulties in enforcing the technical rules. There is a lack of adjustment of the frequency, setting ranges too wide, lack of overload protection and the operating conditions are not systematically followed, e.g. decommissioning of the tension adjuster to prevent wear. .

Delays have also been recorded in the commissioning of the national dispatching (planned for October 2019) failing to reach an agreement with SOGES for the use of its fibers optics and SOGEKA for access to the telecom network and operational data of the Kaléta power station.

SOGEKA operates 5 HV substations (Hamdallaye, Matoto, Manéah, Kaleta, Tombo) which would disrupt the EDG network because the protections in place and the operating rules would differ from those of EDG: for example, the neutral would be earthed without a current limiting resistor fault, which has the effect of damaging the distribution cables. A strengthening of contractual conditions is necessary to ensure that the EDG specifications and operating procedures.

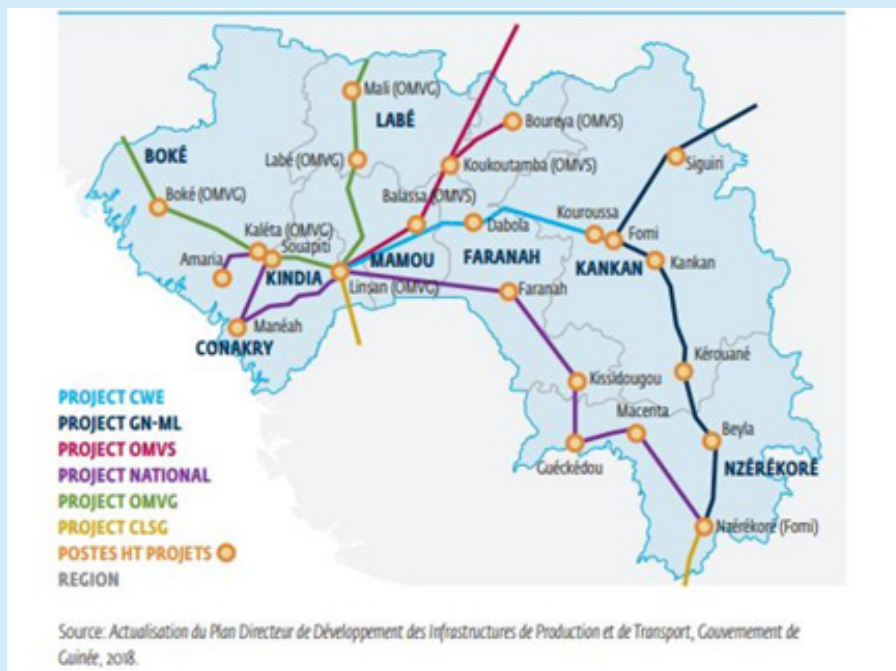
On a regional level, Guinea is part of three major regional interconnector projects; the Organisation pour la Mise en Vigueur du fleuve Gambie (OMVG The Gambia River Basin Organisation) and Energy Project (interconnexion of Guinea, GuineaBissau, The Gambia and Senegal); the Côte d'Ivoire, Liberia, Sierra Leone and Guinea (CLSG) Interconnector Project; and the Guinea-Mali Interconnection Project.

The government has already mobilised financing from the EIB to build the transmission line between Linsan and Fomi which will link the dams of the western part of the country with the consumption centres in High Guinea in the east and the Guinea-Mali interconnection.

The Guinea-Mali Interconnection project involves constructing five substations in N'Zérékoré in Guinea that will also be connected to the CLSG system with a 714km 225kV transmission line from N'Zérékoré in Guinea to Sanakoroba in Mali. To implement this project, USD317.3 million are co-funded between IDA, AfDB, EU, European Investment Bank (EIB), Islamic Development Bank (IsDB), ECOWAS Bank for Investment and Development (EBID) and West African Development Bank (BOAD) (World Bank, 2018). The CLSG project is expected to electrify potentially up to 32 localities surrounding the substations. Another substation in Fomi will be connected to the Organisation pour la Mise en Valeur du fleuve Gambie (OMVG) through the future Linsan-Fomi transmission line in Guinea. The OMVG system is planned to

connect Western Guinea with a 225kv line to Guinea-Bissau and Senegal.

FIGURE 8 - MAP OF PLANNED REGIONAL INTERCONNECTIONS



Source: Actualisation du PND des infrastructures de production et de transport, Gouvernement de Guinée, 2018. Project CWE is currently being financed by EIB. Project National is the Boucle de Guinée, in search for funds.

Challenges

One challenge concerns the instability of the network is inbetween generation and transmission and the ability of EDG to offer ancillary services. There is no framework allowing the incumbent to interfere with the IPPs scheduling, and it is not even clear if the large new dams of Kaleta and Souapiti are equipped to provide these services.

Another important challenge in the transmission segment is the capacity of EDG to become a real TSO, able to manage a more complex grid that will cover the entire WAPP ICC Zone 5, including also Sierra Leone and Liberia. It will be important that the forthcoming regional grid and market codes, currently being developed by WAPP, be rapidly internalized by EDG and the MoE, whenever approved. It is also important that EDG receive the necessary capacity building support to acquire the key skills to operate the regional grid.

The complexity of the transmission network and the strained financial conditions of EDG could perhaps be addressed by promoting the unbundling of the transmission assets of the company from the generation and distribution and sale. A separation of the accounting or even legally, would bring clarity and transparency to the sector, and specifically on how the transmission network is managed, now that EDG must play the role of an international TSO.

Energy access and off-grid electrification

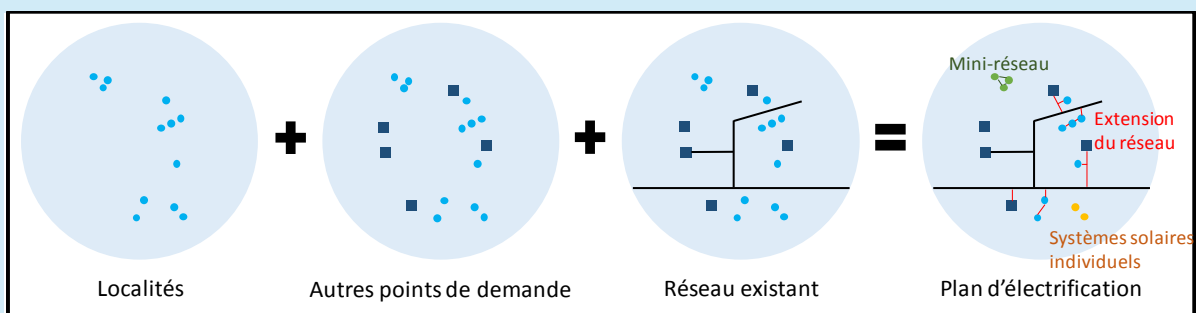
In terms of access to electricity, the Government of Guinea's objective is to achieve 100% access by 2030. This target is in line with the commitments of the SE4ALL initiative, which the government joined in 2012. This target implies making an additional 1.7 million connections over the period 2018-2030.

However, only 46% of the Guinean population has access to electricity, with only 18% of the population having formal and legal access to electricity (this rate falls to 2% in rural areas). In view of this low access rate, the National Programme for Improving Access to Electricity, which aims to plan for long-term electrification of the country by 2030, was launched in 2017. Based on the least-cost planning approach, this programme coordinates both the extension of the national grid, the development of Mini-Grids, and the implementation of individual solar solutions (SHS).

According to the plan, the interconnected network will be extended to the households closest to the grid that are cheapest to connect and then, over time, to households further away. This strategy allows for many low-cost connections to be made quickly, requiring little MV line, the most expensive component of a grid connection, while bringing the benefits of electricity access to as many people as possible. As the programme progresses, the connections become more remote, requiring the extension of MV lines.

Mini-grids will be deployed in remote communities. These mini-grids will also serve as a pre-electrification solution for communities that will be electrified via the grid, but wish to accelerate their access to electricity. If the Guinean authorities express a desire to do so and are willing to cover the additional cost of temporary access, mini-grids can be set up by AGER to serve them. The mini-grids will be built according to the standards of the national grid in order to prepare them for the arrival of the interconnected system. Finally, individual solutions (SHS), for isolated households and very small communities (of the order of three households on average)

FIGURE 9 - BASIC STEPS IN THE ELECTRIFICATION PLANNING APPROACH



Source: Programme national d'amélioration de l'accès à l'électricité en Guinée, Octobre 2017

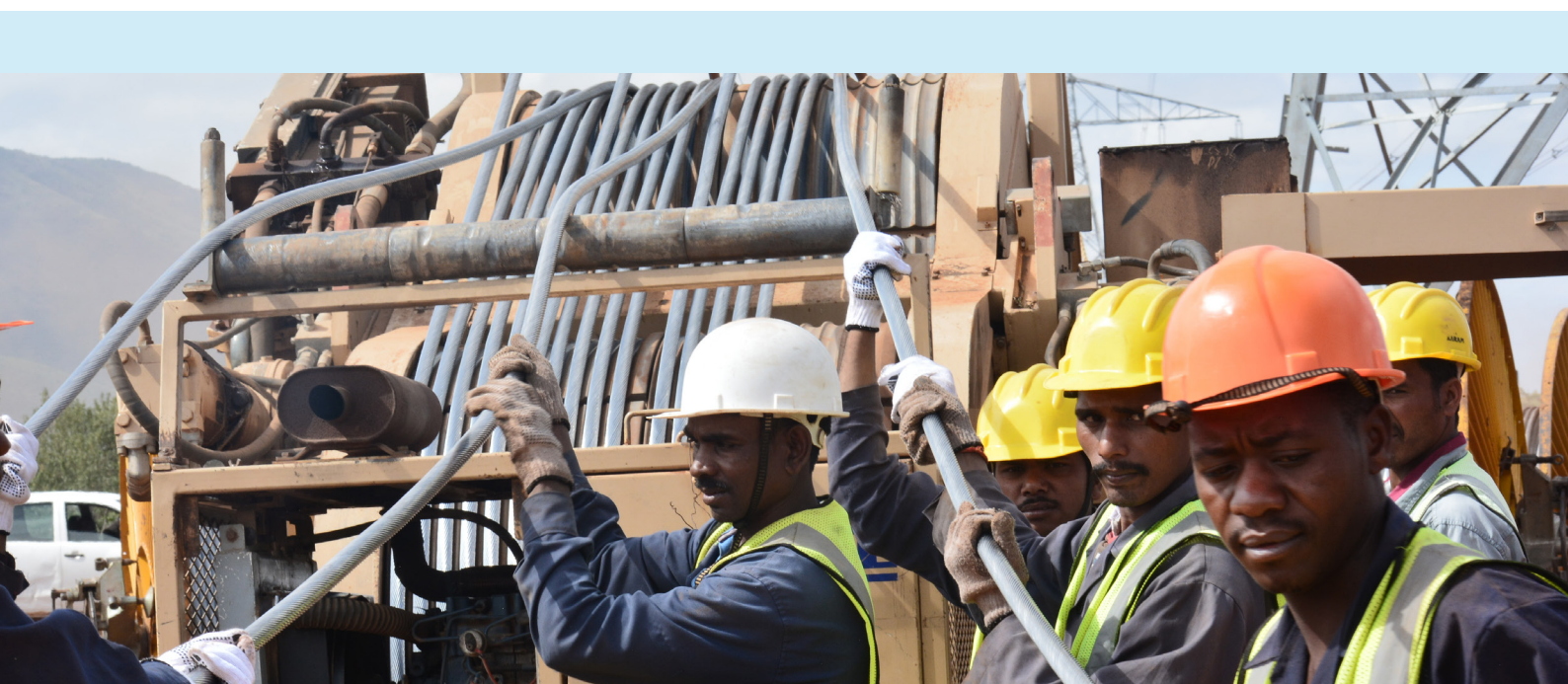
Figure 9 above shows the main steps of this approach. It consists of identifying the geo-location of demand (population and others) and its evolution; integrating data from the existing electricity infrastructure; comparing the total costs of the options for electrification (interconnected grid, mini-grids, solar home systems) for each demand point; and developing the optimal sequential grid deployment plan, prioritising the cheapest connections. Thus, in the first few years, connections will be made in areas close to the existing and developing transmission network. Following this approach, the strategy foresees that 99% of the 1.7 million households to be connected will be connected through the gradual expansion of the network. The grid is the lowest cost option due to the country's large-scale hydropower potential. According to the findings of the simulations, small-scale solutions (diesel-photovoltaic or hydro mini-grids, and individual solar solutions) are the lowest cost option in a limited number of situations.

In close collaboration with the World Bank, the CoG launched its Investment Prospectus at the end of 2017 to finance the first phase of this vast program. This first phase of the program is expected to run for five years (2018-2022) and would achieve the intermediate target of 721,000 connections to meet the goal. This target is broken down into more than 662,000 connections on the grid, more than 6,000 on the mini-grids and more than 2,000 individual solution connections. In addition, the Government wants to allow the deployment of mini-grids as pre-electrification solutions. This initiative would allow an additional 50,000 households to be connected through temporary mini-grids. The sequencing of these connections, as well as the electrification technologies, are presented in the table below.

In addition, the government intends to integrate the development of mining with the electrification program both to develop the large-scale hydroelectric potential (large consumers to make these major investments profitable) and to generate revenue to cross-subsidize the consumption of households benefiting from the social electricity tariff (high reserve price of mining industries). The presence of significant mining resources in the country (bauxite, gold, iron etc.) constitutes an opportunity for the electricity sector. The activities generated represent a significant potential demand for energy in relation to the population's consumption⁶.

However, this first phase of the electrification program will require a substantial overall capital investment of US\$ 644 million over the next five years (i.e. approximately US\$ 495 million for the national Grid, US\$ 16 million for the Mini-Grids, US\$ 8 million for the individual solutions and US\$ 125 million for the pre-electrification component).

	YEARS 1 AND 2	YEAR 3	YEAR 4	YEAR 5
Grid	37 512	78 256	198 256	348 256
Cumulative		115 768	314 024	662 280
Mini-Grids	2 600	1 300	1 300	1 299
Cumulative		3 900	5 200	6 499
Individual solutions	888	444	444	445
Cumulative		1 332	1 776	2 221
Permanent connections	41 000	80 000	200 000	350 000
Cumulative		121 000	321 000	671 000
Pre-electrification Mini-Grids	6 000	12 000	15 000	17 000
Cumulative		18 000	33 000	50 000
Total connected households	47 000	139 000	354 000	721 000
Percentage	18,6%	20,2%	25,0%	36,6%



Challenges

In terms of energy access, the main challenge lies with the unprofitability for EDG to connect new customers. The end-user tariffs are so low that each new user corresponds to a loss for the electricity company. The financial distress of EDG also means that it largely depends on public subsidies, the grants or the concessional funds of development partners to fund energy access programs.

Within the parameters of the existing grid, it is of paramount importance to deploy meters as soon as possible. In Guinea as of now, only 16% of the registered customers own a meter, the rest pay an “indicative” standard bill and fraud remains widespread.

The off-grid segment has never been a priority of the GoG, as the national energy strategy reflects in its findings. However, with the delays in extending the network and the financial difficulties of EDG, these solutions could find a bigger space than the one reserved for them so far. On a similar note, two additional elements have been observed; the lack of coordination between EDG (access through grid extension) and the AGER (access through off-grid solutions), and the relatively weakness of the latter. However, in a country where, according to the national strategy, 99% of consumption centres are to be electrified through grid extension, the role and the same existence of a rural electrification agency is put into question.

AfDB involvement in the power sector

Project title	OMVG Energy Project
Country	Guinea, Guinea-Bissau, Senegal and The Gambia
Project description	Construction of 1677 km of 225 kV, 15 sub-stations and 2 dispatching centers to interconnect national grid of the four member countries (Guinea, Guinea-Bissau, Senegal and The Gambia) of The Gambia River Basin Organization (OMVG).
Signature	14-Dec-2015
Effectiveness	23-Nov-2016
First disbursement	25-Sep-2017
Closing date	31-Dec-2022
Amount (Million UA)	41.32
Partner	Co-financed by AfDB (MUA 97), AFD, EIB, kFW, KFEDA, WB, WABD and Governments.

Project title	Côte d'Ivoire, Sierra Leone, Liberia and Guinea electricity interconnection project
Country	Guinea, Côte d'Ivoire, Sierra Leone and Liberia
Project description	Construction of a high voltage interconnection network (225 kv) between Côte d'Ivoire, Liberia, Sierra Leone and Guinea. Activities related to the construction of the transmission infrastructure have also been scheduled, namely: (i) electrification of localities along the powerline; capacity-building for WAPP and the countries; (ii) planning and feasibility studies for hydropower plants to enhance energy exchange; and (iii) project management. Implementation of the project will make it possible to complete the WAPP interconnection network and increase safe power supply by 290 MW.
Signature	06-Nov-2013
Effectiveness	20-Jan-2015
First disbursement	3-Febr-2015
Closing date	31-Dec-2022
Amount (Million UA)	331.51
Partner	Co-financed by AfDB (MUA 40.8), EU, EIB, kFW, WB, WABD and Governments.

Project title	Guinea-Mali electricity interconnection project
Country	Guinea and Mali
Project description	Construction of 714 km of 225 kV, and 7 sub- to interconnect national grids of Guinea and Mali.
Signature	06-Jul-2015
Effectiveness	08-Feb-2016
First disbursement	3-Febr-2017
Closing date	31-Dec-2021
Amount (Million UA)	299.63
Partner	Co-financed by AfDB (MUA 30), AFIF/EU, EIB, EBID, IsBD, WB, WABD and Governments.

Project title	Technical assistance for the implementation of green mini-grid studies in 57 localities
Country	Guinea
Project description	Study to evaluate mini grids opportunity for 57 remote localities
Signature	21-Jan-2020
Effectiveness	21-Jan-2020
First disbursement	
Closing date	20-Jan-2023
Amount (Million UA)	0.83
Partner	Co-financed by SEFA (MUA 0.83), and Government.

Project title	Project to improve access to electricity in Guinea
Country	Guinea
Project description	Construction of 1,183 km of MV lines, 1,394 km of LV lines, 60 km of mixed MV/LV, erection of 38 MV/LV sub-stations, 209 H61 sub-stations and last mile connection of 78,520 households and SMEs.
Signature	To be approved on 15th September 2021.
Effectiveness	
First disbursement	
Closing date	
Amount (Million UA)	119.99
Partner	Co-financed by AfDB (MUA 50), IsBD, JICA, USAID, SEFA and Government.

Donor engagement and coordination

PROJECT	DESCRIPTION	DONOR	PROGRESS	EXPECTED DELIVERY
Audit of the electrical sector	Overall assessment of the state of the electricity sector in Guinea: its main challenges, its expected evolution and recommendations	WB	Completed	Q1 2021
Electricity Sector Recovery Project (PRSE)	Supply and installation of materials and equipment for the rehabilitation of connections and the improvement of technical conditions of connection of the makeshift networks in the areas of KALOUM, RATOMA and MATOTO. Engineering & Supervision of the rehabilitation and extension of the MV/LV distribution network in the commune of Dixinn Supply and installation of an integrated software package for EDG. Engineering, Supervision of works and installation of meters in the Greater CONAKRY Technical assistance for the continuation of the customer census and subscriber coding operation	WB	Ongoing	Q4 2021
Mining demand study	Quantification of the mining industry's electricity demand to 2030	USAID / Power Africa	Completed	Q4 2020
Study and realization of the feasibility of 4 (?) Micro Hydro Power Plants		AFD / EU	Ongoing	2024
Solar integration study	Assessment of the intermittent solar capacity that the Guinean grid is capable of absorbing. (2019 study updated in 2021 for the short term)	WB	Completed	2021
Khoumaguey Solar Power Plant 40 MW	Solar power plant in BOT (IPP), with Proparco funds and AFD guarantee	AFD/Proparco	Ongoing	2023
Keno mini hydro power plant	Hydro power plant of 7.4 MW whose studies were financed by UNIDO. Search for an operator in progress	ONUDI		2024
Rehabilitation and reinforcement of hydroelectric plants and source stations	Rehabilitation and reinforcement of the Grandes Chutes, Donkea, Baneah and Garafiri hydroelectric power stations. Rehabilitation and reinforcement of the 60/20kV substations of Sonfonia and Kipe. Construction of a new 110/20 kV substation in Sonfonia Casse.	EIB	Ongoing	2023

PROJECT	DESCRIPTION	DONOR	PROGRESS	EXPECTED DELIVERY
National Dispatching of Guinea	National Dispatching (Production and Transport)	Abu Dhabi Fund	Ongoing	Q4 2021
OMVG (Guinea Component)	Sambalou hydroelectric scheme (128 MW - 402 GWh/a, Senegal), of which 85% of the lake's output and 20% of the power generation is reserved for Guinea. - Interconnection line and substations Sambalou-Labé-Linsan-Kaleta-Boké-Saltinho (575 Km total in Guinea) - Populations settled in new sites	EIB	Ongoing	Q3 2022
Guinea - Mali Interconnection	Construction of a 714 km double track line linking Nzérékoré to Bamako via Beyla, Kérouané, Kankan, Kouroussa and Siguiriri.	AFDB, BIDC, ISDB, EIB, BOAD, EU, WB	Ongoing	Q4 2024
CLSG (Guinea Component)	- CIV-Liberia-Sierra Leone-Guinea interconnection line - Rural electrification of 32 localities of the CLSG project (147 km of LV line, 197 km of 33 MV line, 41 substations and 2,000 prepayment meters)	AfDB	Ongoing	Q4 2021
Linsan-Fomi interconnection line	Studies and construction of the line for the connection of the East of the country to the interconnected network	EIB	Ongoing	Q3 2023
Linsan-Maneah line	Studies and construction of the line to allow the complete evacuation of the Souapiti production to Conakry	AFD		Q3 2023
PREREC 2	Rehabilitation and extension of the electricity networks in Conakry (Ratoma, Matam and Matoto).	AFDB	Ongoing	2022
Regional Capitals Project - Phase 2	Rehabilitation and extension of the distribution networks of the regional capitals and the interconnected system - Phase II	BIDC (CEDEAO)	Ongoing	2023

PROJECT	DESCRIPTION	DONOR	PROGRESS	EXPECTED DELIVERY
Rehabilitation and extension of Conakry's electricity transmission and distribution network	Construction of a new 110/20kV substation in Sanoyah Rehabilitation of 110 kV, 60 kV and 30 kV transmission lines Rehabilitation and reinforcement of the Conakry distribution network (Ansoumaniah and Lansanayah areas)	AFD	Ongoing	2023
Installation - Prepayment meters	Supply and installation of 14,000 prepayment meters and 505 post-payment meters in the commune of Kaloum	WB	Ongoing	
PER (Rural Electrification of 31 localities)	Rural electrification of Mamou, Dalaba, Pita and 28 other localities, supply of goods Services and Consultants	AfDB	Ongoing	Q4 2021
Small Scale Hydraulics in Guinea (PEHGUI)	- Electrification of the pilot locality of Kouramangui (Labe) by MV/LV mini-grid powered by a hybrid solar PV/pico hydro/generator plant - Elaboration of a rural electrification programme using renewable energies for a dozen rural localities	FFEM	Ongoing	Q4 2021
Rural electrification with mini-grids (13 localities)	ADO for the selection of one or more operators for the construction and management of Mini-networks in 13 remote localities	WB/ AFD	Ongoing	2024
Development of the 15-year National Rural Electrification Programme (PNER).	Establishment of a specific programmatic framework for the development of Rural Electrification in Guinea through the elaboration of a global report proposing a division of the Guinean territory into Rural Electrification Zones (REZ) to be conceded to Private Rural Electrification Operators (PRO)	ECREEE (CEDEAO)	COMPLETED ?	2021

NOTE

¹ Assuming this is allowed by the shareholders agreement that remains confidential.

² Although it is possible that this contract be terminated before, due to lack of performance of the IPP.

³ Source: Nodalys, 2021.

⁴ Although some of them are partially shut down for renovation works.

⁵ This power plant has had several technical issues and never reached the full capacity.

⁶ To illustrate, mining demand in the North West of the country is estimated at 1,500 GWh for the year 2025, compared to an estimated demand of the newly connected population in this region (which concentrates about one third of the total population of the country) of 500 GWh for the same year.

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