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Energising Africa: Enabling Private Sector Development in Renewable Energy

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By Nnadozie Ifeanyi-Nwaoha





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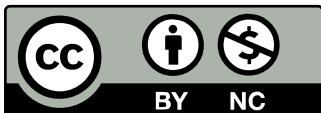
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Many thanks to Nnadozie Ifeanyi-Nwaoha for writing this policy brief. Nnadozie Ifeanyi-Nwaoha is an Associate Director at EMRC, where he leads work on electricity market development, regulatory reform and digital tools for the electricity sector. He is an accomplished energy and sustainability consultant with over a decade of experience in clean energy access, decarbonisation and regulatory reform across emerging markets.

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List of abbreviations and acronyms

AEDC	Abuja Electricity Distribution Company
AfDB	African Development Bank
ATCC	Aggregate, Technical, Commercial and Collection
BESS	Battery Energy Storage System
DARES	Distributed Access through Renewable Energy Scale-up
DISCO	Distribution Company
ELEC-T	Electricity Tracker
EMRC	Energy Market and Rates Consultants
FiT	Feed-in Tariff
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GW	Gigawatts
IEA	International Energy Agency
IEP-SIP	Integrated Electricity Policy and Strategic Implementation Plan
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency
JICA	Japan International Cooperation Agency
LTWP	Lake Turkana Wind Power Project
MW	Megawatts
NAPTIN	National Power Training Institute of Nigeria
NED	Nigerian Energy Database
NEP	Nigeria Electrification Project
NERC	Nigerian Electricity Regulatory Commission
NREEEP	National Renewable Energy and Energy Efficiency Policy
P2P	Peer-to-peer

PPA	Power Purchase Agreement
PPI	Presidential Power Initiative
PPP	Public-private Partnership
PV	Photovoltaic
RE	Renewable Energy
REA	Rural Electrification Agency
REF	Rural Electrification Fund
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
RESCO	Renewable Energy Service Company
se4all	Sustainable Energy for All
SHS	Solar Home System
TCN	Transmission Company of Nigeria
TW	Terawatts
TWh	Terawatt-hours
VPP	Virtual Power Plant



Executive summary

Africa stands at an important moment in its energy transition journey, with high renewable energy (RE) potential expected to tackle chronic energy poverty. Despite abundant solar, wind, hydro and geothermal resources, over 600 million Africans still lack access to electricity, highlighting the urgency of scaling sustainable energy solutions. According to the International Renewable Energy Agency (IRENA), Africa has the potential to annually generate:

- 10 terawatts (TW) of solar energy
- 350 gigawatts (GW) of wind energy
- 15 GW of geothermal energy, and
- 1,750 terawatt-hours (TWh) of hydropower

Despite this, only 2% of global RE investments in the last two decades have been made in Africa. These investments have been constrained by policy volatility, ineffective financing mechanisms and high capital costs. The private sector could play a key role in filling these gaps. The sector is already a major player in Africa's RE landscape, providing finance and deploying and managing energy solutions across both on-grid and off-grid markets. Developers such as M-KOPA and Bboxx have expanded access by deploying solar home systems. Meanwhile, large-scale investors such as CrossBoundary, InfraCredit – which has mobilised over NGN 264 billion in financing – Impact Fund Denmark (IFU), the Norwegian Investment Fund for developing countries (Norfund), Finnfund and Vestas (the investors behind Kenya's Lake Turkana Wind Power Project) have demonstrated the value of public-private partnerships.

However, while these contributions are recognised, progress has been slow.

African leaders have persistently spoken of the need for private investment into their countries and have implemented initiatives to develop the sector. Nevertheless, across both utility-scale and decentralised systems, the private sector's role is not yet fully optimised. Consequently, through desk research that takes Nigeria as a case study, this policy study explores the role of private sector investment in unlocking Africa's RE potential – focusing on practical strategies, policy instruments and financing innovations to address key sectoral barriers.

Despite abundant solar, wind, hydro and geothermal resources, over 600 million Africans still lack access to electricity

The research findings show that private sector participation is persistently constrained by financial challenges such as:

- Currency mismatch (securing project funding in a foreign currency but collecting revenue in the local currency);
- A lack of affordable local financing (foreign loans expose projects to exchange rate risks while local loans, when available, often come with high interest rates and no government guarantees);
- High perceived-risk, compound structural issues such as inadequate infrastructure (existing grids being unable to allow RE integration at any scale); and
- Weak sector creditworthiness (poor payment discipline as customers' payment performance remains low).

Green bonds, blended finance tools and concessional climate funds are beginning to unlock new capital, but private capital remains concentrated in a few countries and dominated by a handful of players. Programmes such as the Nigeria Electrification Project (NEP) and the Distributed Access through Renewable Energy Scale-up, both of which are supported by the World Bank and the African Development Bank (AfB), have demonstrated the potential of government-backed de-risking instruments. More effort is needed to support local banks and credit enhancement institutions like InfraCredit and to extend

local currency financing options to widen investor participation.

We also find that while several African countries have made strides in developing supportive regulatory frameworks, regulatory uncertainty is constraining private sector engagement. This is marked by poor policy execution, complex licensing processes (which can take a minimum of six months to secure) and fragmented market frameworks, especially in countries like Nigeria that have undergone electricity

While several African countries have made strides in developing supportive regulatory frameworks, regulatory uncertainty is constraining private sector engagement

market decentralisation. Furthermore, the underdevelopment of local technical expertise and supply chains also limits scale and sustainability. Nigeria's Mini-Grid Regulation, the utility franchising guideline and the recent Electricity Act 2023 are commendable efforts to address these shortcomings. However, gaps remain, particularly around stable implementation, accessing the benefits of incentives and enforceable market rules. In addition, many countries lack harmonised RE targets, reliable feed-in tariffs and enforceable purchase obligations. There is also insufficient alignment between national and sub-national policies in certain markets.

To enhance private sector participation and scale up RE investment across Africa, governments and stakeholders should:

- **Institutionalise predictable policies:** Establish long-term, stable policy environments with clear RE targets, enforceable market rules and consistent fiscal and regulatory incentives to reduce investor uncertainty.
- **Streamline regulatory processes:** Simplify licensing and approval procedures, eliminate overlapping mandates and adopt standardised, bankable power purchase agreements that reflect fair risk allocation, hedge currency risks and guarantee revenue certainty.
- **Invest in grid-compatible infrastructure:** Invest in modernising transmission and distribution networks, support energy storage and enable off-grid and mini-grid systems to complement centralised generation, especially in under-served and unserved regions.
- **Expand access to innovative finance:** Scale up green bond markets, operationalise concessional climate funds and leverage blended finance models that combine public and private capital to de-risk investments.
- **Build local capacity and supply chains:** Invest in vocational training, support the emergence of credible local developers and equipment providers, and promote technology transfer and local manufacturing to strengthen the sector's long-term viability.

1. Introduction

Africa's energy landscape presents vast untapped renewable energy (RE) resources juxtaposed against a backdrop of widespread energy poverty. Despite being rich in solar, wind, hydro and geothermal potential, the continent has the lowest electricity access rates globally, with about 600 million Africans living without power. RE offers an answer to this electricity deficit. Renewables are now gaining traction not only because of falling technology costs and global climate commitments but also because they offer modular, scalable solutions in a context where traditional grid expansion has often faltered. They also represent a pathway to improved energy security, energy transition and economic diversification through their ability to provide an improved, reliable supply.

The shift towards RE sources is a response to the global climate crisis as well as a strategic move to reduce dependency on fossil fuels, which often come with volatile prices and geopolitical tensions. Yet despite this potential, the actual deployment of RE has been limited. For instance, in 2019, RE sources accounted for less than 20% of Africa's electricity generation, with solar and wind power accounting for less than 6% of this.¹ The obstacles

to expansion include high initial costs, inadequate infrastructure, regulatory hurdles and political instability. This scenario highlights a critical need for transformative energy solutions that are sustainable, accessible and scalable.

The private sector could be the key to filling the investment and deployment gaps in Africa's RE sector. Private companies bring innovation, investment and efficient project management. Already, the private sector is a major player. Independent

Renewables represent a pathway to improved energy security, energy transition and economic diversification through their ability to provide an improved, reliable supply

power producers (IPPs) such as Scatec Solar and Mainstream Renewable Power have invested in large-scale solar and wind projects across the continent, demonstrating the private sector's vital role in RE development. In addition, banks and investment firms are increasingly financing RE projects. For example, the African Development Bank (AfDB) has played a leading role through programmes such as the USD 379.6 million Desert to Power initiative, which aims to develop 10 gigawatts (GW) of solar capacity and provide electricity

to 250 million people across the Sahel region. This builds on previous large-scale regional solar visions like Desertec while offering a more structured, Africa-led implementation strategy.

International organisations and non-governmental organisations have also supported RE development through funding, capacity building and policy advocacy. The International Renewable Energy Agency (IRENA) provides data, analysis and support to African countries to help them realise their RE potential. IRENA's initiatives and publications offer valuable insights and guidance for policy development and implementation. The World Bank has funded numerous RE projects and provided technical assistance to improve regulatory frameworks, supporting the growth of the RE sector in various African countries.²

While these contributions are recognised, domestic and international constraints are hindering progress. As a result, across both utility-scale and decentralised systems, the private sector's role is not yet fully optimised. Much effort has been put into remedying this challenge. For instance, African leaders have implemented initiatives to develop the private sector. To fully harness these benefits, there needs to be an enabling environment characterised by supportive policies, regulatory certainty and mechanisms for public-private collaboration.

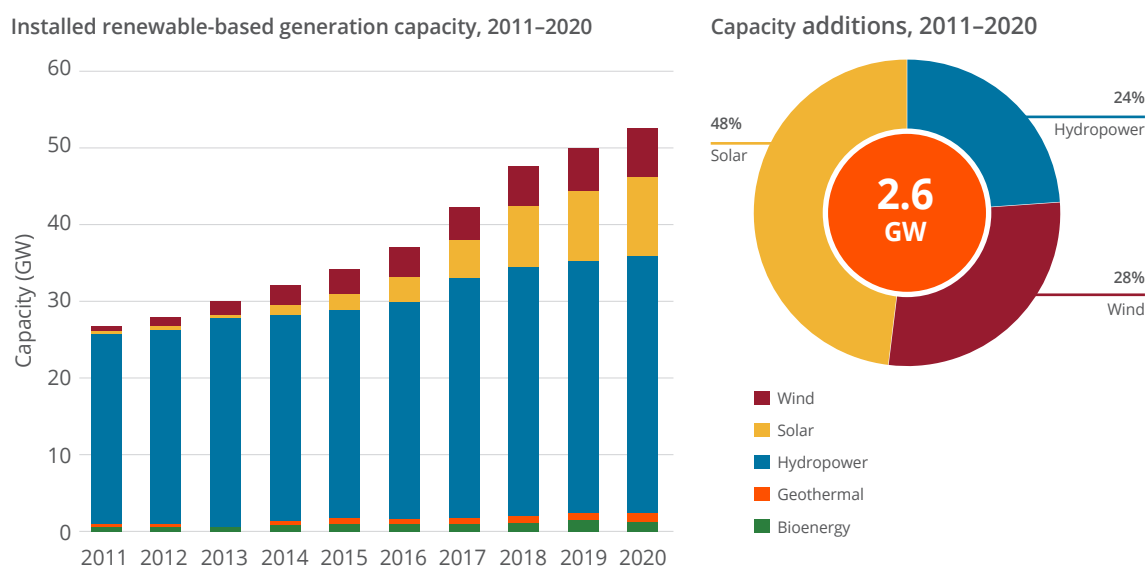
Through desk research, this policy paper delves into exactly how to achieve this. The paper analyses the current state and future potential of private sector development in Africa's RE sector. Using Nigeria as a case study, this report also assesses the role and dynamics of the private sector, highlights the challenges and opportunities, and proposes strategies and policy recommendations to enhance private sector involvement.

2. Overview of the current and potential development of renewable energy in Africa

Africa has huge RE potential, with some of the highest solar irradiation levels globally. More than 85% of Africa receives at least 2 000 kilowatt-hours per square metre (kWh/m²) per year, which is notably higher than many parts of Europe and North America, which typically receive around 1 000 hours of sunshine per year. IRENA estimates that Africa could generate over 10 terawatts (TW) of solar power annually, which is enough to meet a significant portion of its electricity needs.³ Wind energy prospects are equally promising, particularly in the East African Rift System and the coasts of North and Southern Africa. IRENA highlights that the continent has the potential to generate approximately 461 GW of wind power.⁴ Hydropower, a historically significant source of RE in Africa, also has considerable untapped potential, especially in Central and East Africa, with the potential to generate around 1 750 terawatt-hours (TWh) annually. In addition, geothermal resources in the East African Rift present significant opportunities for countries such as Kenya and Ethiopia, with a potential capacity of about 15 GW.

The data indicates a consistent upward trajectory in the installation of RE generation capacity from 2011 to 2020.⁵ In countries such as Nigeria, three distinct dynamics are at

Figure 1
Africa's renewable energy generation capacity 2011–2020



Source: IRENA (2025)

play: large-scale grid-connected generation, community-scale off-grid systems such as solar mini-grids, and individual self-generation through rooftop solar and inverter-based systems. RE is increasingly displacing traditional sources across at least two of these segments.

The bar chart in Figure 1 shows the annual increase in gigawatts of installed capacity, with the contributions segmented by energy source. The dominance of wind and solar technologies is evident, reflecting global trends in RE adoption and the continent's vast potential in these areas. The substantial year-on-year growth highlights Africa's progress in harnessing its renewable resources, with a notable acceleration in the latter half of the decade. Complementing this, the pie chart in the figure focuses on the capacity additions between 2019 and 2020, where solar energy emerges as the front-runner, contributing to nearly half of the new capacity. Wind energy also plays a significant role, accounting for over a quarter of the additions, followed by hydropower. The smaller shares of geothermal and bioenergy suggest that these early-stage sectors could be poised for future development.

Despite this growth in deployment, the overall penetration of RE in Africa's energy mix is still relatively low at just 25%, compared to the global average of 41%. This could be attributed to several factors, such as limited public and private funding, inadequate infrastructure, policy and regulatory challenges, and a lack of technical expertise. RE installations are also unevenly distributed. As of 2024, a significant portion of Africa's RE generation comes from hydropower and not solar and wind energy. While hydro has long been a leading contributor, it is increasingly vulnerable to the effects of climate change, such as drought, while solar and wind can be more predictable depending on their geographical locations. Solar and wind energy developments are increasing but remain nascent in many regions. Deployment is also hindered by the fact that most African countries rely heavily on fossil fuels for their energy needs.⁶ Below are regional and country RE highlights:

- **North Africa:** Countries like Morocco and Egypt are leading in solar energy, with ambitious projects such as the Noor Ouarzazate Solar Complex in Morocco, one of the world's largest solar power plants. North Africa's proximity to Europe also offers potential for energy export.
- **West Africa:** The region has made strides in both solar and wind energy. Nigeria, despite its vast oil reserves, is gradually exploring solar energy to address its power shortages and growing electrification gap. Projects such as the Nigeria Electrification Project (NEP) and the Distributed Access through Renewable Energy Scale-up (DARES) programme are promoting off-grid solar solutions like mini-grids and solar home systems (SHSs) to enhance energy access in rural communities, education facilities and health care centres. Ghana and Senegal are also emerging as key players in the solar energy sector. In Ghana, the Scaling-Up Renewable

Despite this growth in deployment, the overall penetration of RE in Africa's energy mix is still relatively low at just 25%, compared to the global average of 41%

Energy Programme (SREP) is driving the deployment of RE power projects, while Senegal has implemented projects such as the 20 megawatts (MW) Bokhol Solar Park to diversify its energy mix.

- **East Africa:** The Great Rift Valley offers significant geothermal potential. This region is already a leader in geothermal energy. Kenya is the largest producer of this energy in Africa (over 800 MW), allowing the country to generate 90% of its electricity from RE sources.⁷ Ethiopia is also making strides in geothermal development with projects like the Aluto-Langano Geothermal Plant (in 2023, well tests confirmed a capacity of 25 MW⁸). Wind energy is gaining traction, exemplified by the Lake Turkana Wind Power (LTWP) project in Kenya, Africa's largest. Off-grid solar solutions are also rapidly expanding, providing electricity to rural households and businesses across the region.
- **Central Africa:** This region remains the least developed regarding RE. However, countries such as the Democratic Republic of Congo, through which runs the Congo River, have significant untapped hydropower potential (up to 100 000 MW). Projects such as the Inga Dam could drastically increase the region's RE capacity. Furthermore, decentralised energy solutions are beginning to take hold, with off-grid solar systems providing much-needed electricity to remote communities.
- **Southern Africa:** South Africa is at the forefront of wind energy development (over 3 442 MW being contributed by 34 wind farms) and is actively expanding its solar energy capacity. The country has implemented several RE programmes, attracting significant private-sector investment. A notable example is its Just Energy Transition Partnership, announced at the 26th United Nations Climate Change Conference (COP26), which involves USD 8.5 billion in funding from international partners to accelerate the country's transition from coal to RE. This investment is poised to attract additional private sector involvement by providing a stable and supportive policy environment and leveraging financial resources for further RE projects. In addition to large-scale projects, South Africa is seeing growth in decentralised energy solutions, including off-grid and mini-grid solar systems, which are crucial for providing power to rural, under-served and unserved areas.

3. The case for the private sector in renewable energy

This section discusses the importance of private sector participation in advancing RE adoption across Africa. It highlights the key roles that private stakeholders play in driving investment, innovation and project implementation, which continue to shape and accelerate the growth of the RE sector.

3.1 Types of private sector actors

The private sector currently plays a pivotal role in advancing RE across Africa. It contributes not only in direct investment into RE projects but also by bringing innovative technologies, efficient project management and global best practices. Private enterprises can be categorised into three key groups.

3.1.1 Private solar companies and developers

Private solar companies and developers are at the forefront of deploying individual off-grid energy solutions across Africa. Companies like M-KOPA, d.light, and Bboxx have been instrumental in providing SHS and panel-inverter setups to millions of households. M-KOPA alone has connected over one million homes in East Africa to affordable solar power. These solutions differ from communal off-grid systems such as solar mini-grids, which serve entire communities and are typically developed by different types of operator under separate regulatory frameworks. Companies such as ACOB Lighting, Ceesolar Energy, Sun King and Power Gen Renewable are large-scale mini-grid providers.

3.1.2 Financiers and investors

Financial institutions and investors provide the necessary capital for RE projects. The AfDB and private equity firms such as Actis and Berkeley Energy have invested heavily into RE projects across the continent. According to IRENA, private sector investment accounts for approximately 70% of all RE investments in Africa.

3.1.3 Technology providers

Technology providers are central to the advancement of Africa's RE sector. They supply critical components such as solar photovoltaic (PV) modules, wind turbines, battery systems, inverters and, increasingly, software-based energy management tools that support both on-grid and off-grid systems. Major global players like Siemens, Huawei and

General Electric have supplied technologies for large-scale renewable projects across the continent. Meanwhile, African innovators are increasingly contributing to product design, customisation and after-sales support that is tailored to local conditions.

Emerging innovations

Technology providers are also driving innovation:

- **Battery energy storage systems (BESSs):** Are used to stabilise grids and enable 24/7 off-grid access in areas with unreliable supply.
- **Artificial intelligence:** Helps optimise grid performance, forecast demand, automate maintenance and enhance energy efficiency.
- **Decentralised platforms:**
 - **Micro-grids and mesh networks:** Allow for the dynamic sharing of power in under-served regions.
 - **Peer-to-peer (P2P) energy trading:** Are platforms that enable communities to exchange power locally. While still an emerging innovation, P2P energy trading will allow communities to generate and exchange electricity locally through digital platforms when fully developed.
 - **Virtual power plants (VPPs):** Allow for the aggregation of excess energy to be bought and sold, transforming users into consumers and prosumers. When fully developed, these VPPs will be able to function as a single power plant – balancing supply and demand in real time.

Technology providers are no longer just equipment suppliers, but they are also critical enablers of flexible, data-driven, community-based energy models. As Africa shifts from centralised power to hybrid and decentralised systems, these players will define the pace and scalability of RE adoption.

3.1.4 Project management and consultancy firms

Firms specialising in project management and consultancy, such as McKinsey and Company, Cross Boundary and PwC, provide strategic guidance and manage the implementation of RE projects. These firms bring global best practices and efficient management techniques to the African RE sector.

3.2 Role and impact

3.2.1 Investment and financing

According to the International Energy Agency (IEA), private investments make up over 70% of total RE financing in Africa, highlighting the critical role of private capital in driving RE growth.⁹ For example, the LTWP economic fact sheet notes that the project is the recipient of the largest single private investment (USD 680 million) in Kenya's history.¹⁰

3.2.2 Innovative technologies

Private companies are driving innovation in RE technologies. For example, d.light and Bboxx have introduced affordable SHSs that use pay-as-you-go models, making solar energy accessible to low-income households.^{11, 12}

3.2.3 Efficient project management

This has been central to private sector participation in Africa's RE landscape, particularly in project design, financing and timely capacity deployment. However, success must also be measured by post-commissioning performance, including reliable service delivery and effective revenue collection. In countries like Nigeria, private RE projects often face downstream challenges, such as delayed payments by off-takers and weak collection systems.

Private investments make up over 70% of total RE financing in Africa, highlighting the critical role of private capital in driving RE growth

These issues undermine long-term commercial viability, even for well-executed projects. This highlights the need for project management frameworks that go beyond technical delivery to address commercial and operational sustainability. The LTWP in Kenya remains a strong example of implementation through its construction excellence and coordination, although it also illustrates the importance of aligning generation projects with sector-wide reforms, particularly in transmission and payment systems, to ensure full operational success.

3.2.4 Technology transfer

Global companies such as Siemens and General Electric are pivotal in transferring advanced RE technologies to Africa, enhancing the continent's capacity to generate clean energy efficiently. For example, Siemens Gamesa has installed the first utility-scale (59 MW) wind farm in Djibouti, doubling the country's generation capacity.¹³ GE Vernova is deploying advanced gas and grid-management solutions across multiple countries, including its Grid Orchestration Software in the West Africa Power Pool to improve the integration of variable renewables.¹⁴

3.3 Case studies of private sector participation

This section highlights real-world examples of how the private sector is shaping RE and development across Africa. It critically examines the nature of private sector involvement, the challenges overcome and the key lessons learned.

3.3.1 Lake Turkana Wind Power Project, Kenya¹⁵

The LTWP in Kenya is Africa's largest wind farm, with a capacity of 310 MW. Developed by a consortium of private investors, this project is a prime example of successful private sector engagement in RE.

Key takeaways

- **Private sector involvement:** The project was developed by a consortium including KPandP Africa B.V., Aldwych International and Vestas, with substantial financial backing from the AfDB, the European Investment Bank and others.
- **Challenges overcome:** The project faced logistical challenges due to its remote location and the need for significant infrastructure development, including a 428 km transmission line to connect the wind farm to the national grid.
- **Impact:** LTWP supplies approximately 14% of Kenya's electricity demand, significantly boosting the country's RE capacity and reducing its reliance on fossil fuels.¹⁶
- **Lessons learned:** This case demonstrates the importance of public-private partnerships (PPPs), the potential for large-scale renewable projects in Africa and the ability to overcome logistical and infrastructural challenges through collaboration and innovation.

3.3.2 Scatec Solar Projects, Egypt¹⁷

Scatec Solar, a private Norwegian company, has developed several large-scale solar parks in Egypt, contributing significantly to the country's RE landscape.

Key Takeaways

- **Private sector involvement:** Scatec Solar has invested into and developed multiple solar projects in Egypt, including developing a 400 MW portion of the Benban Solar Park (completed in 2019), which has a total capacity of 1.65 GW.
- **Challenges overcome:** Due to Egypt's then-relatively-new RE sector, the projects faced initial regulatory and financial hurdles, such as the uncertainty of tariff structures, especially under feed-in tariff (FiT)¹⁸ programmes and power purchase agreements (PPAs). These challenges were mitigated through strong collaboration with the Egyptian authorities and international financiers such as the International Finance Corporation (IFC).
- **Impact:** These solar projects have helped diversify Egypt's energy mix, increase energy security and reduce greenhouse gas emissions.
- **Lessons learned:** This case illustrates the critical role of international private enterprises in local RE development, the importance of overcoming regulatory challenges and the benefits of leveraging international financial support.

3.3.3 Noor Ouarzazate Solar Complex, Morocco¹⁹

The Noor Ouarzazate Solar Complex in Morocco is the world's largest concentrated solar power plant. Substantial private-sector involvement in the project illustrates the potential of PPPs.

Key Takeaways

- **Private sector involvement:** The project involved several private companies including ACWA Power, which played a crucial role in the development and financing of the plant. The project also received support from international financial institutions such as the World Bank and the AfDB.
- **Challenges overcome:** The project had to address issues related to financing as it had an estimated initial cost of around USD 9 billion. There were also challenges to integrating and scaling innovative technologies such as thermal energy storage systems and concentrated solar power.
- **Impact:** Noor Ouarzazate has a total capacity of 580 MW and provides a significant portion of Morocco's energy needs, helping the country reduce its carbon footprint and achieve its RE target of 52% by 2030.²⁰
- **Lessons learned:** This case highlights the effectiveness of PPPs in achieving large-scale RE projects, the ability to integrate advanced technologies and the effect of substantial international financial support.

3.3.4 South Africa's REIPPPP²¹

South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) is one of the most successful examples of structured, government-led private sector participation in Africa's renewable energy sector. Launched in 2011, the programme has procured over 6.2 GW of renewable energy capacity across multiple bid windows, attracting billions in investment.

Key Takeaways

- **Private sector involvement:** The REIPPPP is fully driven by the private sector, with project developers, investors and lenders competing through transparent bid windows. It has attracted global players like Enel Green Power, Scatec Solar and Mainstream Renewable Power, alongside domestic South African partners. Over 90 independent power producers (IPPs) have been contracted under the programme since inception.
- **Challenges overcome:** Initial uncertainty around grid capacity, local content requirements, and Power Purchase Agreement (PPA) bankability were addressed through consistent policy application, strong government backing (via the Department of Mineral Resources and Energy and the IPP Office), and Eskom's role as the offtaker. Political delays and financial issues at Eskom did cause interruptions in Bid Windows 5 and 6 but were eventually resolved through continued government engagement and support.
- **Impact:** REIPPPP has mobilised over ZAR 210 billion (US\$ 13 billion) in private investment, created thousands of jobs, and brought more than 120 projects to financial close. It has significantly diversified South Africa's energy mix, adding solar PV, wind, biomass and small hydro to the grid. The programme has also contributed to socioeconomic development through community trusts and local ownership structures.
- **Lessons learned:** REIPPPP illustrates the effectiveness of a clear, transparent, and competitive procurement framework in attracting private investment. It shows that long-term success requires consistent implementation, institutional leadership, and de-risking mechanisms like standardised PPAs and government support letters. Importantly, it underscores how local development impact can be integrated into project design through ownership and community benefit requirements.

3.3.5 Toto interconnected mini-grid project, Nigeria

The Toto interconnected mini-grid in Nasarawa State is one of Nigeria's budding interconnected hybrid mini-grids, demonstrating the power of public-private collaboration to deliver decentralised RE at scale. The project combines solar generation with national grid supply under a service-level agreement between the developer and the distribution company, Abuja Electricity Distribution Company (AEDC).

Key Takeaways

- **Private sector involvement:** The project was developed and is operated by PowerGen Renewable Energy in partnership with Nigeria's Rural Electrification Agency (REA) and the AEDC. It was funded through the NEP, with backing from the World Bank.
- **Challenges overcome:** The project overcame several first-of-their-kind challenges, including designing an effective operational and commercial model for an interconnected mini-grid. It also addressed the technical complexities of combining daytime solar generation with nighttime grid supply and negotiated power-sharing and revenue arrangements with the utility.
- **Impact:** The system provides 24/7 electricity to over 2 000 households and businesses, serving around 14 000 people. It has displaced self-generation, provided better reliability, improved service delivery in health and education and boosted local economic activity.
- **Lessons learned:** The Toto project shows the potential of interconnected mini-grids in urban and rural areas with unreliable grid access. It demonstrates the value of enabling regulation, results-based financing and public-private coordination, making it a scalable model for expanding access to reliable, clean electricity in similar contexts.

3.3.6 Osun State solar hybrid mini-grids, Nigeria

In November 2023, four solar hybrid mini-grid projects were commissioned in Osun State, Nigeria. With a total installed capacity of 150 kilowatt peaks (kWp), these projects marked continuous growth in the country's efforts to expand RE access.²² They were also developed under the NEP in a collaborative initiative between the World Bank and the REA.

Key takeaways

- **Private sector involvement:** The hybrid mini-grid projects were executed through a partnership between CESEL, a subsidiary of Aradel Renewables Limited, and Concerto. This collaboration exemplifies how effective PPPs can advance RE solutions.
- **Challenges overcome:** The development faced challenges such as community engagement and logistical hurdles. The developers successfully navigated these issues, ensuring smooth implementation and fostering community support.
- **Impact:** The mini-grids provide reliable electricity to approximately 1 200 households across four communities in Ife South Local Government Area. This access to energy has the potential to spur economic activities, improve healthcare and education services and enhance overall quality of life for residents.
- **Lessons learned:** The success of these projects highlights the importance of community involvement, robust partnerships and supportive regulatory frameworks in the deployment of RE solutions. It also highlights the scalability of such models in similar contexts across Nigeria.

4. Case study: Nigeria's electricity sector

4.1 Detailed analysis of Nigeria's electricity sector

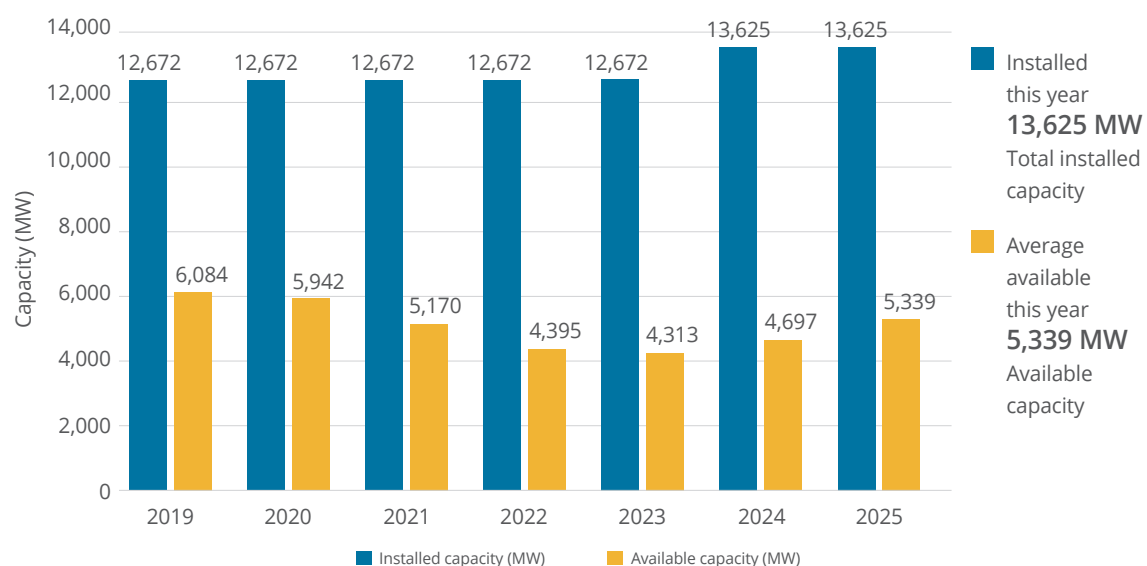
Nigeria's electricity sector has been characterised by significant challenges including inadequate generation capacity, an unstable grid and frequent power outages. Despite having a sizeable population and being one of the largest economies in Africa, the country has struggled to provide reliable and sufficient electricity to its citizens and businesses.

4.1.1 Generation capacity

Nigeria's electricity generation relies heavily on natural gas and hydroelectric sources. However, the country's generation capacity is often under-utilised due to gas supply constraints, aging infrastructure and technical challenges.

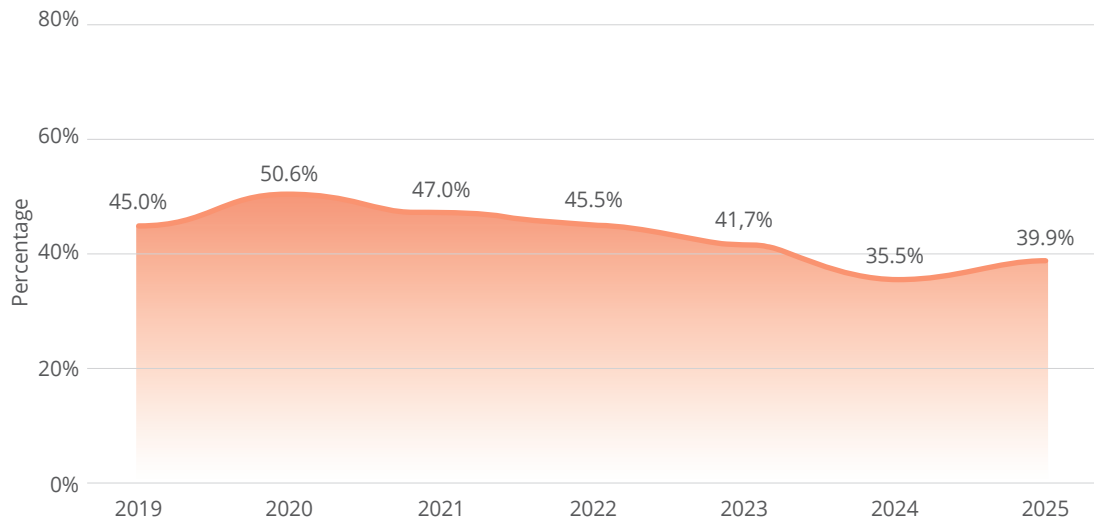
Figure 2

On-grid energy generated in Nigeria (installed vs available capacity)



Source: ELEC-T (Electricity Tracker), EMRC. Available at: <https://elec-t.energymrc.ng/> (Accessed: 22 May 2025)

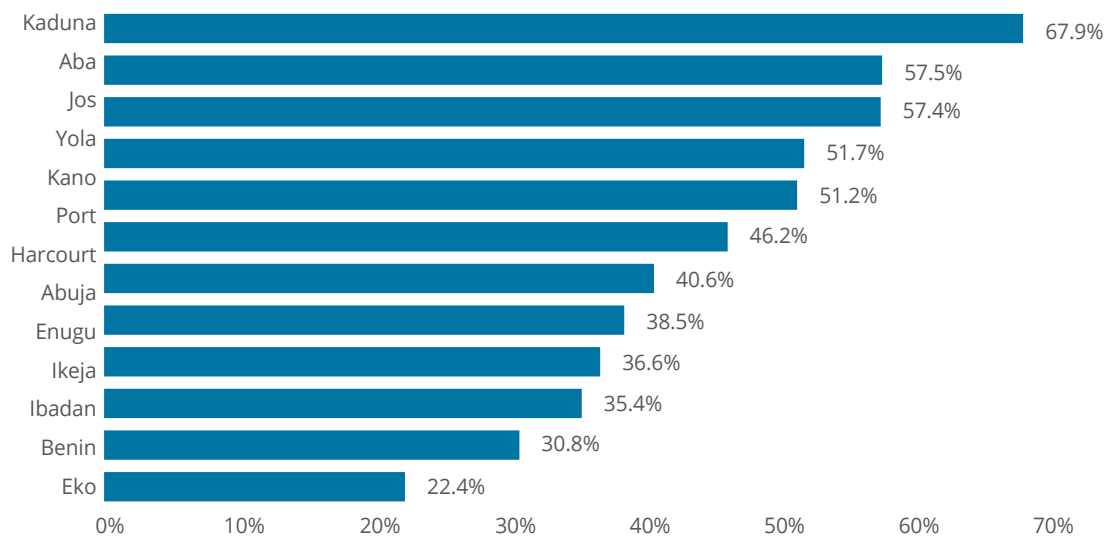
Figure 3
Nigerian Electrical Supply Industry (NESI) ATCC losses



Source: ELEC-T (Electricity Tracker), EMRC. Available at: <https://elec-t.energymrc.ng/> (Accessed: 22 May 2025)

Despite Nigeria’s installed generation capacity of over 13 000 MW, its actual energy production has consistently fallen short, as evidenced by the data spanning from 2019 to 2025. This persisting underperformance – with the available capacity never exceeding 5 500 MW – points to significant operational inefficiencies and systemic challenges in the energy sector. While it is a commendable achievement, the peak available generation capacity at 5 339 MW in 2025 still represents less than a third of the installed capacity.

Figure 4
DISCOS ATCC losses 2025



Source: ELEC-T (Electricity Tracker), EMRC. Available at: <https://elec-t.energymrc.ng/> (Accessed: 22 May 2025)

Although there is substantial infrastructure in place, factors such as maintenance issues, fuel supply shortages, grid instability and payment defaults are hindering its utilisation. This has led to losses as high as 70% among power distribution companies (DISCOs). The transmission and distribution networks are plagued with inefficiencies. Ageing infrastructure, inadequate maintenance and under-investment have resulted in significant energy losses and unreliable power supply. Figure 3 shows the most recent aggregate, technical, commercial and collections (ATCC) losses in Nigeria.

These ATCC losses are both transmission and distribution losses. The Transmission Company of Nigeria (TCN) is still experiencing losses higher than its regulated loss of 7.5% in delivering electricity from the generation companies to the distribution companies. The ATCC losses also include commercial and collection losses from the distribution companies due to electricity theft and customers' unwillingness and inability to pay for power.

4.1.2 Electricity access

A large portion of the population does not have access to the national grid (43% according to a World Bank report),²³ with rural areas being particularly under-served. This lack of access hinders economic development and exacerbates inequalities between urban and rural areas. The government's rural electrification plans, often focusing on off-grid solutions like solar mini-grids and standalone systems, are crucial in addressing this gap. As of the end of 2024, the total number of on-grid customers in Nigeria stood at 12 994 042. In contrast, as of the end of 2023, the number of off-grid customers stood at less than 1 million.

A large portion of the population does not have access to the national grid (43% according to a World Bank report), with rural areas being particularly under-served

4.2 Government and private reform efforts (2010 to date)

This section focuses on the Nigerian government's reform efforts that are either directly aimed at or have had significant implications for encouraging private sector participation in the electricity sector, particularly in RE. The following discussion highlights how policy, regulation and institutional changes are creating enabling conditions for private investment despite the challenges that still exist.

4.2.1 Power sector privatisation

In 2013, Nigeria privatised its power sector by selling a majority stake (60%) in its generation and distribution companies to private investors. The reform aimed to attract private capital, improve efficiency and revitalise electricity supply. While private investment increased (e.g. the United Bank for Africa provided USD 700 million in financing),²⁴ the initiative has delivered

Average electricity generation grew modestly from around 3 419 MW in 2014 to approximately 4 492 MW in 2024

mixed results. For instance, average electricity generation grew modestly from around 3 419 MW²⁵ in 2014 to approximately 4 492 MW²⁶ in 2024. However, as at 2025, the stranded capacity of available generation that cannot be dispatched (13 625 MW of installed capacity and 5 339 MW of available capacity)²⁷ remains at over 50%. Furthermore, the Manufacturers Association of Nigeria has criticised

some privatised DISCOs for lacking operational effectiveness, despite tariff increases.²⁸ The outcome of the exercise shows that privatisation and private sector involvement has not automatically brought about improvement to the sector, which reinforces the need for sustained reforms to drive infrastructure investment and strengthen payment performance and regulatory support for initiatives.

4.2.2 Renewable energy initiatives

There has been a growing focus on decentralised RE, particularly solar, to bridge the electricity gap. Initiatives such as the NEP and the DARES programme implemented by the REA aim to increase access to electricity through off-grid solar solutions. These include a component for energising education by providing uninterrupted power supply to 37 federal universities and seven teaching hospitals.²⁹

Efforts such as the Rural Electrification Fund (REF), which provides grants to developers of mini-grid and off-grid solutions, show a targeted approach to extending electricity access through decentralised RE projects. The REF has supported projects like the Sabon Gari Market's solar hybrid mini-grid in Kano State, which provides reliable power to thousands of traders and boosts local economic activities and other projects.

4.2.3 Policy frameworks

Nigeria has developed several policies to foster RE and energy efficiency and create a conducive environment for private sector investment and innovation.

- **National Renewable Energy and Energy Efficiency Policy (NREEEP):** This policy outlines Nigeria's commitment to increasing the share of RE in its energy mix and promoting energy efficiency. The NREEEP sets targets for RE contributions to the national grid, encouraging investment in solar, wind, hydro and biomass projects.
- **Mini-Grid Regulations:** These regulations provide a framework for the development and operation of mini-grids, enabling private sector participation in off-grid and under-served areas. In 2024 alone, the Nigerian Electricity Regulatory Commission (NERC) issued over 174 mini-grid licenses to new developers.
- **Franchising Regulation Bill:** This regulation would allow private companies to operate within specific geographical areas of the DISCO networks under franchise agreements, thereby improving service delivery and investment in distribution networks.

- **Electricity Act 2023:** Released in 2023, this act is heavily focussed on RE incentives and the integration of RE into the national grid.
- **NERC RE obligation:** In April 2024, the NERC mandated all distribution companies to purchase an extra 5% of their current energy capacity from RE sources – a step in the right direction, although this has not yet been achieved.
- **Energy Transition Plan:** This governmental policy aims to transition Nigeria towards a more sustainable energy future, focusing on RE, energy efficiency and reducing carbon emissions. The plan aligns with Nigeria’s commitment to the Paris Agreement on climate change, setting ambitious targets for reducing greenhouse gas emissions and increasing RE capacity.
- **Integrated Electricity Policy and Strategic Implementation Plan (IEP-SIP):** Introduced in 2025, the IEP-SIP provides a comprehensive roadmap for developing Nigeria’s electricity sector. It focuses on optimising the energy mix, enhancing grid reliability and promoting sustainable practices. The plan also considers the integration of BESSs to support RE deployment.

4.2.4 Investment in infrastructure

The Nigerian government is investing in critical infrastructure to support the RE sector. This includes upgrading transmission and distribution networks to improve reliability and reduce technical losses. Through the Presidential Power Initiative (PPI), the TCN is implementing multi-phase grid enhancements.³⁰ In 2024 alone, a USD 800 million federal investment was announced under the PPI to boost transmission capacity and enable evacuation of up to 6 000 MW by the end of 2024 – scaling to 25 000 MW by 2025. Phase 1 included a USD 328.8 million contract for substations awarded in April 2025. Meanwhile, the 2025 budget has allocated NGN 150 billion (approximately USD 195 million) to PPI transmission projects.³¹

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4.2.5 International partnerships and funding

Nigeria has engaged in numerous international partnerships to secure funding and technical assistance for RE projects. Organisations such as the World Bank, the AfDB and the United States Agency for International Development have been instrumental in providing financial and technical support. The NEP (funded by the World Bank) and the AfDB have connected more than 1 million households and 11 400 micro, small and medium enterprises to electricity through solar hybrid mini-grids and stand-alone solar systems.³² The NEP is now being supported by the DARES programme, which aims to provide electricity to over 17 million Nigerians.³³

4.3 Lessons learned from private sector participation in Nigeria

The Nigerian electricity sector provides several key lessons.

4.3.1 Challenges in privatisation

The privatisation process has faced challenges including tariff disputes, loss under-estimation, payment defaults by both customers and DISCOs (leading to increased sector debts) and under-investment in infrastructure, which led to a market shortfall of over NGN 4 trillion owed to the generation companies at the end of 2024.³⁴ These issues highlight the need for a well-planned, transparent and implemented-as-designed privatisation process, with improved, implementable policies that are supported by regulatory oversight.

Addressing these challenges can make the sector more attractive to private investors by ensuring a stable and predictable investment environment. For example, achieving cost-reflective tariffs and managing legacy debts can reduce financial risk for investors, while improving infrastructure can enhance the viability of the overall sector.

4.3.2 The importance of stable policies

Consistent and clear government policies are crucial for attracting and retaining private investment in the electricity sector. Policies that support RE development, such as feed-in tariffs, net metering, tax incentives and RE targets, can provide the certainty needed for

long-term investments. Nigeria currently has a robust mini-grid regulation, widely regarded as one of the most progressive in Africa.³⁵ This has led to significant improvements in its off-grid sector and impacted over 20 million people with RE so far.³⁶ Demonstrating its maintenance of stable and supportive policies based on stakeholder consultations (the Mini-Grid Regulations were updated in 2023), the NERC is set to

release a Net Metering Regulation by the end of 2025. Nigeria can continue to signal its commitment to improving energy access, thereby attracting more private-sector investments beyond those from the IFC, which currently make up most of the current funding in the space.

Nigeria can continue to signal its commitment to improving energy access, thereby attracting more private-sector investments

4.3.3 The role of renewable energy in improving energy access

RE, particularly solar, has demonstrated strong potential in bridging Nigeria's electricity access gap, especially in rural and under-served areas. Mini-grids and SHSs have reached communities that the national grid is unlikely to extend to within the next five-ten years due to cost and infrastructural limitations. According to the REA, over 176 mini-grids have been deployed as part of the NEP, impacting over 7.8 million Nigerians.³⁷

Compared to the on-grid sector, Nigeria's off-grid RE space has thrived under more stable and enabling conditions. These include cost-reflective tariffs through buyer-willing seller arrangements, simplified licensing and targeted donor support. This regulatory flexibility, reinforced by the Electricity Act 2023, has made the off-grid space more attractive for private capital. Projects such as the 50 kW Toto inter-connected mini-grid in Nasarawa State demonstrate this: the system provides reliable supply with tariffs of up to NGN 450/kWh, sustained by cost-reflective pricing and stable operations.³⁸ These conditions have led to greater electricity reliability, faster project timelines and broader access to commercial and concessional funding compared to the more complex and rigid on-grid sector.³⁹

To unlock more private investments, Nigeria must sustain and expand enabling conditions for energy projects, particularly in the RE sector. These conditions include supportive policies and regulations (such as the updated Mini-Grid Regulations and the forthcoming Net Metering Regulation), access to both local and international financing (including concessional funding and risk mitigation instruments), clear procurement frameworks and capacity development for local technical expertise.

4.3.4 The need for comprehensive reforms and infrastructure

Addressing Nigeria's electricity challenges requires a more comprehensive approach that includes:

- Upgrading network infrastructures
- Improving payment systems, especially for on-grid systems (this has seen significant improvement in the last three years)
- Enhancing regulatory frameworks
- Engaging consumers for better understanding of the electricity market
- Achieving cost-reflective tariffs, and
- Encouraging energy efficiency.

Comprehensive reforms can create a more attractive investment climate. For instance, modernising infrastructure and improving payment systems by closing the current metering gaps can increase the reliability and profitability of energy projects.

By translating these lessons into actionable strategies, Nigeria can keep creating a more conducive environment for private sector investments into RE. This involves addressing the main challenges in the electricity sector, implementing supportive policies and fostering a stable and predictable investment climate.

Overall, Nigeria's electricity sector case study highlights the complexities involved in energy sector reform and the potential of RE in addressing electricity challenges in developing countries.

4.4 Challenges and barriers to private sector participation in Nigeria

It is important to critically examine the key issues faced by private entities in Nigeria's electricity sector. Understanding these challenges is crucial for developing strategies to enhance private investment and foster a more robust and efficient energy sector.

4.4.1 Financial and economic barriers

Access to capital

Due to several interlinked challenges, access to affordable finance remains a key barrier to RE development in Nigeria. First, RE developers often spend in dollars but earn in naira, creating significant currency mismatch and exchange rate risk, especially in a highly volatile forex market. Second, RE projects require high up-front capital costs, which can deter both investors and lenders in the absence of long-term, low-interest financing options. Third, post-COVID macro-economic instability, including Nigeria's weakened credit outlook, rising global interest rates and reduced fiscal space have made capital even harder and more expensive to access. According to the International Monetary Fund (2023), tightening financial conditions and inflation-control policies in advanced economies has raised global borrowing costs, further squeezing emerging markets.⁴⁰

While initiatives like the World-Bank-funded NEP offer subsidised loans to reduce the cost of capital, they still add to Nigeria's public debt stock, which has grown substantially due, in part, to past fuel subsidy regimes. Efforts to create local-currency financing pathways are emerging. In 2025, Sun King secured a naira-denominated loan that is equivalent

Egypt has addressed currency risk in RE PPAs by denominating part of the tariff in its local currency

to USD 80 million, a milestone that suggests that credible RE firms may increasingly access domestic financing even in tight markets (the exchange rate at the time was NGN 1500: USD 1550).⁴¹ Egypt has addressed currency risk in RE PPAs by denominating part of the tariff in its local currency. For example, its FiT regime for utility-scale solar sets 15% of the payments in Egyptian pounds and 85% are linked to United States dollar rates, shielding investors from forex volatility.⁴²

More broadly, a February 2025 report by the AfDB and KPMG notes that improving access to finance in Africa requires a combination of currency-hedging instruments, local content policies and blended finance solutions.⁴³ In parallel, China has pledged USD 2 billion to support trade-related infrastructure in Nigeria.⁴⁴ If properly directed, this could help unlock capital for local RE projects.

Capital intensity of renewable projects

The substantial up-front capital requirement for RE infrastructure like solar panels can be a significant barrier, especially for start-up companies. Developing a solar farm can range from USD 1 million to USD 2 million per megawatt. This excludes additional costs that may be incurred during implementation.

Perceived risk

Political and economic instability leads to higher perceived risks for investors. Political instability and policy shifts in African countries have historically led to weakened investor confidence.⁴⁵ Frequent changes in the leadership of key government institutions have also created uncertainty. For example, between 2016 and 2019, the tariffs in the electricity sector were frozen following a directive from the regulator, which came directly from the presidency of Nigeria at the time. This meant that the private investors in these companies could not invest new capital as there was no line of sight for recovery. In addition, part of their capital expenditure needs could not be funded, as no financial institutions were willing to lend to these companies.

4.4.2 Regulatory and policy challenges

Policy inconsistency and poor implementation

Frequent changes in energy policy, regulations and orders, often driven by political shifts, create a volatile investment environment (this is especially prevalent in the on-grid sector). Changes in tariff structures, frequent freezing of tariffs (though mainly on-grid-related) and poor implementation of RE incentives discourage long-term investments.⁴⁶ There is also an absence of sufficient fiscal incentives for RE projects. While some tax incentives exist, they are often insufficient or inconsistently applied, which reduces their effectiveness.

For instance, Nigeria offers several fiscal incentives for RE projects.⁴⁷ These include the Pioneer Status Incentive administered by the Nigerian Investment Promotion Commission, which grants a three–five-year corporate income tax holiday to eligible RE companies. Other incentives include import duty waivers on solar panels, inverters and batteries, as well as accelerated capital allowances for RE investments. However, many of these incentives are difficult to access. For example, the duty exemption on solar components, while available under the national energy policy, often requires a ministerial exemption letter, making it difficult for smaller players to benefit. These bureaucratic hurdles, combined with inconsistent implementation, reduce the overall impact of available incentives and deter private sector participation.

Frequent changes in energy policy, regulations and orders, often driven by political shifts, create a volatile investment environment

Complex licencing procedures

The complexity and time-consuming nature of obtaining licences and approvals for energy projects can significantly delay project initiation. For instance, it takes a minimum of six months from the time an application is acknowledged by the NERC for the licence to be issued. The extensive paperwork and multiple approvals required for mini-grid projects can take months or even up to a year. However, efforts are being put in place to better streamline this process.

4.4.3 Infrastructural limitations

Poor network infrastructure and integration challenges

The existing grid is unable to integrate RE sources due to outdated technology and a lack of capacity. Although Nigeria has an installed generation capacity of over 13 000 MW, the grid struggles to consistently deliver more than 4 500–5 000 MW.⁴⁸ According to the Energy Market and Rates Consultants' (EMRC) Electricity Tracker (ELEC-T) platform, the national grid collapsed 10 times in 2024 alone, highlighting instability across the country.⁴⁹ These constraints make it difficult to incorporate RE, which requires flexible and responsive grid systems.

As at 2025, no utility-scale RE projects have been integrated into the national grid. However, according to stakeholder consultations, ongoing feasibility studies and pilot initiatives are underway to support future integration.

Logistics and access issues

In remote locations, the lack of adequate transportation and logistics infrastructure can hinder the supply-chain management of project materials. Projects in rural Nigeria often face delays due to poor road conditions and lack of transport infrastructure.⁵⁰ For instance, mini-grid developers under the NEP reported that delivering solar panels and batteries to sites in the Taraba, Benue and Cross River states often took four–six weeks longer than planned due to poor road networks, especially during the rainy season.

4.4.4 Market-related challenges

Limited market information

Access to reliable market data remains a key constraint for private investors in Nigeria's RE sector. Many developers lack accurate, granular information on energy consumption patterns, customer payment behaviour and project viability, making investment planning more difficult and riskier. As a result, companies are often forced to carry out their own customer enumeration, energy audits and demand studies as part of their pre-investment activities, which increases transaction costs. However, several new initiatives have been able to provide more readily available data for projects. For example, EMRC's ELEC-T platform, the German international development agency's (Deutsche Gesellschaft für Internationale Zusammenarbeit – GIZ) Sustainable Energy for All (se4all), the REA's Nigerian Energy Database (NED) and the new World Bank databases that were launched at the 2025 spring meetings.

Competition with established energy sources

RE developers often face difficulty competing with the national grid, especially for customers in bands B to E, who still benefit from government electricity subsidies (tariff bands are the electricity pricing classes in Nigeria, the bands representing the hours of supply a customer gets, ranging from a minimum of 20 hours for Band A customers to minimum of 4 hours for Band E customers). While fuel subsidies for petrol were officially removed in June 2023, grid electricity subsidies persist and can distort market pricing, making RE less attractive for cost-sensitive consumers.⁵¹ Although captive generator use (primarily diesel and petrol) is not directly subsidised, the legacy perception of lower up-front costs and user familiarity continues to create competition. In addition, while some donor-backed mini-grid projects offer subsidised customer connections to encourage uptake, a number of these have struggled with commercial viability post implementation due to poor management, demand and payment collection challenges.⁵² This underscores the need for better demand forecasting and sustainable business models in RE deployment.

Market maturity

While Nigeria's RE market is still developing in depth, scale, geographical spread and financing structures, notable progress has been made in recent years. The supply chain for key components is increasingly robust, with major original equipment manufacturers such as Jinko, JA Solar, Felicity Solar, Blue Carbon and Huawei establishing strong distributor networks and after-sales service in the country. However, challenges remain in project development capacity, access to scale financing and the relatively small number of local firms that are able to deliver large-scale, bankable projects. The introduction of renewable energy service companies (RESCOs) by the REA has helped address this, with some RESCOs now pursuing projects exceeding 300 MW.

4.4.5 Technical and skills gaps

Lack of technical expertise

There remains a gap – although gradually narrowing – in the availability of trained professionals to design, install and maintain RE systems in Nigeria. This capacity challenge is being actively addressed through initiatives such as the REA NEXTGEN RESCO programme, which aims to build a pipeline of young, skilled energy professionals. Another initiative that seeks to resolve the skills gap challenge is the National Power Training Institute of Nigeria's (NAPTIN) renewed partnership with the Japan International Cooperation Agency (JICA), which expands training in solar PV installation and maintenance nationwide.^{53, 54}

5. Strategies and recommendations for enhancing private sector participation

Overcoming these challenges requires collaborative efforts between the government, the private sector and other key stakeholders to create a conducive environment for private sector participation in RE. Drawing from the evidence, case studies and insights presented

in this report, the following strategic actions are recommended to enhance private sector participation in Africa's RE sector.

To unlock the full potential of private sector participation in RE across Africa, enabling environments must be designed with the region's unique realities in mind. This includes tailored policy frameworks that are stable yet flexible, financial systems that support local currency financing and mitigate forex risk, and strong

Challenges such as the inconsistent implementation of policies, weak local capital markets and fragmented state-federal roles under the Electricity Act 2023 persist

public institutions that can coordinate –not compete – with the private sector. As evidenced by case studies across the continent, from South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP)⁵⁵ to Egypt's partial local-currency PPAs, successful outcomes are tied to government-led efforts that reduce market risk while allowing the private sector to lead in delivery.

In Nigeria, this enabling environment remains under construction. Challenges such as the inconsistent implementation of policies (incentives etc.), weak local capital markets and fragmented state-federal roles under the Electricity Act 2023 persist. Therefore, the strategies that follow are not generic recommendations but practical steps towards building an enabling ecosystem that works for Nigeria and similar African markets.

1. Strengthen policy and regulatory certainty

Creating a predictable policy environment is essential for attracting long-term investment. Stable frameworks, such as South Africa's REIPPPP, demonstrate how consistent regulations can mobilise billions in private capital. In contrast, Nigeria's experience with the 2016 solar IPPs, where 14 developers signed PPAs but failed to reach financial close due to

tariff disputes and regulatory uncertainty, illustrates the risk of inconsistent implementation. To avoid such outcomes, countries must improve the execution of their RE roadmaps, clarify incentive structures and streamline approval timelines to align investor expectations with national energy goals.

2. Expand access to innovative and blended finance

To scale RE deployment, Nigeria must diversify financing options beyond traditional debt. Nigeria's issuance of sovereign green bonds in 2017 and 2019 illustrates how government-backed financing can unlock private capital for renewable projects. Expanding such mechanisms alongside blended finance structures (e.g. through the World Bank's NEP) and concessional climate funds can further de-risk investments, particularly for smaller developers. These tools will help address currency, payment and political and economic risks, making projects more bankable. However, more effort is needed to institutionalise and scale these approaches within Nigeria's financial ecosystem.

To scale RE deployment, Nigeria must diversify financing options beyond traditional debt

3. Prioritise grid infrastructure readiness

Reliable infrastructure is a prerequisite for bankable energy projects. Grid modernisation, including investments in flexible transmission systems and BESSs, is necessary to absorb variable RE. At the same time, continuous improvement in existing decentralised models, such as interconnected mini-grids like those implemented in Toto, Nasarawa, should be scaled to keep electrifying under-served areas while reducing dependence on national grid extension. Just as in Kenya, mini-grid regulations require mini-grid designs to include plans to integrate with the national grid. This should be encouraged across all African countries.

4. Private sector participation through PPPs

Effective PPPs offer a proven route to mobilise private capital, technical expertise and efficiency. Projects such as the Azura-Edo IPP in Nigeria and Ghana's Kpone thermal power plant illustrate the importance of transparent procurement and co-investment models. Future efforts should also strengthen commercial and industrial (CandI) market frameworks through regulations such as Nigeria's Eligible Customer regulations, which allow direct power procurement by large power users. This model should be strengthened even further through state participation in the electricity market. States can accomplish this via PPPs instead of wholly operating utilities.

5. Build domestic capacity and local market ecosystems

Sustaining RE growth requires investment in skills and local ecosystems. Partnerships like JICA's support for NAPTIN in Nigeria highlight the value of technical training and knowledge transfer. At the same time, growing domestic value chains in battery assembly, fabricators, repair and operations and maintenance services can drive down costs, increase project sustainability and create local jobs, especially as the RE sector scales. It is important to quantify the RE local content capacity so that interventions can be better targeted.

6. Improve market transparency and data flow

Access to reliable data on tariffs, demand forecasts, energy generation and project pipelines remains limited. Establishing centralised, open-access platforms for RE market intelligence such as initiatives by IRENA or the Global Off-Grid Lighting Association can improve decision-making for developers, financiers and regulators, while reducing project development time and cost. In Nigeria, some platforms have already been launched to help reduce the data gaps (e.g. EMRC's ELEC-T, GIZ's se4all and REA's NED).

References

- Acorn Holdings (2019). *Kenya's first green bond issued for student housing projects in Nairobi*. Nairobi: Acorn Holdings.
- Africa Development Bank (AfDB) (2018). *Why Africa is the next renewables powerhouse*. Available at: <https://www.afdb.org/en/news-and-events/why-africa-is-the-next-renewables-powerhouse-18822>
- AfDB (2022). *Desert to power initiative*. Available at: <https://www.afdb.org/en/news-and-events/african-development-banks-desert-power-initiative-71072>
- AP News (2024). *Solar power companies are growing fast in Africa, where 600 million still lack electricity*. Available at: <https://apnews.com/article/4dae37aa5c7984e157f00ed5b88fd75b>
- Azura Power (2023). *Azura-Edo independent power plant*. Azura Power Holdings. Available at: <https://azuraedo.com/>
- BloombergNEF (2023). *Financing clean energy in Africa: Barriers and opportunities*. Available at: <https://about.bnef.com/blog/financing-clean-energy-in-africa>
- Genpower Generation Company (2023). *Kpone independent power plant*. Available at: <https://www.cenpowergen.com>
- Climate Policy Initiative (2022). *Landscape of climate finance in Africa 2022*. Available at: <https://www.climatepolicyinitiative.org/publication/landscape-of-climate-finance-in-africa/>
- Debt Management Office Nigeria (2018). *Nigeria green bond issuance factsheet*. Available at: <https://www.dmo.gov.ng>
- Energy Market and Rates Consultants (2025). *ELEC-T electricity sector data platform*. Available at: <https://elec-t.energymrc.ng/>
- EY (2023). *Attractiveness program Africa: Resilience through sustainable growth*. Available at: https://www.ey.com/en_gl/attractiveness/24/how-fdi-can-bring-resilience-and-sustainable-growth-to-africa
- Finnfund (2022). *Portfolio and projects*. Available at: <https://www.finnfund.fi>
- Global Off-Grid Lighting Association (2023). *Global off-grid solar market report*. Available at: <https://gogla.org/reports/semi-annual-solar-market-report/global-off-grid-solar-market-data-july-december-2023/>
- International Energy Agency (IEA) (2023). *Africa energy outlook 2022*. Available at: <https://www.iea.org/reports/africa-energy-outlook-2022>
- IEA (2023). *World energy outlook 2023*. Available at: <https://www.iea.org/reports/world-energy-outlook-2023>
- Impact Fund Denmark (2022). *Africa investment initiatives*. Available at: <https://www.ifu.dk>
- InfraCredit (2023). *InfraCredit mobilises N264 billion for infrastructure projects*. Available at: <https://infracredit.ng/news/infracredit-mobilises-n264-billion>
- InfraCredit (2024). *InfraCredit secures strategic investment from MOBILIST and marks its listing on NASD as it transitions to a public company*. Available at: <https://infracredit.ng/infracredit-secures-strategic-investment-from-mobilist-and-marks-its-listing-on-nasd-as-it-transitions-to-a-public-company/>
- International Renewable Energy Agency (IRENA) (2022). *Renewable energy market analysis: Africa and its regions*. Available at: <https://www.irena.org/publications/2022/Jan/Renewable-Energy-Market-Analysis-Africa>
- IRENA and CPI (2023). *Global landscape of renewable energy finance 2023*. Available at: <https://www.irena.org/publications/2023/Feb/Global-renewable-finance-2023>
- Lake Turkana Wind Power (LTWP) (2023). *Project overview*. Available at: <https://ltwp.co.ke/overview-2/>
- LTWP (2023). *LTWP marks 5 years of generation*. Available at: <https://ltwp.co.ke/ltwp-marks-5-years-of-generation>

- National Power Training Institute of Nigeria (NAPTIN) (2023). *Capacity building programs*. Available at: <https://www.naptin.gov.ng>
- Nigerian Electricity Regulatory Commission (NERC) (2024). *Nigerian Electricity Regulatory Commission – Q3 2024 electricity sector performance report*. Available at: https://nerc.gov.ng/wp-content/uploads/2024/12/2024_Q3-Report.pdf
- NERC (2025). *Order No. NERC/2025/050*. Available at: https://nerc.gov.ng/wp-content/uploads/2025/05/IE_May_2025_050.pdf
- Norwegian Investment Fund (2022). *Investments in clean energy in Africa*. Available at: <https://www.norfund.no>
- Scatec (2019). *Benban solar park – Egypt*. Available at: <https://www.scatec.com/projects/benban>
- State of Green (2024). *Providing green, reliable, economical energy to Kenya*. Available at: <https://stateofgreen.com/en/solutions/the-largest-wind-park-in-africa>
- Sun King (2024). *Sun King secures \$80 million in local currency financing*. Available at: <https://sunking.com/news-blog/sun-king-ifc-and-stanbic-ibtc-bank-close-80-million-debt-facility-to-expand-solar-access-in-nigeria/>
- This Day Live (2022). *COP 27: African businesses can leverage climate action for sustainable business growth*. Available at: <https://www.thisdaylive.com/index.php/2022/11/22/cop-27-african-businesses-can-leverage-climate-action-for-sustainable-business-growth>
- World Bank (2020). *Noor Ouarzazate concentrated solar power project*. World Bank. Available at: <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/503371525382384008/morocco-ouarzazate-concentrated-solar-power-project>
- World Bank (2023). *Nigeria Electrification Project (NEP)*. Available at: <https://projects.worldbank.org/en/projects-operations/project-detail/P161885>
- World Bank (2024). *Mission 300: Providing access to electricity to 300 million people in sub-Saharan Africa by 2030*. Available at: <https://www.worldbank.org/en/programs/energizing-africa/overview>

Endnotes

- 1 <https://www.statista.com/topics/9143/renewable-energy-in-africa/#topicOverview>
- 2 <https://www.reuters.com/world/africa/world-bank-provide-750-mln-clean-energy-projects-nigeria-2023-12-15/>
- 3 https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2022/Jan/IRENA_Market_Africa_2022.pdf?rev=bb73e285a0974bc996a1f942635ca556
- 4 https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2022/Jan/IRENA_Market_Africa_2022.pdf
- 5 https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2022/Jan/IRENA_Market_Africa_2022.pdf
- 6 <https://ember-climate.org/insights/research/global-electricity-review-2024/>
- 7 <https://www.statista.com/statistics/1276547/share-of-renewables-in-electricity-generation-in-kenya/>
- 8 <https://www.thinkgeoenergy.com/eep-confirms-25-mw-at-aluto-langano-geothermal-project-in-ethiopia/>
- 9 <https://www.iea.org/reports/financing-clean-energy-transitions-in-emerging-and-developing-economies/executive-summary>
- 10 <https://ltwp.co.ke/economic-impact/>
- 11 <https://www.dlight.com/atlas>
- 12 <https://www.bboxx.com/technology/>
- 13 <https://www.africa-newsroom.com/press/africas-energy-transition-gains-traction-as-siemens-gamesa-introduces-renewable-energy-in-djibouti?>
- 14 <https://ge.africa-newsroom.com/press/ge-vernova-provides-gridosr-orchestration-software-to-help-west-african-power-pool-wapp-facilitate-energy-exchange-among-its-member-states?lang=en>
- 15 <https://ltwp.co.ke/>
- 16 <https://stateofgreen.com/en/solutions/the-largest-wind-park-in-africa/>
- 17 <https://scatec.com/2019/10/16/scatec-solar-completes-the-390-mw-benban-project-in-egypt/>
- 18 <https://www.esi-africa.com/renewable-energy/egypt-solar-energy-feed-in-tariff-projects/>
- 19 <https://documents1.worldbank.org/curated/en/138481528687821561/pdf/Morocco-Noor-AF-project-paper-P164288-May17-clean-05212018.pdf>
- 20 <https://www.cif.org/CIF10/morocco/ouarzazate>
- 21 <https://openknowledge.worldbank.org/entities/publication/141693cf-1ed8-587d-9f30-0a7ef30c4998>
- 22 <https://www.greenbuildingafrica.co.za/four-solar-hybrid-mini-grid-projects-commissioned-in-osun-state-nigeria/>
- 23 <https://www.worldbank.org/en/news/press-release/2021/02/05/nigeria-to-improve-electricity-access-and-services-to-citizens#:~:text=85%20million%20Nigerians%20don't,access%20deficit%20in%20the%20world>
- 24 <https://oxfordbusinessgroup.com/privatisation-of-power-generation-assets-in-nigeria/>
- 25 <https://africa-energy-portal.org/news/nigeria-post-privatisation-stranded-power-rises-263-percent-3742mw?>
- 26 <https://elec-t.energymrc.ng/dashboard/On-Grid/GenerationData>
- 27 Ibid.
- 28 <https://www.thisdaylive.com/2025/02/07/man-2013-power-sector-privatisation-unfruitful-operators-lack-technical-financial-capacity-to-deliver-optimally/>
- 29 <https://rea.gov.ng/energising-education-renewable-power-thisday/>

- 30 <https://nairametrics.com/2025/01/05/2025-budget-ministry-of-power-to-spend-n150-billion-on-ppi-transmission-projects/>
- 31 <https://www.dealsandadvisoryreport.com/2025/04/presidential-power-initiative-fgn-power.html?>
- 32 <https://nep.rea.gov.ng/>
- 33 <https://nep.rea.gov.ng/dares.html>
- 34 <https://nairametrics.com/2025/05/04/president-tinubu-to-meet-gencos-over-n4-trillion-debt-to-avert-power-sector-collapse/>
- 35 <https://nerc.gov.ng/wp-content/uploads/2024/01/MINIGRIDREGULATIONS.pdf>
- 36 <https://nep.rea.gov.ng/>
- 37 Ibid.
- 38 <https://rmi.org/powering-a-brighter-future-for-nigeria/>
- 39 <https://rea.gov.ng/rea-impact-report-2022-17.pdf>
- 40 <https://www.imf.org/en/Publications/REO/SSA/Issues/2023/10/16/regional-economic-outlook-for-sub-saharan-africa-october-2023?>
- 41 <https://www.tekedia.com/sun-king-secures-80-million-debt-facility-to-expand-solar-access-for-nigerian-households/?srsltid=AfmBOoogKjxaa1laor-AwGLNi6PKhqGBs5vouyEMVDCbsgnJZn7MOh5y>
- 42 https://sharkawylaw.com/wp-content/uploads/2021/01/Egypt_FIT_Program.pdf
- 43 https://assets.kpmg.com/content/dam/kpmg/za/pdf/2025/New%20Mechanism%20for%20Mitigating%20Currency%20Risk%20to%20Support%20Africa%27s%20Energy%20Transition_January%202025.pdf?
- 44 <https://www.bloomberg.com/news/articles/2024-12-27/china-and-nigeria-renew-currency-swap-to-boost-bilateral-trade?>
- 45 <https://dailytrust.com/nerc-delays-electricity-tariff-review-for-fourth-time/>
- 46 Ibid.
- 47 <https://assets.kpmg.com/content/dam/kpmg/ng/pdf/power-sector-watch-special-edition-volume-4.pdf>
- 48 <https://elec-t.energy.mrc.ng/dashboard/overview/industry>
- 49 <https://elec-t.energy.mrc.ng/dashboard/transmission/TransmissionData>
- 50 <https://cleantechnologyhub.com/wp-content/uploads/2022/07/Overcoming-The-Challenge-of-Insecurity-in-Nigerias-Mini-grid-Sector-1.pdf?>
- 51 <https://kpmg.com/ng/en/home/insights/2023/06/removing-nigeria-pms-fuel-subsidies.html>
- 52 <https://www.sigma-gcrf.net/blog/mini-grid-development-and-management-in-nigeria-sustainability-and-matters-arising#:~:text=The%20system%20in%20Sokoto%20has,long%2Dterm%20onsite%20technical%20management>
- 53 <https://nairametrics.com/2025/01/24/fg-launches-nextgen-resco-programme-to-empower-nigerian-youths-in-renewable-energy/>
- 54 <https://naptin.gov.ng/naptin-commissions-state-of-the-art-training-equipment-to-strengthen-nigerias-power-sector-workforce/>
- 55 Renewable Energy Independent Power Producer Procurement Programme <https://ndcpartnership.org/knowledge-portal/good-practice-database/south-africas-renewable-energy-independent-power-producer-procurement-programme>



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Executive Director

Dr. Olumide Abimbola
E-mail: oabimbola@afripoli.org

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APRI – Africa Policy Research Private
Institute gUG (haftungsbeschränkt)
Brunnenstraße 9, 10119 Berlin, Germany

Contact:

Dr. Serwah Prempeh, Senior Fellow and Head of
Economy and Society Program, APRI
E-mail: sprempeh@afripoli.org

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