Powering People, Not Just Grids: The Role of Small Wind, Battery Storage and Hybrid Mini-Grids in Africa's Energy Future



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Policy Power People



POWERING PEOPLE, NOT JUST GRIDS

The role of small wind, battery storage and hybrid mini-grids in Africa's energy future

Moving wind beyond utility-scale generation to deliver reliable power for communities and productive uses.

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WHY HYBRID MINI-GRIDS?

Africa's energy access challenge is not only about generation but also about delivering reliable, productive power where people live and work.

*Around 600 million people in Africa still lack access to electricity, with 80% of those without access living in rural areas. A cost-effective mix of grid expansion and decentralised solutions, including mini-grids and stand-alone systems, is needed to expand access. (**IEA, 2025**)*

THE HYBRID MINI-GRID BUILDING BLOCKS

An integrated system designed around resource, demand, reliability and local operating capacity.



Small Wind Turbines

Distributed turbines sited close to demand, complementing solar where the wind resource allows.



Solar PV Panels

The most widely deployed distributed source pairs naturally with the wind's different daily and seasonal profiles.



Battery Storage

Firms variable generation, extends hours of service, and can support EV-charging and other flexible loads.



Mini-Grid Control

Manages generation, storage and demand together so the system runs reliably without a national grid connection.



Productive Use

Powers milling, cold storage, welding and other income-generating activities, turning electricity into livelihoods.



Community O&M

Local training, jobs and ownership models that keep community-level systems running long after installation.

CASE STUDY: PLATEAU STATE

4

LGAs Monitored

Weather stations were deployed across **Shendam**, **Langtang North, Kanke and Jos East**.

10.6 meters

Small-Wind Measurement Height

Weather stations were installed at **10.6 m** to characterise wind conditions at the measurement sites for the small-scale wind assessment.

TOP 5

Nigeria Wind Ranking

Plateau ranks among Nigeria's top five states for wind resource in NWEC'S Desktop Study for Nigeria's wind profile.

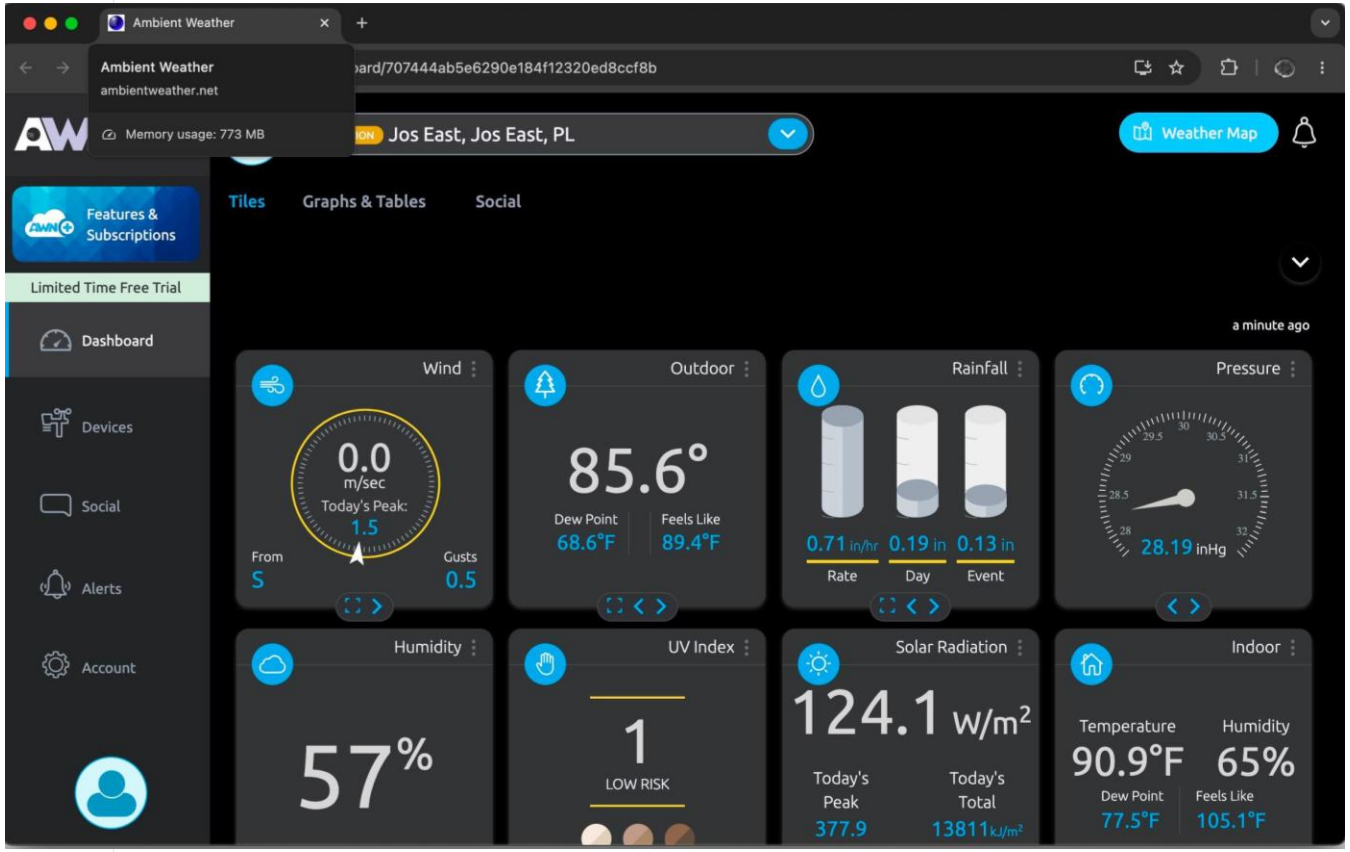
*Confirmed also in Odiniya's Composite Wind Suitability Index for 36 States, including the FCT (**Odiniya, 2026**).*

MEASURING BEFORE BUILDING

NWEC is moving from desktop resource modelling to site-specific evidence for small-scale wind, using measurements from four (4) Plateau State LGAs.

FROM MEASUREMENT TO HYBRID PILOT

The field data is informing the siting and design of NWEC's planned wind-solar-battery hybrid pilot in Plateau.



Plateau State Weather Station Deployment Project 2026







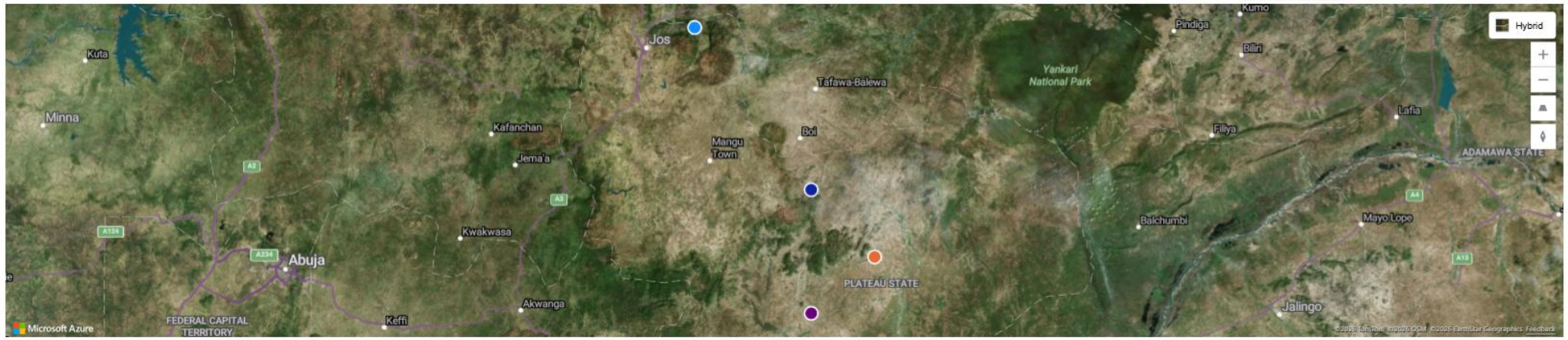
Weather Stations Dashboard

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Wind

S
Wind Dir

4.16
Avg. Wind Gust

3.06 m/sec
Avg Wind Speed

21.2 m/s
Peak

0 m/s
Least

Outdoor

13
Max UV Index

27.25°C
Avg Temperature

73%
Avg Humidity

21.85 °C
Avg Dew Point

29.28 °C
Avg Feels Like

Rainfall

Rain Rate	Daily Dept	Event Dept
203 mm/hr	89 mm	6.5... mm

Pressure

0 2000

969.75 hPa

Solar Radiation

202.92 W/m^2
Avg Radiation

1395.5 W/m^2
Peak

19.9M W/m^2
Total

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Designed and Developed by **NWEC Team**

FROM MEASUREMENT TO PRODUCTIVE POWER

The Plateau case illustrates how site evidence can connect resource assessment to a practical hybrid-energy application.

1	2	3	4	5
MEASURE	**INFORM DESIGN**	**HYBRIDISE**	**SERVE DEMAND**	**CREATE VALUE**
Site-specific wind and weather data	Use evidence to inform pilot siting and system design	Combine wind, solar and battery storage	Match reliable power to community and productive uses	Support livelihoods, skills and local economic activity

Measure before building. Design around real demand. Build systems that can deliver lasting value.

POLICY, POWER, PEOPLE

FROM ENERGY ACCESS TO PRODUCTIVE POWER

PRODUCTIVE USES

Small and distributed wind, paired with solar and battery storage, can bring hybrid mini-grids to communities the main grid has not yet reached.

Reliable hybrid power can support agro-processing, cold storage, small enterprise and EV charging, while installation, operations and maintenance can build local jobs and skills.

1
AGRO-PROCESSING
Milling, drying & value addition

2
COLD STORAGE
Reducing post-harvest losses

3
SMALL ENTERPRISE
Powering shops & workshops

4
EV CHARGING
Supporting clean transport

5
LOCAL JOBS & SKILLS
Installation, O&M & training



Energy access → reliable power → productive activity → local value

ENABLING THE MARKET: POLICY, FINANCE & LOCAL CAPACITY

Moving from pilots to scale requires supportive policy, patient capital, local skills and strong partnerships.

Supportive Regulation

Clear licensing and interconnection rules for mini-grids and distributed wind, building on frameworks such as Nigeria's NERC Mini-Grid Regulations, 2026.

Blended & Patient Finance

De-risking instruments and local-currency financing that make small-scale hybrid projects bankable, not just fundable on paper. Public finance accounted for more than 70% of electricity access financing flows in sub-Saharan Africa in 2023, underscoring the continued importance of concessional and public capital. (**IEA, 2025**)

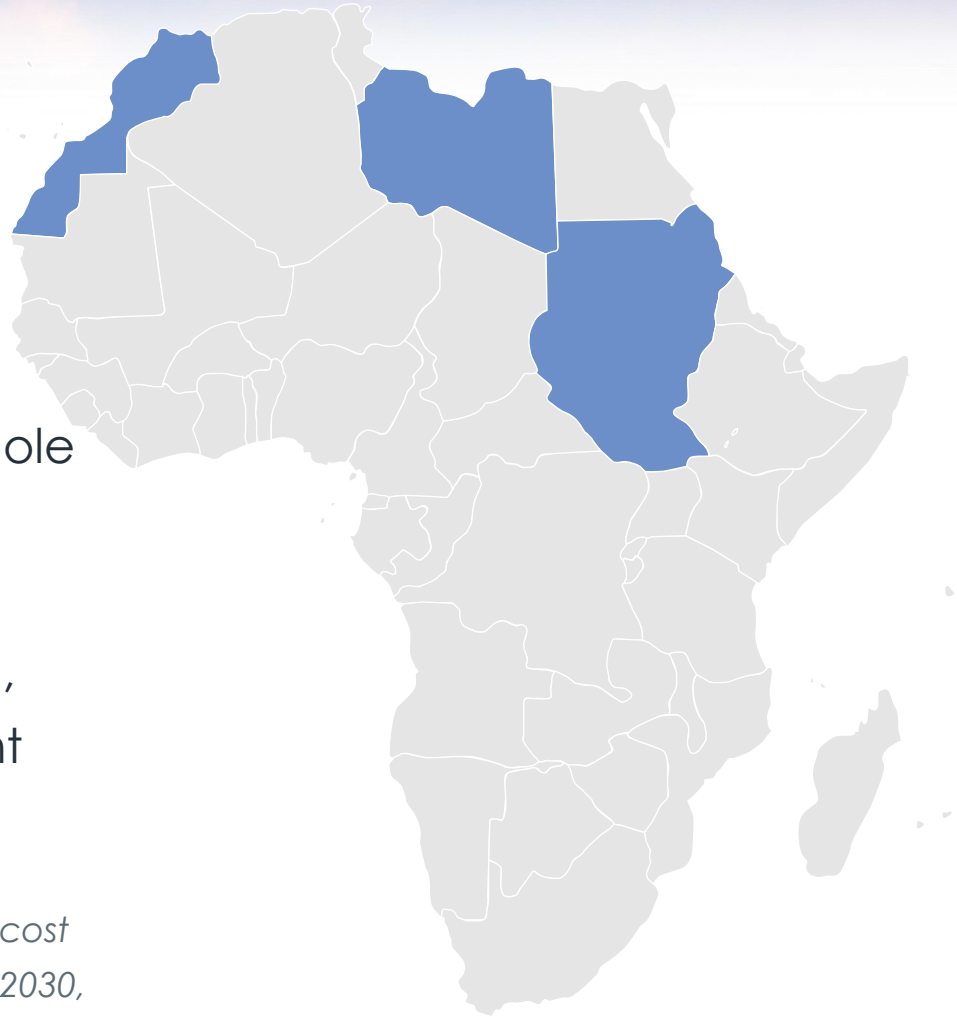
Local Partnerships & Skills

Working with communities, developers and technical partners to build installation, operations and maintenance capacity on the ground.

FROM ONE PILOT TO A CONTINENTAL OPPORTUNITY

Plateau State is one case study, not the whole story. The same approach, ground-truthed resource data, hybrid wind-solar-storage design and mini-grids sized to real demand, can inform distributed-energy development across African markets.

*The World Bank estimates that mini-grids could be the least-cost option for connecting nearly 490 million people globally by 2030, provided the necessary enabling conditions are in place (**ESMAP, 2022**).*



KEY TAKEAWAYS - What Will It Take to Scale?

01	**Measure before building**	Site-specific measurements strengthen the evidence base for small-wind applications.
02	**Design the system as a hybrid**	Wind, solar and battery storage work together to provide more reliable service.
03	**Power livelihoods as well as households**	Productive uses can turn reliable electricity into local economic activity.
04	**Build local capability**	Community O&M, skills and partnerships are part of long-term project sustainability.
05	**Create the conditions for scale**	Supportive policy, patient finance and strong local partnerships can help move pilots toward replication.

The next stage of Africa's energy transition won't be defined only by megawatts; it will be defined by how many people that power actually reaches.

- Ojodomo Odiniya -
Research & Operations Consultant
Nigerian Wind Energy Council (NWEC)

SELECTED SOURCES & DATA

This talk combines public data and regulation with NWEC's own field research in Plateau State.

Wind & Policy Data

- Global Wind Atlas 4.0 - DTU Wind and Energy Systems.
- **Odiniya, O.** (2026). *GIS-Based Site Suitability Analysis for Wind Energy Development in Nigeria*. SSRN. DOI: 10.2139/ssrn.7276339
- NERC, Mini-Grid Regulations, 2026.

Energy Access & Mini-Grid Literature

- IEA, Financing Electricity Access in Africa (2025).
- World Bank/ESMAP, Mini Grids for Half a Billion People (2022).

NWEC Project & Field Data

Nigerian Wind Energy Council (NWEC) Desktop Study on Nigeria's Wind Energy Profile.

NWEC - Plateau State weather station measurement campaign, with partners Plateau State Energy Corporation (PSEC) and Sirius-X Energy.

THANK YOU

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