

Rethinking the solar energy story

Fragile power grid is forcing solar firms to think smarter

SOLAR
DEOGRATIUS
WAMALAI

The solar power sector has reached a critical inflection point.

After several years of steady growth in grid-connected solar projects, expansion has slowed because the national electricity grid cannot absorb much more variable renewable energy.

This reality was formally acknowledged in October last year, when Electricity Regulatory Authority (ERA) announced a temporary suspension on the permitting and licensing of new grid-connected solar and wind projects.

The decision marked a pause in the country's renewable energy expansion.

Signed on October 22 by ERA Chief Executive Officer Ziria Tibalwa Waako, the notice invoked the law that empowers the regulator to safeguard grid reliability and security.

The suspension reportedly affects about \$230m in planned investments, including proposed solar plants ranging from 20 megawatts in districts such as Gomba, Nebbi, Moroto and Luuka to large-scale developments of 150 megawatts in Amuru and 100 megawatts in Nakaseke.

Though temporary pending a comprehensive grid stability assessment, the halt signals a shift in how Uganda must approach renewable growth.

At the heart of ERA's decision is concern that the grid has reached its safe absorption limit for intermittent sources like solar and wind.

Earlier estimates suggested the grid could absorb about 250 megawatts of variable renewable energy. More recent studies have lowered that to roughly 200 megawatts due to engineering constraints.

By August 2025, Uganda had already surpassed this threshold, with about 239 megawatts licensed or permitted, including operational, near-completion and feasibility-stage projects. In effect, the grid is oversubscribed.

Sudden changes in sunlight or wind speed can trigger voltage fluctuations and frequency imbalances. Without adequate balancing mechanisms, such as flexible generation or storage, these fluctuations heighten the risk of outages and instability.

Aisha Naiga Wamala, Managing Partner at ABMAK Associates, notes that generation capacity has expanded faster than transmission and distribution infrastructure.

"Electricity generation capacity has grown faster than the supporting network, creating a situation where the grid risks overload if additional variable energy is added without reinforcement," she says.

Variable renewable energy depends heavily on weather conditions, and without a flexible grid that variability can translate into interruptions affecting consumers.

This thinking is reflected in national budgeting priorities. The 2026/27 National Budget Framework Paper proposes Shs1.172 trillion for sustaina-



ble energy development. Funding will support the 380 MW Kiba Hydropower Plant, a 10 MW floating solar installation at Isimba, 500 MW of utility-scale solar in Elgon and Acholi, and site studies for the Buyende Nuclear Power Plant.

Resources are also earmarked for high-voltage transmission lines, the Kampala Metropolitan System Improvement Project, and industrial electrification to help achieve the National Development Plan IV target of 70 per cent electricity access.

Such upgrades are costly and time-consuming, making ERA's cautious approach a stabilising measure before further expansion.

The impact of grid constraints is visible at plant level.

At the 20-megawatt Kabulasoke Solar Power Plant operated by Xsabo Power, integration limits shape daily operations.

Grid-connected solar power plants feed clean energy into the national electricity system, reflecting the country's renewable energy ambitions alongside the growing need for stronger transmission and storage infrastructure. PHOTO / FILE

Commissioned in December 2018 and launched in January 2019, Kabulasoke feeds directly into the national grid.

On clear days it can generate close to its full 20-megawatt capacity. Yet output depends on irradiance and ambient conditions. During a December site visit, cloud cover reduced generation to between six and eight megawatts despite full functionality.

Engineers explained that panels require a balance between sunlight intensity and temperature. Extremely hot or cloudy conditions can limit performance.

Kabulasoke averages five to six effective sun hours daily, producing about 120 megawatt-hours, rising to roughly 136 megawatt-hours on favourable days. Generation peaks at midday and tapers off toward evening.

Like other grid-connected plants, Kabulasoke operates under dispatch orders

from Uganda Electricity Transmission Company Limited, which decides how much power can be injected at any time.

When the grid is saturated, it may be instructed to curtail output. Though power purchase agreements provide compensation, repeated curtailment underscores structural limits rather than plant shortcomings.

Project siting is also shaped by local realities. Kabulasoke was built near an existing switching station later upgraded to a substation, reducing transmission losses and avoiding costly new lines.

Older projects operate under contracts at about 11 US cents per kilowatt-hour, reflecting higher capital costs.

Newer plants such as the 20-megawatt Nkonge facility operate at about 8.5 cents, while ERA's latest benchmark tariff stands near 5.1 cents.

Lower tariffs enhance affordability and competitiveness but tighten operator margins as maintenance costs rise. Against this backdrop, storage and smarter technology are emerging as the next phase.

Industry players note that while curtailment for new grid-tied solar has slowed, battery energy storage systems remain permitted, though tariff negotiations are still evolving.

Storage can capture excess daytime generation and release it during evening peaks or low irradiance periods, helping stabilise supply.

Technology is also reducing land requirements. Kabulasoke uses about 68,000 panels rated at 320-330 watts across 130 acres.

By contrast, Nkonge uses about 38,000 high-efficiency bifacial panels rated at 590-600 watts with mounting systems, achieving similar output on less land.

Innovations such as agrivoltaics combining farming and solar on the same land, and floating solar on water bodies, are also being explored.

To guide future decisions, ERA and UETCL are conducting a comprehensive grid stability study to determine how much additional renewable capacity can be safely integrated. The study is expected to conclude by the first quarter of this year.

For investors, the suspension presents both challenge and recalibration. Projects relying solely on grid-tied capacity may need redesigning to include storage or hybrid configurations.

Uganda's long-term ambitions remain intact. The 2023 Energy Policy targets 52,000 megawatts of installed capacity by 2040, up from about 2,046 megawatts, requiring investments of roughly \$245b.

As of 2025, solar contributed just 0.5 per cent of capacity, about 4.4 per cent of total installed capacity. In that context, the pause on new grid-connected projects aims to secure the foundations of transition. Ultimately, the solar sector is constrained less by sunshine or investor appetite than by grid capacity.

The next phase of growth will belong to projects combining storage, smart technology and system flexibility.

Key takeaways

- Estimates had suggested the grid could absorb about 250 megawatts of variable renewable energy. But studies have lowered that to roughly 200 megawatts due to engineering constraints.
- By August 2025, Uganda had already surpassed 200 megawatts threshold, with about 239 megawatts licensed or permitted, including operational, near-completion and feasibility-stage projects. In effect, the grid is oversubscribed.

A mismatch

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