



The Opportunity for Digital Transformation in Africa's Utility Sector

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Factor  Equator

Surpassing the Modern Energy Minimum in sub-Saharan Africa requires a functioning power grid and effective utilities to run it. Digitalisation is a keystone strategy that can achieve both.

Africa's power grid — and the utilities, energy sector, and customers behind it — stands at a crossroads. Long a constraint on development, it's now one of the continent's most promising levers for growth.

To meet [UN Sustainable Development Goals](#), improve quality of life, and realise meaningful economic development across the Global South — including Africa — people and businesses need kilowatts and megawatts of electricity.

The [Modern Energy Minimum](#) sets a benchmark of 1,000 kWh per capita per year for a prosperous life. In much of Africa, the average remains just a fraction of that: around 150 kWh per person (excluding South Africa). Meanwhile, a wave of [AI innovation tailored to local needs](#) is beginning to take shape across the continent — and with it comes a surge in demand for digital infrastructure and the energy that powers it.

At the same time, there's also growing recognition that the success of global climate solutions depends on meaningful investment in the Global South — not only to address historic inequities, but because that's where the biggest opportunities for clean energy transformation exist.

This means thinking, and acting, beyond basic electrification goals in sub-Saharan Africa. Vaulting 10x from 100 kWh per capita per year to 1,000 kWh requires both a) functioning power grids as well as b) the effective utilities needed to run them.

Digitalisation is a keystone strategy that can achieve both. Investing in digital infrastructure is a critical pathway to improve utilities' economic viability, connect customers with reliable electricity, and ensure investment can confidently flow and generate clear returns.

This involves using digital technologies — such as smart meters, sensors, and software — to help utilities operate more efficiently, reduce losses, forecast energy needs, manage demand, enable power trading and wheeling, and deliver better service to customers.

Electricity systems that leverage flexible and networked renewable energy resources are the fastest and cheapest way to accelerate the transition in Africa.

To unlock their full potential, however, utilities will need to embrace innovation — both in technology and in how they operate. Innovative technologies and new business models are urgently needed to disrupt the status quo in sub-Saharan Africa's utilities... and are already emerging and ready for targeted investment to scale their impact.

African utilities are unbankable, the grid is broken, and the entire system is massively underinvested.

Across sub-Saharan Africa, power outages are common, billing is inconsistent, and utilities are often on the brink of collapse. Utilities are losing money as we speak: The World Bank estimates that [\\$20B or more is lost annually across the continent](#) via utilities' quasi-fiscal deficits. In many countries throughout Sub-Saharan Africa, these losses can total 1% or more of total national GDP.

The losses span transmission and distribution (T&D) system losses, as well as non-technical losses such as underpricing, bill collection losses (including electricity theft), and overstaffing. Most African utilities operate at a loss, crippled by inefficient billing systems, rampant electricity theft, and obsolete infrastructure.

It's no wonder that African utilities are hemorrhaging cash. Some lose [as much as 30–40%](#) of their electricity before it is paid for — through a combination of technical faults, outdated meters, theft or just as often, unbilled customers.

In places like the US and Europe, utilities have modern tools at their disposal. But for many African utilities, even foundational systems are still out of reach, including:

- Matching supply with demand. Many utilities lack the infrastructure and data needed to manage generation and consumption in real time. That includes the physical infrastructure for generation and storage, data on actual demand and asset performance, and control technologies to act on what's happening on the grid.
- Collecting revenue effectively. Unregistered connections are widespread across Africa, making it hard to track usage and bill customers accurately. Where metering infrastructure does exist, it's often analog, poorly maintained, and blind to real-time activity. Post-paid bills add another hurdle, with high rates of nonpayment.
- Tracking outages. Outage management is often reactive — waiting for failures, then scrambling to respond. Many utilities lack basic visibility into low-voltage networks, and in some areas, there are no meters at all to detect disruptions.

The result is a vicious cycle: financially frail utilities cannot invest in upgrades, which leads to worse service, lower revenue, and ultimately, deeper insolvency.

How digitalisation can stabilise and strengthen utility revenue, attract investment through liberalisation, and improve overall grid performance.

Digital transformation presents a strategic opportunity for African utilities to move past legacy systems and embrace decentralised, two-way flows powered by distributed renewable energy.

Unlike developed markets — which face costly infrastructure replacements and complex public-private dynamics — Africa has a greenfield opportunity. But it's also a capital-constrained environment, and can't follow the same digitalisation path as global utilities have over the past 20+ years.

That's why digitalisation is such a powerful leverage point — especially for investors and utilities. Modest, targeted investments in digital tools (in tandem with market liberalisation) can unlock three urgent and mutually reinforcing goals for utility transformation:

1. **Stabilise and strengthen utility revenues.** Build a digital foundation that helps utilities recover lost revenue and stabilise finances, making the entire system more reliable and investable.
2. **Pivot from monopolies to marketplaces.** Use digital infrastructure to support the massive grid buildout ahead, while enabling utilities to shift from centralised suppliers to open, decentralised operators in increasingly green energy systems.
3. **Attract large-scale investment into grid operations.** Lay the groundwork for new business models supported by market liberalisation — opening the door to private capital, new entrants, and broader grid resilience.



Strategy 1: Improve utility billing to support utility revenue

Digitalisation helps utilities recover costs, enabling sustainable operations. With the right digital tools, utilities can: **1) identify who to bill** through customer registration and accurate metering, **2) know how much to charge** by tracking consumption and pricing fairly, and **3) collect what is owed** by streamlining pre-paid and post-paid systems.

Smart meters and IoT-enabled platforms allow utilities to measure consumption with precision, detect losses instantaneously, and bill customers transparently. They also make electricity theft riskier and easier to stop. Prepayment systems, already common in parts of East and Southern Africa, can be integrated with digital meters to guarantee revenue collection before a single watt is consumed.

So why hasn't smart metering scaled after roughly a decade of attention? Two major roadblocks: high implementation costs and doubts about return on investment. For many cash-strapped utilities, digital systems have long been seen as an out-of-reach luxury.

That perception is starting to shift. Prices have been falling, and World Bank programmes have helped some utilities begin the digital transformation process. Still, broader adoption depends on the convergence of business model innovation and technology breakthroughs that make advanced metering infrastructure investment register as future-proof.

We see three key trends opening the door to faster adoption and deeper impact:

- 1. Software-centric modern metering platforms.** Modern metering systems with open data architecture are hardware-agnostic, remotely updateable, and avoid vendor lock-in. Their scalability and interoperability give utilities confidence that their investment will pay off and won't soon become obsolete.
- 2. AI and machine learning for sparse data environments.** New AI/ML tools can draw insight from even limited sensor networks, enabling topology estimation, fraud detection, and predictive maintenance without needing full-scale infrastructure. This helps fill data gaps and reduce CapEx requirements for new smart meters.
- 3. Flexible, revenue-secure payment models.** In addition to pre-paid programmes, pay-as-you-save programmes can give utilities confident on-bill revenue for investments while saving customers on their bills — a win-win that lowers risk and supports faster adoption.

Strategy 2: Harness digitalisation to attract investment, orchestrate markets, and strengthen the grid

As Africa's energy systems grow more complex, digitalisation is the key to making them more functional — and investable. By embracing digital tools, utilities can shift from being vertically integrated monopolies to dynamic network operators: facilitating markets, improving performance, and unlocking new sources of capital.

The continent's changing energy landscape demands new utility models. Solar, batteries, and independent power producers are proliferating, decreasing the cost and carbon intensity of the grid — but also introducing more variability and congestion. At the same time, consumers are becoming “prosumers,” generating and storing their own power onsite.

In this new environment, the traditional utility model — centralised, top-down, and rigid — no longer fits. What's needed now is a shift towards orchestration: a utility that enables energy flow from many directions, balancing supply and demand through smart, real-time coordination.

Two emerging digital tools are central to this transition:

- **Digital wheeling platforms.** Traditional wheeling — moving electricity from central generators to large demand centers and commercial and industrial (C&I) end users — has long relied on custom agreements and manual processes.

But newer wheeling models enable smaller, distributed renewable projects to move power flexibly across shared grid infrastructure. Digital platforms automate tracking, verification, and settlement — lowering transaction costs, opening up markets, and enabling new forms of energy trade.

- **Virtual power plants (VPPs).** These cloud-based systems aggregate distributed energy resources — like rooftop solar, batteries, electric vehicles (EVs), and smart thermostats — and manage them as a single coordinated entity.

VPPs use real-time data to coordinate when assets charge, discharge, or curtail consumption. That flexibility is crucial for integrating renewables and maintaining grid stability without building new fossil-based capacity.

The value of these tools becomes especially clear as solar generation continues to expand. Solar is abundant across Africa — but its production often peaks during low-demand midday periods. This mismatch can lead to solar saturation and curtailment, where clean energy goes unused.

VPPs help shift demand to align with solar availability, while wheeling allows surplus solar to be delivered across regions — ensuring that cheap, clean power is actually put to use.

SOUTH AFRICA'S DECENTRALISED WHEELING MARKET

As South Africa moves away from coal and towards cleaner energy, the country needs at least 20 GW of new renewable capacity — a \$10 billion investment opportunity.

A more flexible wheeling model is emerging, where independent power producers can sell to multiple private buyers, even across jurisdictions — using utility infrastructure without the utility acting as the buyer.

Companies like [Open Access Energy](#) are helping make this possible by digitising power flows, automating settlement, and turning the grid into a smart transport layer — making distributed clean energy easier to deliver at scale.

Meanwhile, momentum is growing on the policy front. Regulators in Kenya, Nigeria, and South Africa are beginning to support power wheeling, distributed generation, and performance-based utility models. Donors and development financiers are increasingly prioritising digital infrastructure, and a growing ecosystem of African energy tech firms is proving that local innovation can match global ambition.

To unlock this potential:

- **Governments** must accelerate liberalisation markets and support data-sharing between utilities and third-party providers.

- **Investors** should dig into this space (despite the complexity) and look to support innovation at the intersection of the physical and digital layers of the grid.
- **Utilities** need to reframe digitalisation not as a threat to their business — but as the foundation of its survival.

By moving towards digital orchestration, utilities can manage complexity, attract investment, and deliver the kind of performance today's energy systems demand.

Why digitalisation — and why now

Digitalisation isn't just a technical upgrade; it's one of the most powerful leverage points African utilities have today. It can improve reliability, recover revenue, attract private investment, and enable cleaner, more distributed energy — all without the massive capital requirements of traditional infrastructure expansion.

And it's not just about smart meters. The next wave of digital energy systems includes cloud-based orchestration, AI-powered analytics, and open, modular platforms that support entirely new ways of managing supply, demand, and customer engagement.

Africa also has a timing advantage. Unlike markets weighed down by legacy systems, it has an opportunity to adopt more modern, agile approaches from the start — shaped by today's realities, not yesterday's playbook. That includes applying AI not only as a future demand driver, but as a tool to unlock insights from limited data and improve grid performance right now.

CONCLUSION

A different path is possible

Africa doesn't have to repeat the slow, fragmented digital transitions seen elsewhere. With the right support, it can take a more coordinated, future-facing approach — one that puts smart, flexible infrastructure at the heart of utility transformation.

The window is open. The technologies exist. What's needed now is focus, urgency, and the recognition that digitalisation is not a side project — it's the foundation for powering inclusive growth, clean energy deployment, and a stable, investable grid across the continent.

ABOUT US

Factor E + Equator

As specialist early-stage investors, Factor E Ventures and Equator invest against a specific set of theses to effect change, and are investors who look to bridge proven technologies and business model innovations with the markets that urgently need them at scale. The two organizations work closely together in a variety of functions including thesis development, sourcing and evaluating potential investment opportunities, as well as sharing a post-investment support platform to add value to the portfolio of companies across both organizations.

ABOUT

Factor

Factor E Ventures specialises in global technology brokering, a strategy connecting innovative global technologies with market application. We are a team of pre-seed investors and venture builders dedicated to supporting the growth of early stage, technology-enabled companies solving global challenges in energy, agriculture, mobility, and smart infrastructure with a focus on Africa.

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ABOUT

Equator

Equator is a venture capital firm with teams in Nairobi, Lagos, London, and Colorado that targets technology-enabled, early-stage ventures in energy, agriculture and mobility that are accelerating an equitable climate transition and supporting inclusive economic growth in Sub-Saharan Africa. The firm is backed by a team of technologists, operators, and investors with decades of experience investing in and scaling early-stage ventures in climate-positive sectors and across Sub-Saharan Africa.

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