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# AIKO ABC PV Module Revolutionising the Solar Industry in South Africa

Whether for residential, commercial, or utility-scale applications, AIKO is redefining the South African solar industry with its high-performance **ABC (All-Back Contact) PV modules**. With superior efficiency, higher power output, and long-term durability, AIKO presents an investment-worthy solution for businesses and homeowners looking to maximize returns and sustainability.

## AIKO's High-Performance Product Lineup

**Neostar 2S+60 (Full Black) – Aesthetic and Efficient for High-End Residential**

- Designed for homeowners who value premium aesthetics and efficiency.
- Over **22% efficiency**, ensuring maximum energy generation in limited spaces.
- Full-black design integrates seamlessly into rooftops, enhancing home aesthetics.

**Comet 2U Series – The Ideal Choice for C&I Applications**

- Tailored for commercial and industrial (C&I) energy needs.
- Over 24% efficiency to maximize solar generation for warehouses, factories, and offices.
- Enhanced shading optimization and lower degradation rates for long-term stability.

**Stellar 1N+ – Unlocking Utility-Scale Solar Potential**

- Engineered for large-scale solar farms to ensure maximum energy output.
- Lower degradation rates and advanced durability ensure a higher return on investment.
- Designed to perform efficiently under South Africa's challenging climate conditions.

## Why AIKO? Unrivaled Core Values

**Higher Power Output**

- 6%-10% more power per unit area compared to traditional TOPCon technology.

**Higher Return on Investment**

- Partial Shading Optimization: Generates 30% more electricity than TOPCon in fully shaded conditions.
- Superior Temperature Coefficient: AIKO's ABC modules have a coefficient of -0.26%/°C, outperforming TOPCon's -0.29%/°C.
- Lower Degradation Rates: First-year degradation of ≤1%, with annual degradation at 0.35% for long-term efficiency.

**Ultra-Safe and Durable Design**

- 30% lower heat buildup than TOPCon, minimizing overheating risks.
- Micro-Crack Resistance: Silver-free metallization coating and single-sided soldering reduce the risk of micro-cracks, ensuring longevity.

## Powering the Future of Solar in South Africa

AIKO is at the forefront of solar innovation, providing cutting-edge solutions that combine efficiency, durability, and superior performance. As South Africa continues its transition to renewable energy, AIKO's advanced ABC PV modules offer the most reliable and profitable choice for energy independence.

For investors and businesses seeking higher power, greater returns, and long-term safety, AIKO is leading the way in transforming South Africa's solar landscape.

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Residential Scenarios

**500W+** Output
**22.0%+** Efficiency

**Comet 2U**
C & I Scenarios

**650W+** Output
**24.0%+** Efficiency

**Stellar 1N+**
Utility Scenarios and C & I Scenarios

**650W+** Output
**24.0%+** Efficiency

## Higher Power

Power output 6%-10% higher than TOPCon under the same area

## Higher Return

**Partial Shading Optimisation:**
Generates 30% more electricity than TOPCon when fully shaded

**Better Temperature Coefficient:**
ABC -0.26%/℃ vs. TOPCon -0.29%/℃

**Lower Degradation:**
≤1%/0.35%
First-year/Year by year Degradation

## Ultra-Safe

**High Temperature Restriction:**
30% lower heat buildup than TOPCon

**Micro-crack Resistance:**
Silver-free metallization coating & Single-sided Soldering reduce micro-cracks

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# THE EOL FACTOR

Effective end-of-life (EoL) management for solar panels and battery storage requires advanced recycling and upcycling technologies, robust policy frameworks, landfill bans, and design improvements. But how does this work?

Solar panels can last 25-30 years, while lithium-ion batteries in energy storage systems eke out about 8-15 years. Their decommissioning introduces both environmental challenge and opportunity to recover valuable materials, reduce waste, and strengthen the renewable sector's circular economy.

At the EoL, modules and batteries must be safely removed, assessed, and then reused, refurbished, or recycled. This stage, if poorly managed, risks leaching toxic substances into the environment, but when properly done, it supports extended producer responsibility (EPR) models and contributes to sustainability objectives embedded in ESG frameworks. The goal is to retain as much material value as possible in the supply chain while reducing dependence on virgin resources.

Panels are mostly made of glass, aluminium, polymers, silicon, and trace metals such as silver and copper. While the frame and glass are recyclable, encapsulation layers that protect internal components make separation and recovery more complex. Mechanical recycling processes crush and separate materials, while thermal and chemical recycling methods use heat or solvents to isolate silicon and precious metals. Recycling is costly compared to landfill disposal, though environmental regulations are starting to shift this balance.

Beyond recycling, upcycling introduces new possibilities. Functional panels can be reused in rural microgrids or community electrification projects, while recovered glass may be found in architectural panels or greenhouse glazing. Silicon wafers can be repurposed for electronics manufacturing. These uses extend materials' lifespan, generate local employment and reduce waste volumes destined for landfills.

On the battery side, most stationary systems use li-ion technology containing lithium, cobalt, nickel, manganese, copper, and graphite. Improper disposal risks fire and contamination, making responsible EoL treatment essential. Recycling pathways include pyrometallurgical smelting, hydrometallurgical leaching, and direct recycling, which preserves cathode materials with minimal reprocessing. Each method balances cost, energy demand, and recovery efficiency differently, and some companies have even created closed-loop recycling systems to reclaim critical minerals for reuse in new cells.

Second-life applications further enhance sustainability, e.g. retired EV batteries to serve additional years in stationary energy storage or backup systems. Secondary use reduces pressure on recycling infrastructure and defers costs, while stabilising renewable-heavy power grids. It also fits into a broader circular economy framework that encourages design for disassembly, modular manufacturing, and product leasing schemes.

In Africa, awareness is growing but infrastructure is limited. Still, the continent holds immense potential to develop local recycling and upcycling industries to create green jobs and reduce dependency on imported materials. Integrating EPR principles into national renewable energy policies would help.

Recycling is expensive, and many countries lack consistent policy frameworks. Mixed material compositions complicate processing, while data gaps make it difficult to track the flow of retired systems. Standardised reporting, material traceability using digital tools such as blockchain, and collaboration among manufacturers, recyclers, and governments are needed to scale sustainable EoL management. ESI

Yours in powering Africa, Nicolette

***Nicolette Pombo-van Zyl***
*ESI Africa Editor-in-Chief*

**In 2023, monocrystalline held 98% of global solar panel shipments.**

# TECHNOLOGY BEHIND THE CELL
# The trending market solar panel solutions and next-gen innovations

The technology behind solar panels is advancing rapidly, with panel efficiency climbing from around 10% in the past to well over 20% today. Now continuous innovation is fundamentally reshaping the industry, making solar photovoltaics (PV) progressively more powerful, affordable, and adaptable.

## CRYSTALLINE SILICON PANELS: THE MAINSTREAM CHOICE

The most common and traditional solar panels are made from crystalline silicon. This category includes two main types: monocrystalline and polycrystalline. While both have been industry staples, technological advances have created a clear winner for installations.

Monocrystalline panels are the most efficient type of solar panel currently available on the market. They are crafted from a single, pure silicon crystal, which gives them their sleek, black appearance. This high-purity silicon structure allows electrons to move more freely, resulting in higher energy conversion rates. Their superior performance and aesthetics have made them the dominant force in the industry, accounting for an incredible 98% of global solar panel shipments in 2023.

Polycrystalline panels represent an older generation of solar technology made by melting and combining multiple silicon crystals in a square mold, a process that results in their characteristic blue, speckled look. While this manufacturing method was less expensive, it created imperfections between the crystals that made the panels less efficient than their monocrystalline counterparts.

As technology improved and costs for monocrystalline panels dropped, polycrystalline panels became obsolete, vanishing from production lines and accounting for 0% of global production in 2023, according to the National Renewable Energy Laboratory.

## BIFACIAL PANELS: CAPTURING MORE LIGHT

The core concept of bifacial panels is simple yet powerful. They are designed to capture sunlight from both the front and the back of the module. This allows them to generate additional electricity from light that reflects off the ground or other surfaces, significantly increasing their total energy output. Additionally, bifacial modules perform strongly in diffuse light, maintaining effective power generation even under cloudy or low-light conditions.

However, these benefits come with certain drawbacks. They typically carry a higher initial cost than standard panels and require specialised mounting systems that prevent obstruction of the rear surface, adding to installation complexity. Moreover, because the backside is exposed, bifacial modules tend to accumulate more dust and dirt, necessitating more frequent cleaning to maintain optimal performance.

Because they rely on reflected light, bifacial panels are ideally suited for large-scale solar farms or installations over highly reflective surfaces like snow or light-coloured ground coverings, where their energy-boosting potential can be fully realised.

## THIN-FILM PANELS: FLEXIBILITY AND VERSATILITY

Thin-film solar panels are flexible sheets of solar material that are thousands of times thinner than standard crystalline panels. This incredible flexibility allows them to be bent, rolled, and wrapped around objects, opening a range of applications where rigid panels are impractical.

Currently, there are three cases for thin-film panels:

1. Portable and off-grid solutions: Their lightweight nature makes it easy to transport and deploy for emergency power or in remote locations.
2. Uneven surfaces: Can easily conform to the curved roofs of vehicles or the fabric of a tent.
3. Informal housing and mobile homes: Perfect for the less sturdy roofs or recreational vehicles (RVs), caravans, and houseboats.

However, this versatility comes with key trade-offs as the panels have a lower average efficiency (17-19%) and a significantly shorter typical lifespan (10-20 years) compared to monocrystalline panels.

## GLASS-GLASS: BENEFITS AND CHALLENGES OVER GLASS-FOIL

Glass-glass (or double-glass) modules have shown better resistance to higher temperatures, humidity and UV conditions and have better mechanical stability, reducing the risk of microcracks during installation and operation. These are particularly important in utility-scale PV sites and for the expected lifetime of modules.

Due to an increased reliability of the glass-glass module design, they are expected to only degrade 0.45% per year as opposed to the traditional polymer backsheet at 0.7%. The weight of these modules is an issue, with current designs using 2mm thick glass on each side for framed modules, the weight is about 22kg compared to traditional glass-foil modules, which are about 18kg.

## PEROVSKITE PANELS: GLIMPSE INTO THE FUTURE

At the forefront of solar innovation are perovskite solar panels, a groundbreaking technology that is not yet commercially available but promises to revolutionise the industry. This next-gen technology provides confidence in the long-term viability and rapid advancement of solar power.

The core concept is a "tandem" solar cell, which involves layering a thin, synthetic perovskite material on top of a traditional silicon cell. This hybrid design is incredibly effective because each layer captures a different part of the solar spectrum.

The perovskite layer absorbs high-energy light from the blue part of the spectrum, while the underlying silicon layer absorbs lower-energy light from the red part. By working together, they convert much more of the sun's total energy into electricity than either material could alone.

The promise of this technology is highlighted by recent record-breaking efficiencies, with manufacturers reporting a lab-tested perovskite-silicon cell attaining 34.6% efficiency and a full-sized panel that reached 30.6% efficiency. Despite this incredible potential, two challenges must be overcome before perovskite panels can become a mainstream product:

1. Long-term stability: Perovskite materials can degrade when exposed to moisture and heat, so researchers are working to make them more durable.
2. Scalability: Translating record-setting results from the lab into consistent, high-volume manufacturing is a complex engineering hurdle.

## SCIENCE FICTION? FUTURE SOLAR PANEL TECHNOLOGY AND DESIGNS

The idea of solar roof tiles that blend seamlessly into a roof is undeniably appealing, promising clean energy without compromising a home's aesthetic. The reality, however, is that this elegance comes with a trifecta of significant drawbacks. The process is typically 50% more expensive, results in a system that is 30% less efficient, and takes about three times longer to install than a standard monocrystalline solar panel system.

Another concept, fully transparent solar windows, based on replacing every window with a transparent solar panel, is compelling. Current research for a fully transparent solar cell has an efficiency of just 1%, making it completely unsuitable for generating meaningful power for a home or business complex.

These should not be confused with the semi-transparent panels used on some large commercial buildings. While those advanced systems are only 40-50% see-through, they can achieve around 20% efficiency. This serves as proof that the technology is not a complete failure, but a series of trade-offs between transparency and power generation that is still a very long way from being a commercially viable option.

In one of the more bizarre areas of solar research, scientists are developing what they call "zombie solar cells." The discovery came from a type of cell called a dye-sensitised solar cell, which traditionally uses a liquid electrolyte to gather and convert power. Researchers found that when they replaced the liquid electrolyte with a solid-state, dry version, the cell not only continued to function but worked better.

Remarkably, these "zombie cells" have reached an efficiency of 30-34% in lab settings; higher than any commercial panel currently on the market. Further development is underway on "smart zombie solar cells" that can even absorb and convert indoor light into electricity, opening entirely new possibilities for energy generation. ESI

# AFRICA'S SOLAR SURGE
## Record solar panel imports signal business opportunities

Africa's energy future is being rewritten, panel by panel. For more than two decades, solar power has been present across the continent in modest ways—lighting up rural classrooms, driving pay-as-you-go home systems, and powering pilot projects. But recent trade data reveals that something far bigger is now underway.

**The number of African countries importing substantial volumes (over 100MW) has grown significantly.**

According to energy think-tank Ember, solar panel imports into Africa hit an all-time high in the 12 months to June 2025, reaching 15,032MW. That represents a dramatic 60% increase from the 9,379MW imported in the previous year.

This surge is the clearest evidence yet of large-scale solar adoption sweeping across the continent and should not be viewed as merely a statistical once-off occurrence. The shift is broad-based, spanning nearly every country in Africa, and points to a structural trend that could redefine energy access, affordability, and even economic resilience. With global supply chains aligning and technology costs falling, Africa's solar leap is now a question of how much faster it will grow.

### EVIDENCE OF CONTINENTAL SOLAR TRANSFORMATION

Ember's data on Chinese solar panel exports has delivered the first hard evidence of a large-scale solar energy take-off across Africa. For years, solar has been part of Africa's energy story, but mostly at the margins including micro and small systems for households, schools, and community projects. Now, import volumes show a decisive shift toward mass adoption, marking what could be a transformative moment for national energy systems across the continent.

- **Unprecedented Market Growth:** Imports into Africa, outside of the established South African market, have nearly tripled in just the past two years.
- **Widespread Continental Adoption:** This growth is not an isolated phenomenon. Twenty African nations set new records for solar panel imports in the last year, and the number of countries importing substantial volumes (over 100MW) has grown significantly.
- **Substantial Impact on Electricity Supply:** The volume of panels imported in the last year alone is sufficient to dramatically increase national electricity generation. In several countries, the potential new capacity could generate electricity equivalent to over 15% of their entire reported 2023 output.
- **Positive Economic Implications:** The rapid adoption of solar power directly addresses economic vulnerabilities by reducing reliance on expensive imported fuels. In Nigeria, for example, a solar panel can pay for itself by displacing diesel costs in as little as six months.

### OVERALL MARKET EXPANSION

Tracking import volumes is a critical leading indicator of market development, providing the earliest quantifiable evidence of shifts in energy investment and deployment. The headline data confirms a massive increase in market activity.

While South Africa's energy crisis previously drove a surge in 2023, the current trend is far broader. The market dynamics beyond South Africa are particularly compelling. Imports to the rest of the continent rose from 3,734MW in June 2023 to 11,248MW to June 2025. This demonstrates a robust, continent-wide expansion that is not dependent on a single market.

The consistency of the import surge confirms its durability. The trend is not the result of a single-month spike. Although imports hit a record in December 2024, volumes have remained consistently elevated

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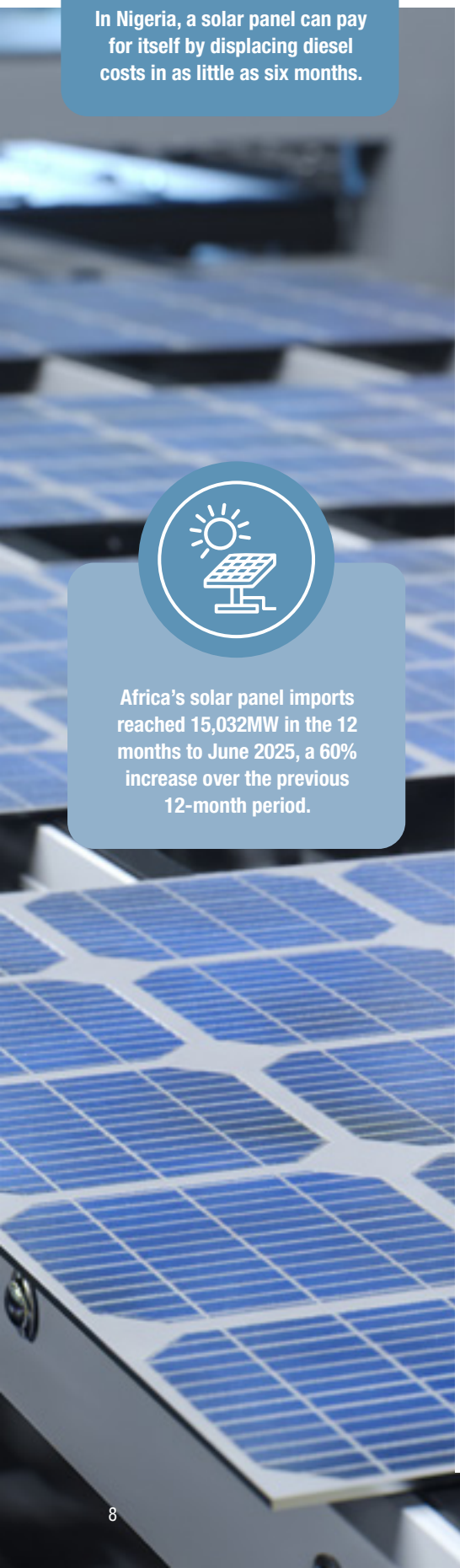


**In Nigeria, a solar panel can pay for itself by displacing diesel costs in as little as six months.**

**Africa's solar panel imports reached 15,032MW in the 12 months to June 2025, a 60% increase over the previous 12-month period.**

since. This sustained high level of activity indicates a structural market shift and sustained demand, rather than a temporary anomaly or a short-term reaction to logistical factors.

## SOURCE OF SUPPLY AND DOMESTIC CAPABILITIES

Africa's solar market is currently dependent on international manufacturing, reflecting global supply chain realities. China produced 80% of the world's solar panels in 2024, making it the primary source for the continent's imports.

Domestic manufacturing capacity in Africa remains limited, with established facilities in Morocco and South Africa (approximately 1GW each) and smaller production lines in countries like Egypt and Nigeria. However, this balance may begin to shift as several gigawatt-scale projects are planned in Egypt—including those by EliTe Solar, Sunrev Solar, and Masdar—which will significantly increase the continent's domestic production capabilities once they come online.

## IDENTIFYING WHERE THE KEY GROWTH HUBS ARE LOCATED

A granular, country-level analysis is critical for investors, policymakers, and industry stakeholders to identify specific opportunities and understand regional dynamics. While the continental trend is impressive, the growth is distributed unevenly, with established leaders and a new class of high-growth emerging markets.

In the 12 months to June 2025, the Ember report highlights three countries standing out as the largest importers of solar panels, forming the backbone of the continental market: South Africa, Nigeria (overtaking Egypt in the last 12 months), and Algeria rising to third place.

Beyond the top importers, the breadth of market expansion is a key indicator of a truly continental shift. In the last year, 20 countries set new national records for solar panel imports. Furthermore, the number of countries importing at least 100MW of panels grew from just 15 to 25 in only 12 months, signaling a deepening of the market across the continent.

Several nations have experienced truly exponential growth, emerging as new hubs for solar adoption, with Liberia, The Democratic Republic of the Congo (DRC), Benin, Angola and Ethiopia more than tripling their individual imports over 12 months to June 2025 versus the previous 12 months.

### Exceptional Year-on-Year Growth Rates

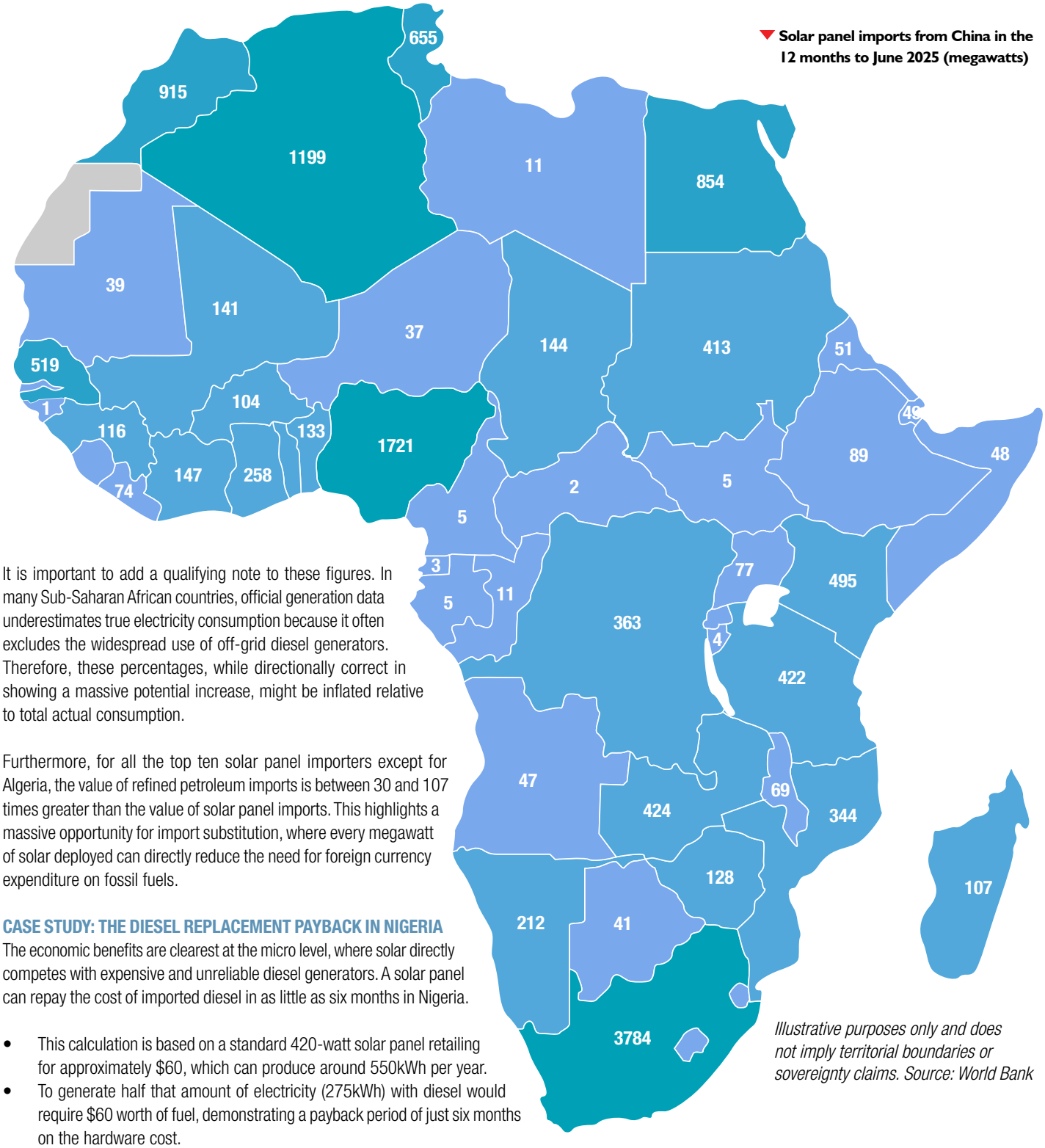
| Country | Import Growth |
|---|---|
| **Algeria** | 33-fold increase |
| **Zambia** | 8-fold increase |
| **Botswana** | 7-fold increase |
| **Sudan** | 6-fold increase |

## ENERGY GENERATION AND ECONOMIC IMPLICATIONS

The strategic value of solar imports extends far beyond the raw megawatt figures. The true impact lies in their potential to transform national energy supplies, enhance energy security, and reshape long-standing economic dependencies.

The sheer volume of recently imported panels is sufficient to significantly augment national electricity supplies, particularly in countries with smaller existing grids. When benchmarked against official 2023 electricity generation data, the potential impact is profound.

- **Sierra Leone:** Panels imported in the last 12 months could generate electricity equivalent to **61%** of the country's reported 2023 generation.
- **Chad:** The potential increase is equivalent to **49%** of 2023 generation.
- **Liberia:** The potential increase is equivalent to **25%** of 2023 generation.
- **Somalia:** The potential increase is equivalent to **15%** of 2023 generation.
- **Eritrea:** The potential increase is equivalent to **15%** of 2023 generation.




**Solar panel imports from China in the 12 months to June 2025 (megawatts)**

*Illustrative purposes only and does not imply territorial boundaries or sovereignty claims. Source: World Bank*

It is important to add a qualifying note to these figures. In many Sub-Saharan African countries, official generation data underestimates true electricity consumption because it often excludes the widespread use of off-grid diesel generators. Therefore, these percentages, while directionally correct in showing a massive potential increase, might be inflated relative to total actual consumption.

Furthermore, for all the top ten solar panel importers except for Algeria, the value of refined petroleum imports is between 30 and 107 times greater than the value of solar panel imports. This highlights a massive opportunity for import substitution, where every megawatt of solar deployed can directly reduce the need for foreign currency expenditure on fossil fuels.

### CASE STUDY: THE DIESEL REPLACEMENT PAYBACK IN NIGERIA

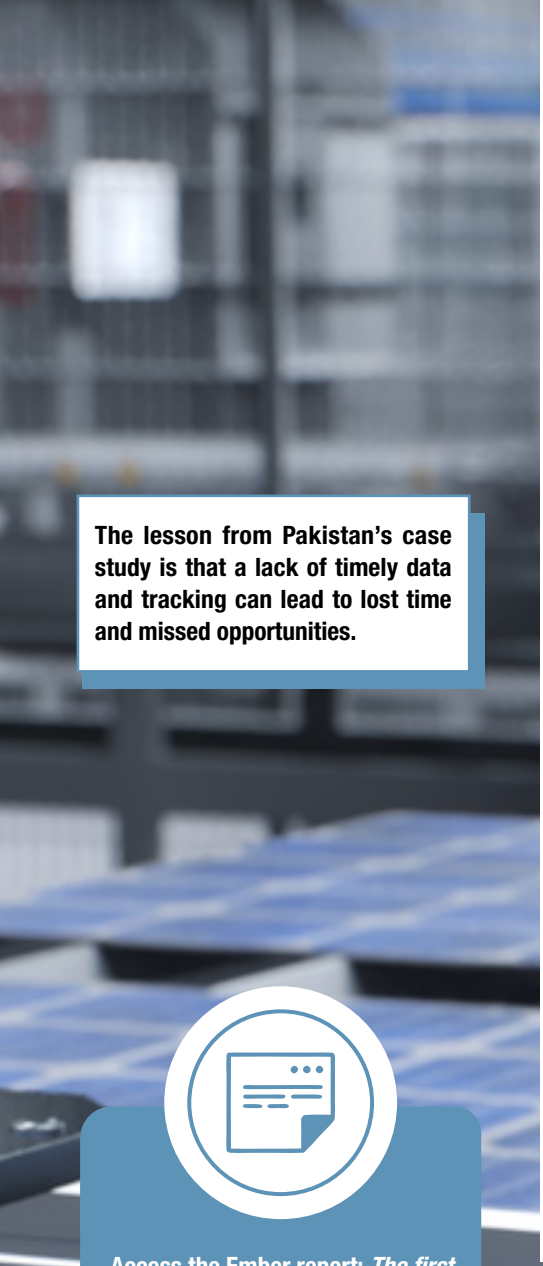
The economic benefits are clearest at the micro level, where solar directly competes with expensive and unreliable diesel generators. A solar panel can repay the cost of imported diesel in as little as six months in Nigeria.

- This calculation is based on a standard 420-watt solar panel retailing for approximately $60, which can produce around 550kWh per year.
- To generate half that amount of electricity (275kWh) with diesel would require $60 worth of fuel, demonstrating a payback period of just six months on the hardware cost.
- The payback period is even shorter in other African countries where diesel is more expensive than in Nigeria.

Beyond simple diesel replacement, the broader value proposition of solar power is its ability to enable sustainable economic growth through more reliable, cleaner, and cheaper access to electricity for homes, businesses and industry. It is important to note that this rapid payback calculation is based solely on the cost of the panel and does not include additional costs for inverters, mounting hardware, installation or maintenance.

### CASE STUDY: BENCHMARKING AGAINST PAKISTAN'S SOLAR BOOM

To fully appreciate the potential speed and scale of Africa's solar transition, it is useful to look at international benchmarks. Pakistan's recent, explosive solar boom offers a relevant case study for what is possible when market conditions align.



**The lesson from Pakistan's case study is that a lack of timely data and tracking can lead to lost time and missed opportunities.**

While Africa's growth is impressive, its absolute scale is still in its early stages. In the 12 months to June 2025, Pakistan imported more solar panels than the entire African continent, despite having approximately one-sixth of the population.

However, this comparison should be viewed not as a limitation but as a powerful indicator of the immense potential for growth. According to Ember, the key lesson from Pakistan is that "change happens quickly." Pakistan's own solar imports tripled in just 12 months, transforming its energy landscape with breathtaking speed. The data confirms that Africa's rise has now "started in earnest," and the current trend may be just the beginning of a similar trajectory.

## FUTURE GROWTH DRIVERS: DISTRIBUTED VS. UTILITY-SCALE SOLAR

Ember's initial analysis suggests that the current surge in Africa may be driven more by distributed solar (rooftop and off-grid systems) than by large, utility-scale projects. This aligns with the market dynamics observed in Pakistan and is fueled by a common set of powerful drivers present in many African nations:

- Frequent power outages from unreliable grids
- High grid electricity prices
- High, volatile diesel prices for backup generation
- Widespread access to cheap Chinese solar panels
- Abundant, year-round sunshine

These factors create a compelling value proposition for consumers and businesses to invest in their own power generation, driving a bottom-up energy transition. The difficulty in tracking this rapid, decentralised growth underscores the need for better market intelligence.

The latest import data provides significant, undeniable evidence of a recent and sizable step-up in solar adoption across most of Africa. The scale of this expansion has the potential to significantly expand national electricity systems, reduce economic dependencies, and accelerate development.

The core lesson from Pakistan's recent experience is that a lack of timely data and tracking can lead to lost time and missed opportunities. Without robust market intelligence, it is difficult to facilitate an equitable, planned, and inclusive energy transition that maximises benefits for all citizens and prepares the grid for a new energy reality. ESI

**Access the Ember report: *The first evidence of a take-off in solar in Africa***

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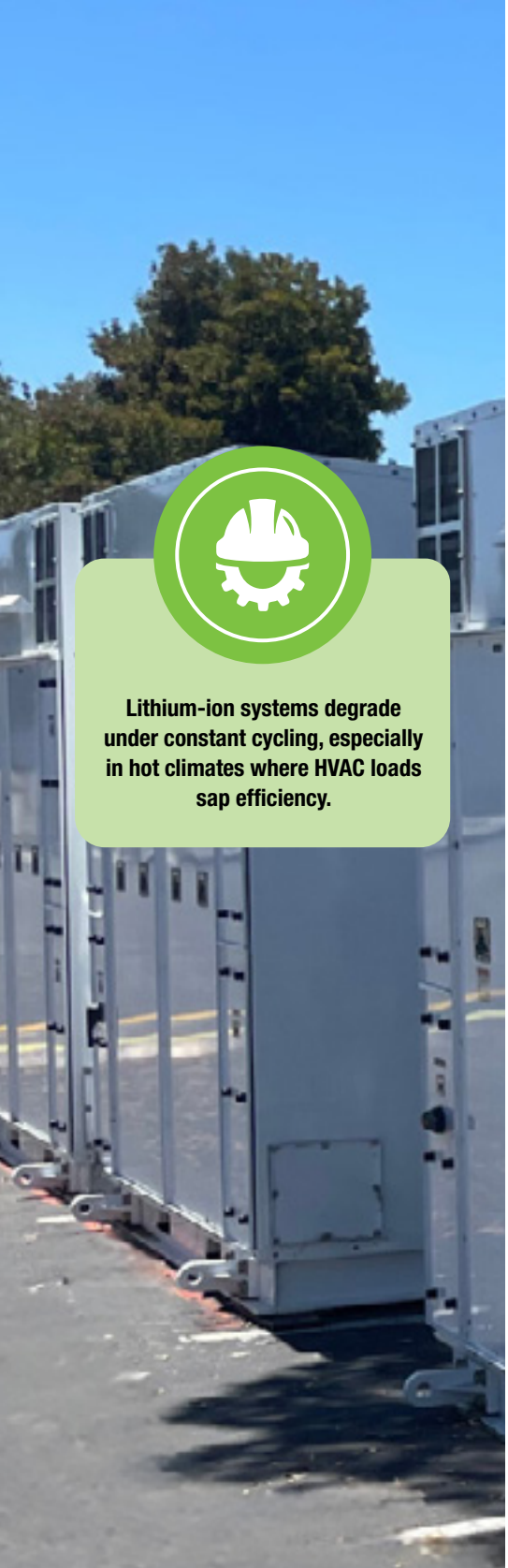
# ENERGY STORAGE FOR AFRICA
## Adapting energy storage to real project needs

Across Sub-Saharan Africa, new solar and wind installations are coming online in villages, towns, and industrial corridors once reliant on diesel and long transmission lines. But the way we think about energy storage *in the context of specific projects* still isn't evolving fast enough, writes ***PETER GONEOS***, operations manager at ***X Flo Energy***.



**Lithium-ion systems degrade under constant cycling, especially in hot climates where HVAC loads sap efficiency.**

Too often, lithium-ion batteries are treated as a one-size-fits-all solution. The global market has matured around them, and many procurement frameworks reflect that familiarity. Familiarity, though, shouldn't be confused with fitness. Part of the challenge here is momentum. Lithium-ion has benefited from decades of scale, supply chain investment, and policy alignment across regions where battery storage has been deployed in volume.

Those advantages are real, but they also create inertia. In procurement documents, grant applications, and design templates, lithium-ion still gets penciled in by default, even when the project realities really say otherwise. In many African environments (and especially remote microgrids, off-grid mining operations, and regions with limited access to maintenance resources) lithium-ion's default status is starting to work against energy reliability, safety, and long-term affordability.

We work across Zambia and neighbouring countries to deliver clean energy solutions tailored to local realities, and that work has taught us one critical lesson: when storage is essential, chemistry matters.

### WHY THE DEFAULT OPTION FALLS SHORT IN PRACTICE

Energy storage is, of course, foundational to every serious clean energy project in Sub-Saharan Africa. But the bigger question is not whether to store power, but how to store it in ways that withstand extreme conditions, simplify logistics, and deliver long-term value across particularly diverse environments.

Lithium-ion systems degrade under constant cycling, especially in hot climates where Heating, Ventilation and Air-Conditioning (HVAC) loads sap efficiency. Their thermal runaway risks can pose serious safety challenges, particularly in locations without trained emergency services or sophisticated containment options. And, when these systems need augmentation or repair, delays can stretch from days to weeks (assuming the necessary parts or personnel are even available).

This isn't a critique of lithium-ion *where it fits*. It's a call to stop pushing it into roles it was never designed to play. Not every application requires the same storage solution, and not every environment can afford to accommodate lithium-ion's constraints.

### DIVERSIFYING CHEMISTRY FOR SAFETY, RELIABILITY AND SCALE

That's why we're seeing growing interest in alternative chemistries that align better with Africa's on-the-ground challenges. Vanadium redox flow batteries (VRFBs) like Vanevo out of Germany, for example, offer stable long-duration energy with reduced degradation and improved fire safety.

▲ EnerVenue 1000V battery storage enclosure

Consider a rural health clinic running on solar power. A battery system that can cycle daily without replacement for 20 years and operate safely without complex fire suppression infrastructure isn't just a technical preference, it's a public health necessity. The same is true for agricultural processing centres, water pumping stations, and border control facilities (all sites where safety, maintenance simplicity, and reliability are non-negotiable).

Similarly, metal-hydrogen batteries, such as those from US-based EnerVenue, are proving especially well-suited to high-temperature, remote, or high-cycle environments with minimal maintenance needs. With chemistry originally developed by NASA for space missions, this battery technology is now being deployed in harsh conditions on Earth where uptime and safety can't be compromised.

In both VRFB and metal-hydrogen battery cases, these systems support a more resilient energy backbone for the continent. They don't just store electrons, they reduce dependence on diesel, simplify logistics, and eliminate the safety tradeoffs that too often come with high-demand applications.

## AN OPPORTUNITY FOR AFRICA TO LEAD IN STORAGE DIVERSITY AND INNOVATION

Africa's energy future doesn't have to follow the same path as Europe or North America. In fact, it shouldn't. Our regions face different constraints, and that gives us the opportunity to build smarter, not just cheaper.

By prioritising the right storage technologies for the right applications, developers and governments can build more robust microgrids, reduce the total cost of ownership, and future-proof systems for the variability of both weather and demand. That includes long-duration storage for industrial loads, ultra-resilient systems for healthcare and emergency response, and solutions that minimise lifetime maintenance. Choosing the right storage solution isn't just a procurement decision, but a long-term commitment to uptime, safety, and equitable access.

## LET'S STOP ASSUMING AND START EVALUATING

The market momentum around lithium-ion has been powerful to the point where it has also led to blind spots. Africa has an opportunity to lead the world by showing how a diversified storage strategy can outperform legacy thinking. That includes a shift to stop assuming lithium-ion is always the answer. The market has matured to the point where it doesn't have to be.

Start evaluating based on what the application, and the environment, truly require. In one Southern African project that X Flo Energy consulted on, designers initially specified lithium-ion for a high-cycling, heat-intensive off-grid installation.

But once the full lifecycle costs and support constraints were modelled, the recommendation shifted to metal-hydrogen (not just for performance, but for simplicity and long-term resilience). This kind of shift is happening more often, and for good reasons. With our local knowledge, we're ready to help power that future. ESI

# BEYOND YOUR MOBILE PHONE
# 5 Ways the battery boom is quietly remaking the world

When we think of batteries, our minds typically go to the devices they power in our daily lives—our phones, laptops, tablets and remote controls. But beneath the surface, a revolution is unfolding, fundamentally rewriting the rules of the power system and placing batteries at the linchpin of the energy transition.

According to a landmark report from the International Energy Agency (IEA), *Batteries and Secure Energy Transitions*, this shift has been dramatic and swift. The energy sector, which includes electric vehicles (EVs) and power grid storage, now accounts for over 90% of annual demand for lithium-ion batteries.

This shift represents a monumental increase from 2016, when the energy sector accounted for only 50% of a market that was ten times smaller.

As IEA executive director Dr Fatih Birol states: "If electricity is the future, batteries will charge us towards it." However, given their critical role, are we moving fast enough to build the resilient, diversified, and sustainable battery ecosystem our future depends on?

This article clarifies five of the most impactful and counterintuitive takeaways from the IEA's analysis, revealing how the battery boom is fundamentally reshaping our world and the threats to this development.

**The price of lithium-ion batteries has fallen from over $1,400 per kilowatt-hour in 2010 to less than $140 in 2023.**

### 1. THE PRICE OF STORAGE DROPPED 90% CHANGING EVERYTHING

The single most important catalyst for the battery revolution is a staggering collapse in cost. Since 2010, the price of lithium-ion batteries has plummeted by an astonishing 90%, falling from over $1,400 per kilowatt-hour in 2010 to less than $140 in 2023.

The IEA identifies this as "one of the fastest cost declines of any energy technology ever." This isn't just an incremental improvement; it's a fundamental game-changer. The cost collapse is the primary enabler that made EVs and large-scale grid storage economically viable, transforming them from niche concepts into mainstream, competitive technologies.

### 2. BATTERIES ARE A "MASTER KEY" TO TRILLION-DOLLAR INDUSTRIES

The IEA uses a powerful analogy to capture the true economic significance of batteries: they are a "master key" that can unlock transformations in several much larger industrial sectors. This means that leadership in trillion-dollar markets now hinges on mastering battery technology. For example:

- Leadership in the $4 trillion global car market will now depend on a manufacturer's battery technology and supply chain.
- Batteries are essential to support the $6 trillion in investment required for wind and solar power by 2030, as they provide the grid stability needed to integrate these variable energy sources.

For the power grid, batteries provide critical services, including short-term flexibility (1-8 hours) to meet peak demand, fast-response frequency and voltage support for grid stability. They also provide backup power during outages for critical facilities, such as hospitals and communication networks, and aid off-grid solar photovoltaic (PV) systems during periods of low irradiance and after sunset.

Viewed differently, batteries are reframed from mere components into a foundational technology that underpins the competitiveness of entire sectors of the future economy.

**A total of 42GW of battery storage capacity was added globally in 2023.**

### 3. OVER HALF OF OUR 2030 CLIMATE GOALS HINGE ON BATTERIES

According to the IEA's Net Zero Emissions by 2025 Scenario (NZE Scenario), batteries are associated, either directly or indirectly, with about 60% of the $CO_2$ emissions reductions needed by 2030 to meet global climate goals. The impact breaks down in two critical ways:

Directly: Batteries in EVs and battery-enabled solar PV account for nearly 20% of the required emissions cuts.

Indirectly: Batteries facilitate an additional 40% of reductions by enabling the broader electrification of industries and buildings, as well as the widespread adoption of renewable energy sources.

The global commitments made at COP28 to triple renewable energy and transition away from fossil fuels are functionally impossible without a massive scale-up of energy storage. The IEA finds that this requires a sixfold increase in energy storage capacity by 2030—a target that will be met almost exclusively by batteries.

### 4. THE BIGGEST RISK TO CLEAN ENERGY ISN'T WHAT YOU THINK—IT'S A LACK OF BATTERIES

The IEA's analysis includes a Low Battery Case Scenario to explore the consequences of not scaling up battery storage fast enough. The findings are a stark warning that failing to deploy enough batteries would stall the clean energy transition and put the goal of limiting global warming to 1.5°C out of reach.

In particular, the uptake of solar PV would slow down, putting at risk nearly 500GW of solar PV capacity needed to meet the 2030 renewables target. This represents 20% of the gap between current policies and the NZE Scenario.

The failure to scale up battery storage would trigger a domino effect. Without sufficient storage, the grid cannot absorb large amounts of new solar power, resulting in a prolonged reliance on coal and natural gas. This would not only stall emissions reductions in the 2030s but also raise fuel import bills for countries by billions of dollars annually.

Fossil fuel import bills in importing countries would be an average of $12.5 billion higher per year from 2030 to 2050. Europe and Korea would be most exposed to higher natural gas imports, and India to higher coal imports.

### 5. THE ENTIRE GLOBAL SUPPLY CHAIN IS INCREDIBLY CONCENTRATED

Despite the global importance of batteries, their supply chain is highly concentrated, presenting significant risks to energy security and resilience. The IEA report highlights China's dominant position across multiple stages of production, including the country processing well over half of the world's lithium and cobalt.

China also accounts for 90% of global graphite mining and 98% of anode active material manufacturing, effectively controlling the entire supply chain for a critical battery component. More importantly, the country holds almost 85% of global battery cell production capacity.

Other countries of note include Australia, which holds roughly 45% of the lithium mineral extraction, Indonesia, which produces 55% of the nickel, and the Democratic Republic of the Congo, which has 65% of the global cobalt extraction market.

This concentration poses a major challenge for nations that are scaling up their own EV manufacturing and renewable energy ambitions. Building more resilient and diversified supply chains is now a critical priority for ensuring a secure energy future. ESI

**The energy sector now accounts for over 90% of annual lithium-ion battery demand.**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# From load shedding to load shifting: How battery storage is powering an energy breakthrough

Absa Business Banking has experienced a significant surge in solar finance over the past three years. A notable trend in this surge has been the mix of solutions shifting towards battery energy storage.

Interestingly, in 2022, over half of Absa Business Banking's solar funding was directed towards solar and battery systems. By 2025, this figure has climbed to over 80%, reflecting a strong shift in business investment priorities towards battery energy storage.

New solutions emerging in the renewable energy value chain include battery energy storage systems (BESSs), which can fully integrate with solar systems and generators. This integration allows businesses to easily switch between energy sources based on their immediate needs, helping to maintain uninterrupted operations. Consequently, implementing a BESS improves return on investment by enhancing energy management and operational efficiency.

**Why are BESS solutions now a driving force in solar financing?**

We see three main drivers of growth in the energy storage sector: business clients are actively investing in storage, government policy has become more supportive and financial institutions like Absa are backing the sector with a positive outlook and investment.

Below is a closer look at the trends and driving forces of energy storage evolution.

**1. Load shifting – BESSs behind solar energy investing**

"We've noticed more business clients integrating BESSs with their solar solutions," comments Rashveer Manilal, Head of Renewable Energy at Absa Business Banking. "This allows them to store excess solar energy during low electricity price periods (off-peak) and to use it when prices are high (peak). This practice, known as arbitrage or load shifting, helps to reduce grid reliance when costs are at their highest. "Another emerging trend we're observing is the rise of repeat clients seeking solar finance solutions – either to expand their existing solar installations or integrate BESS solutions into their grid-tied systems," adds Rashveer. "The surge in further financing is largely informed by the significant cost savings clients are already experiencing. Therefore, many are returning for finance to enhance those savings and further shield their businesses from the impact of Eskom's ongoing tariff increases.

Basically, a BESS helps businesses to protect their solar savings from peak-hour tariff changes, while enabling full use or export of excess energy, to reduce electricity bills and emissions.

On the other hand, our Corporate and Investment Banking (CIB) division is proud to be the financier of the Red Sands BESS project, located in Upington. Recognised as Africa's largest standalone BESS,

the project boasts an impressive capacity of 153MW/612MWh and was successfully awarded to Absa CIB by Minister of (123), Gwede Mantashe, in 2023 under Bid Window 1 of the Battery Energy Storage Independent Power Producer Procurement Programme (BESIPPPP).

This investment by CIB reflects Absa's ongoing commitment to financing innovative renewable energy solutions and aligns with its sustainable finance target of R100 billion, which has already been exceeded a full year ahead of schedule.

**2. Government energy policy and openness have helped to unlock investment and accelerate the growth of battery storage in South Africa**

South Africa's large-scale battery storage market accelerated after 2020, following the government's implementation of the Risk Mitigation IPP Procurement Programme. Industry players garnered behind the programme and there was strong private sector interest. The 2023 BESIPPPP attracted 8GW and R39 billion in investment, boosting confidence and uptake in the commercial and industrial energy sector.

The grid constraints highlighted by Eskom's assessment in 2023 reinforced the need for BESSs. Coupled with falling costs (which are projected to drop 40% by 2030), the global growth of energy generation has made a BESS a strategic, cash-generative asset for businesses.

**3. Business resilience, smart technology use and grid stability**

The latest solar PV systems also offer real-time performance monitoring via secure, user-friendly online portals, making it easy for non-energy businesses to stay informed and in control.

The energy needs of clients primarily focus on their operations, but the use of a BESS also addresses the growing concern of the "duck curve" in South Africa's national grid. According to Eskom, the duck curve occurs because energy demand on the Eskom grid is low during the day when solar energy production from businesses and households is at its peak. Whereas, there's a sharp increase in energy demand in the evening after sunset.

A BESS will be essential for balancing renewable energy sources and flattening the curve to maintain grid stability. With zero load shedding expected this summer, implementing solar-powered systems with a BESS is crucial for businesses looking to mitigate rising electricity costs.

Absa's deep sector expertise, positive outlook and close engagement with industry developments continue to support growth in the energy sector and to help clients navigate opportunities while staying aligned with market trends.

We get it. We're with you every step of the journey.

At Absa, we're proud to partner with our clients in delivering innovative and ground-breaking renewable energy projects. Our tailored financing solutions span the full spectrum – from supporting households with solar systems for their homes to empowering small, medium and macro enterprises (SMMEs) with energy backup solutions and enabling large-scale infrastructure, such as the BESS project in Upington. This approach reflects our commitment to inclusive energy access, resilience and sustainability across all sectors of the economy.

It's essential to remain engaged with key industry platforms such as the Solar and Storage Conference 2025, taking place in Cape Town from 15 to 16 October 2025. This event convenes industry leaders who share thought leadership and insights, while international original equipment manufacturers, local manufacturers and engineering procurement construction contractors/installers showcase cutting-edge renewable energy technologies and a wide range of engineering services.

Staying close to such platforms ensures continued awareness of market trends, regulatory developments and technological innovations. This, in turn, ensures that Absa remains at the forefront of empowering Africa's tomorrow, together … one story at a time.

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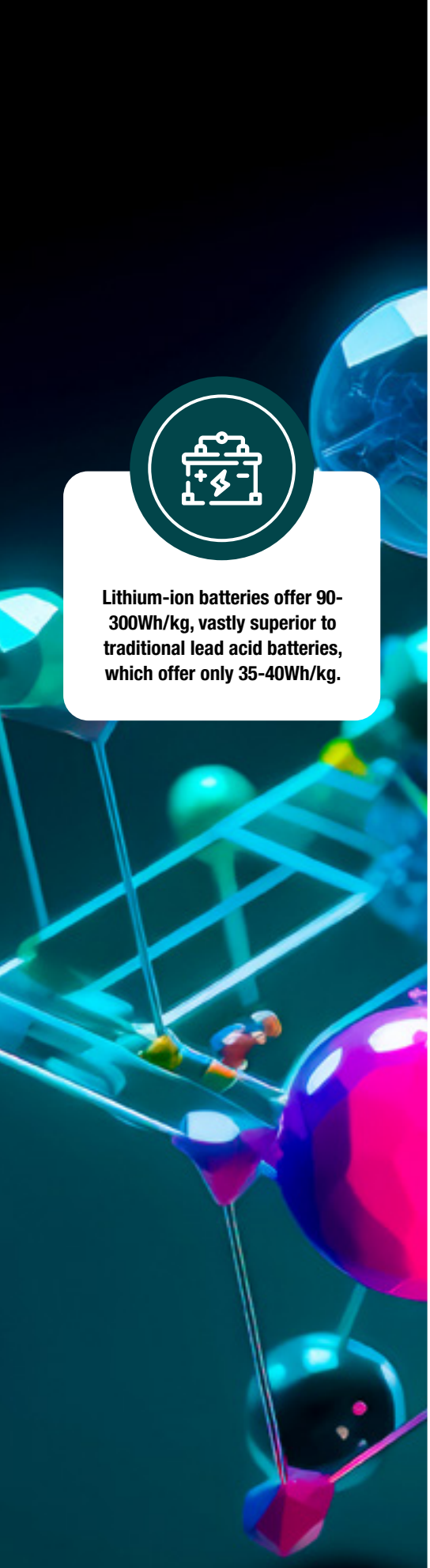


**Lithium-ion batteries offer 90-300Wh/kg, vastly superior to traditional lead acid batteries, which offer only 35-40Wh/kg.**

# A PRIMER ON MODERN BATTERY TECHNOLOGY

## The chemical cocktail powering your EV and energy storage

Batteries are the beating heart of our technology-led societies. They serve as the essential power source for everything from our laptops to electric vehicles (EVs) and the stability of our power grids, but not every battery is right for the intended purpose.

Electrochemical energy storage systems encompass a broad spectrum of battery chemistries, each defined by their electrode materials, electrolyte composition, and ion transport mechanisms. Lithium-ion remains the most commercially dominant, offering high gravimetric energy density (150–250 Watt-hours per kilogram) and efficiency above 90%, while solid-state variants promise enhanced safety and greater volumetric capacity.

Flow batteries, leveraging redox-active liquids, provide scalability and extended cycle life for stationary storage, whereas emerging technologies such as sodium-ion and lithium–sulphur are advancing to address cost constraints and raw material availability. Comparing these systems requires close examination of parameters such as cycle stability, C-rate capability, temperature tolerance, and lifecycle costs.

### THE ANATOMY OF A LITHIUM-ION BATTERY

Every lithium-ion battery cell, regardless of its specific chemistry, is built from four essential components:

1. Cathode: The positive electrode that releases lithium ions during discharge and stores them during charging.
2. Anode: The negative electrode that stores lithium ions during charging and releases them during discharge.
3. Electrolyte: A medium that facilitates the movement of lithium ions between the anode and cathode.
4. Separator: A physical barrier that prevents the cathode and anode from touching and causing a short circuit.

### WHY LITHIUM-ION REIGNS SUPREME

Lithium-ion technology has decisively outclassed older alternatives like lead acid batteries for two primary reasons that have transformed modern technology: cost reduction and energy density.

Since 2010, the cost of lithium-ion batteries has plummeted by an astonishing 90%. This dramatic price decline has been one of the fastest for any energy technology in history, making previously niche technologies like EVs and large-scale grid storage economically viable and competitive.

Superior energy density is a measure of how much energy a battery can store for its weight. Lithium-ion batteries excel here, with specific energies at the cell level ranging from 90-300Wh/kg. This is vastly superior to traditional lead acid batteries, which offer only 35-40Wh/kg. This advantage allows lithium-ion batteries to be made much lighter and more compact, a critical factor for portable electronics and vehicles.

However, lithium-ion is not a single technology. It is a diverse family of different chemical recipes, or chemistries, each engineered with unique strengths for specific jobs.

### THE LITHIUM-ION FAMILY: A TALE OF TWO CHEMISTRIES

Battery design involves a fundamental trade-off. Batteries for EVs must be energy-dense, small, and light to maximise driving range. In contrast, batteries for stationary power storage, which don't have strict size or weight requirements, prioritise different characteristics: low costs, enhanced safety, and long-term durability.

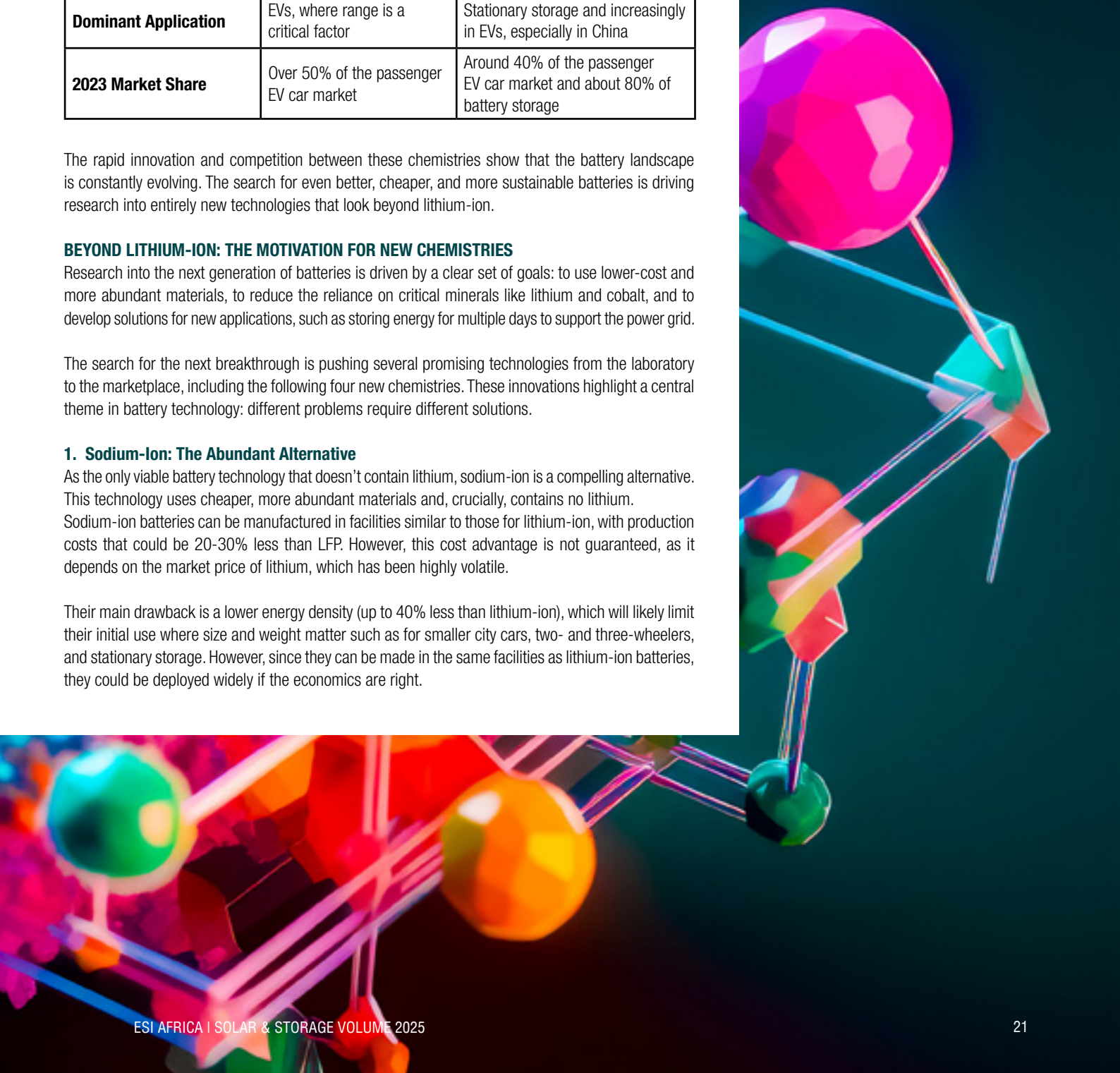
Two dominant chemistries have emerged to meet these different needs: high-nickel chemistries like NMC (Nickel Manganese Cobalt) and LFP (Lithium Iron Phosphate). LFP's recent surge in popularity is driven not just by its lower cost and longer lifespan, but also by engineering innovations like cell-to-pack (CTP) designs that have narrowed the energy density gap, making it a viable competitor for applications previously dominated by high-nickel chemistries.

### Summary of the key differences

| Characteristic | High-Nickel (NMC/NCA) | Lithium Iron Phosphate (LFP) |
|---|---|---|
| **Key Ingredients** | Nickel and cobalt | Does not contain nickel or cobalt |
| **Primary Strength** | Higher energy density | Lower cost (falling below $100/kWh in 2023), longer lifespan, and higher thermal stability (safer) |
| **Key Weakness** | Higher cost and shorter cycle life compared to LFP | Conventionally 20-30% lower energy density |
| **Dominant Application** | EVs, where range is a critical factor | Stationary storage and increasingly in EVs, especially in China |
| **2023 Market Share** | Over 50% of the passenger EV car market | Around 40% of the passenger EV car market and about 80% of battery storage |

The rapid innovation and competition between these chemistries show that the battery landscape is constantly evolving. The search for even better, cheaper, and more sustainable batteries is driving research into entirely new technologies that look beyond lithium-ion.

**Innovations like cell-to-pack (CTP) designs have narrowed the energy density gap.**



## BEYOND LITHIUM-ION: THE MOTIVATION FOR NEW CHEMISTRIES

Research into the next generation of batteries is driven by a clear set of goals: to use lower-cost and more abundant materials, to reduce the reliance on critical minerals like lithium and cobalt, and to develop solutions for new applications, such as storing energy for multiple days to support the power grid.

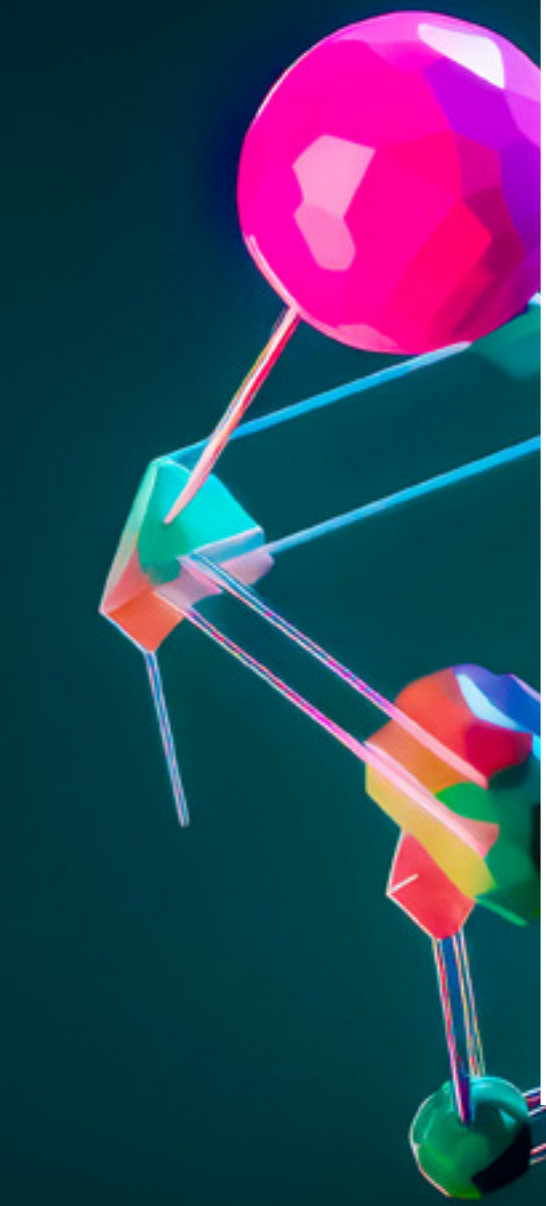
The search for the next breakthrough is pushing several promising technologies from the laboratory to the marketplace, including the following four new chemistries. These innovations highlight a central theme in battery technology: different problems require different solutions.

### 1. Sodium-Ion: The Abundant Alternative

As the only viable battery technology that doesn't contain lithium, sodium-ion is a compelling alternative. This technology uses cheaper, more abundant materials and, crucially, contains no lithium.
Sodium-ion batteries can be manufactured in facilities similar to those for lithium-ion, with production costs that could be 20-30% less than LFP. However, this cost advantage is not guaranteed, as it depends on the market price of lithium, which has been highly volatile.

Their main drawback is a lower energy density (up to 40% less than lithium-ion), which will likely limit their initial use where size and weight matter such as for smaller city cars, two- and three-wheelers, and stationary storage. However, since they can be made in the same facilities as lithium-ion batteries, they could be deployed widely if the economics are right.

**Electric vehicles account for over 90% of battery use in the energy sector.**



### 2. Solid-State: The Performance Pioneer

Considered by many to be the next frontier, solid-state batteries replace the liquid electrolyte with a solid material. This could lead to massive performance gains, including higher energy density and improved safety. While manufacturing hurdles mean they are unlikely to have a major market impact before the 2030s, they could be a game-changer for long-range transport in the future.

### 3. Redox Flow: The Long-Duration Specialist

Redox flow batteries use a completely different design, storing energy in two large tanks of liquid electrolyte. This allows their energy storage capacity (the size of the tanks) to be scaled up independently of their power output (the size of the cell), making them uniquely suited for long-duration storage. This design is most suitable for stationary grid storage systems. The most mature chemistry, which uses vanadium, faces challenges in scaling up its supply chain to meet future demand.

### 4. Iron Air: The Ultra-Long Duration Hopeful

Iron-air batteries offer the potential for very long-duration storage by using extremely abundant and low-cost materials: iron, air, and water. This makes them a hopeful candidate for multi-day or even weekly grid storage. This technology is still in its infancy and faces significant development challenges before it can be commercialised at scale.

## THE RIGHT BATTERY FOR THE RIGHT JOB

EVs: This is the largest market, accounting for over 90% of battery use in the energy sector. Batteries are the critical component enabling the shift away from fossil fuels in transport. From passenger cars to city buses and freight trucks, electrification is accelerating, powered almost exclusively by lithium-ion technologies.

Grid-Scale Power Storage: In the power sector, battery storage was the fastest-growing energy technology in 2023. Large, utility-scale batteries (often LFP) are essential for grid stability. They provide “energy shifting”—storing excess solar power during the day and releasing it during evening peak demand—and offer split-second responses for frequency regulation to keep the grid balanced.

Behind-the-Meter Storage: These are smaller systems installed in homes and businesses, often paired with rooftop solar panels. They help consumers save money on electricity bills, provide backup power during outages, and can be grouped into “virtual power plants” to offer services back to the grid.

Energy Access: In many developing economies, batteries are crucial for providing reliable electricity through off-grid solutions. Solar home systems and mini-grids, powered by solar panels and batteries (increasingly LFP), are connecting hundreds of millions of people to electricity for the first time.

## THE BATTERY MARKET REQUIRES DEEP INVESTMENT INTO R&D

The technical differentiation between battery technologies underscores the reality that no single chemistry can optimise all performance metrics simultaneously. Lithium-ion remains the benchmark for portable and automotive applications, but its resource intensity and thermal management demands limit universal deployment.

By contrast, flow and metal-air systems show strong potential for grid-scale, long-duration applications where energy-to-power ratios are more critical than energy density.

Ongoing research and development into electrode architecture, electrolyte formulations, and manufacturing scalability will determine which chemistries move from laboratory promise to industrial adoption. Collectively, these advancements signal a maturing sector where tailored battery solutions can be matched to distinct operational and economic requirements across the energy landscape. ESI

# BATTERY RULES OF ENGAGEMENT
## Bold policies are the real fuel behind the battery market's revolution

The global energy transition is accelerating, with electric vehicles (EVs) and battery storage emerging as pivotal technologies. Yet their full potential remains constrained by gaps in policy and regulation. From ensuring affordability for consumers to reforming outdated electricity markets and building resilient supply chains, governments have a central role to play in enabling widespread adoption.

EV sales are on the rise in China, Europe (particularly Germany, Norway and France) and the US, which drives demand for battery technology. In 2023, 10% of all new car sales in the US were electric, the EU tracking with 20% and China booming with 40%. Elsewhere, they remain out of reach for most consumers. Closing this gap depends on enabling policies.

Cost is the biggest barrier. Unlocking the market, China has shown how targeted incentives and tax breaks for smaller, cheaper models can bring EVs within reach of ordinary buyers. Shifting support away from broad subsidies towards compact, resource-efficient vehicles both widens access and eases pressure on mineral supplies.

Charging infrastructure is another weak spot. Range anxiety is a persistent barrier, especially in countries where charging stations are sparse. Public investment in charging networks, alongside policies that incentivise private developers, is crucial. Without a visible and reliable charging backbone, consumers are unlikely to switch from internal combustion engines, particularly in rural areas where grid strength is often weakest.

Clear long-term signals are just as important. Ambitious fuel economy standards, emissions targets, and phase-out dates for petrol and diesel vehicles send a strong message to manufacturers. Certainty around regulatory timelines encourage automakers to invest in new EV models, localised production facilities, and supply chains.

### REFORMING ELECTRICITY MARKETS FOR STORAGE

Battery storage was the fastest-growing energy technology in 2023, but market rules have not kept pace. Designed for fossil fuel plants, many regulations fail to recognise the unique capabilities of batteries. Electricity network policymakers must open markets so storage can compete fairly. Batteries can stabilise frequency, relieve congestion, and provide capacity more quickly than conventional assets. However, too often they are blocked from participating by outdated grid regulations.

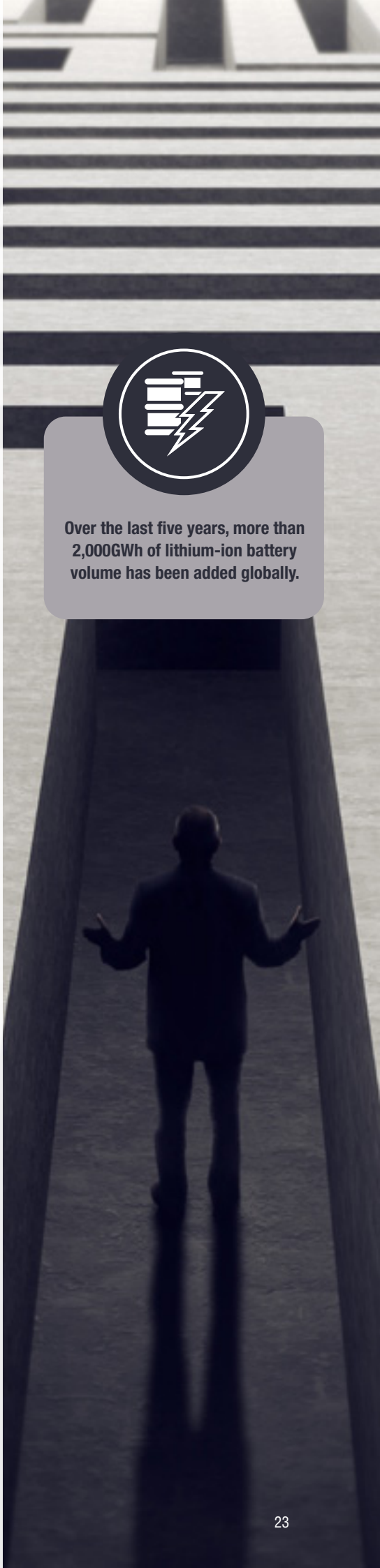
Equally, regulators must value all the services batteries provide. Creating mechanisms for "value stacking"—compensation across multiple roles—can transform project economics and accelerate deployment. A simpler fix lies in tariff reform. In some nations, batteries are unfairly charged fees both when drawing and supplying power. Removing this "double charging" would level the playing field overnight.

### BUILDING RESILIENT SUPPLY CHAINS

Recycling will also be critical. Today's batteries are tomorrow's mineral supply. Policies that set minimum recycled content, require digital passports for traceability, and enforce producer responsibility can turn waste into a strategic resource. A strong recycling framework creates a circular economy, reduces environmental impact, and secures access to lithium, cobalt, and nickel.

Batteries are not just another piece of the clean-energy puzzle. They are the backbone of electrification from powering electric transport and stabilising renewable grids, to cutting emissions. But technology alone won't deliver.

Unlocking their potential depends on policies that make EVs affordable, give storage fair access to electricity markets, and build secure, sustainable supply chains. With the right framework in place, batteries can truly power a cleaner, more resilient future. ESI



**Over the last five years, more than 2,000GWh of lithium-ion battery volume has been added globally.**

# KEETMANSHOOP PROFILE
# Namibia's solar and hydrogen frontrunner

Keetmanshoop, in the //Karas Region of southern Namibia, is poised to play a significant role in the country's shift toward renewable energy. With abundant sunshine, relatively flat terrain, and growing demand for reliable power and infrastructure, the town is becoming a focal point for solar power and green hydrogen investments, as well as electricity grid upgrades and related infrastructure development.

**Keetmanshoop is open for business and looking to foster smart partnerships in terms of industrial development.**

Already, licensed projects such as the 60MWp merchant solar plant near Keetmanshoop—developed by Solarcentury Africa in collaboration with SolNam Energy—are advancing with procurement, environmental clearances, and a planned connection to the Kokerboom substation. At the same time, local municipal works are underway, with Keetmanshoop securing a N$11.9 million (US $690,200) loan from the Development Bank of Namibia to upgrade its electricity network.

Visiting the *ESI Africa* studio, Mayor Annelise Knaus underlined the opportunity: "We have about 30,000 hectares of farmland in Keetmanshoop, and we have already availed some of the land for solar projects." This scale of available land, coupled with Namibia's national push for renewables, places the town at the centre of an emerging green corridor.

## INFRASTRUCTURE GAPS AND OPPORTUNITIES IN KEETMANSHOOP

While Keetmanshoop has made tangible strides in infrastructure upgrades and electrification, challenges remain. Bulk power availability, grid stability, and high-quality supply remain issues, particularly as demand increases and new solar capacity comes online.

The municipal focus on smart meters and power quality measures reflects an awareness that infrastructure must keep pace with shifts in energy generation. According to Knaus: "We are strategically located to have investors for solar energy and power plants develop here."

Chairperson of the Municipal Management Committee, Easter Isaak, echoes the importance of grid access: "The substation the mayor is talking about is just 500 metres away, and the areas of land are within the preference for substations. This proximity makes integration with the NamPower backbone more efficient and reduces transmission losses."

New urban electrification projects, including the installation of prepaid meters and LED lighting, are complementing such opportunities. Isaak stresses the broader goal: "We are always open for business, and we want to foster smart partnerships in terms of industrial development."

## NAMIBIA'S GREEN HYDROGEN STRATEGY

Namibia has committed, in its national Green Hydrogen Strategy, to becoming a major producer and exporter of green hydrogen by mid-century. Targets include producing 10–15 million tonnes of hydrogen equivalent per annum by 2050. Several "hydrogen valleys" are envisioned across the country, with southern Namibia—where Keetmanshoop is located—at the forefront.

The Hyphen Hydrogen Energy project near Lüderitz is the flagship coastal development, while the Dâures Green Hydrogen Village in Erongo showcases an inland proof-of-concept. These projects highlight the scale of ambition, and Namibia estimates that around 750TWh of renewable power will be required by 2050 to achieve its hydrogen goals.

For Knaus, the potential links between solar energy and hydrogen are vital: "Beyond green hydrogen, we want to bring industries to our town that will deliver on employment creation." Her words reflect Keetmanshoop's dual role—both a contributor to Namibia's energy generation and as a beneficiary of downstream industrial development.

Isaak reinforces this vision: "Besides energy, we are strategically located on the corridor that connects Namibia east, west, south and north. The supply chain industry holds real opportunities."

## HOW KEETMANSHOOP FITS INTO NAMIBIA'S RENEWABLE AND $H_2$ VISION

Though most hydrogen project development is on the coast, Keetmanshoop is geographically positioned to feed solar power into national grids or support hydrogen hubs through logistics and supply chain functions. The merchant solar plant near the town is evidence that energy generation beyond the coast is gaining traction.

Electrification and grid upgrades in Keetmanshoop enable better meeting of local demand while laying the foundation for export-oriented hydrogen ventures. "Our sights are on more than just solar and hydrogen," says Isaak. "We want to build industries, attract smart investment, and unlock our full economic potential."

Investments in road equipment, water supply, and service delivery also create a more favourable environment for industrial and energy projects. Knaus notes the broader development focus: "Our priorities at the moment are to attract industries that will create jobs and build on the opportunities energy provides."

These improvements may seem incremental, but they position Keetmanshoop as a valuable inland partner to Namibia's national hydrogen ambitions, ensuring the benefits of renewable energy reach communities far from the coast.

## CHALLENGES FOR KEETMANSHOOP AND THE PATH AHEAD

Despite strong solar potential and infrastructure upgrades, Keetmanshoop faces significant challenges. Large-scale hydrogen requires not only vast renewable energy capacity but also a secure water supply, which is difficult in Namibia's arid environment. Electrolysis is water-intensive, and while desalination projects are planned for the coast, inland hubs must find cost-effective solutions.

Grid stability is another challenge. The north–south transmission backbone enables integration with the Southern African Power Pool; however, Namibia will require additional reinforcements. Financing and regulatory clarity are also crucial as investors must navigate environmental assessments, community interests, and long-term off-take agreements.

Isaak sums up the town's approach: "Clean energy needs huge amounts of power, and this makes us the ideal partner in the green hydrogen sector." The emphasis is on leveraging Keetmanshoop's sunshine and strategic position, while ensuring communities gain from employment, services, and long-term growth."

Having already engaged with parties in the green hydrogen sector and met with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) Environmental Investment Fund, which noted the town's suitability, Knaus adds a note of determination: "We want Keetmanshoop to be seen as the most suitable town for green energy." With abundant solar resources, strategic location, and a commitment to partnerships, the town is carving out its role in Namibia's renewable energy transformation.

If Namibia meets its hydrogen production goals of 1–2 million tonnes annually by 2030, scaling to 10–15 million tonnes per year by 2050, Keetmanshoop will become a significant player in solar power generation, as well as a hub for logistics and infrastructure. ESI

**Watch the interview with Mayor Knaus and Chairperson Isaak on the *ESI Africa* YouTube channel.**

**Keetmanshoop, a strategic hub for road and rail traffic, lies approximately 500km south of Windhoek and at the western outskirts of the Kalahari Basin. By investing in solar and hydrogen projects, the town is driving down energy costs while building a cleaner resilient future for its community and setting an example for cities across Africa.**
**Visit:** www.khpmun.com

# SOLAR POWER SURGING ACROSS THE DESERTS

## How STEPS and APS are powering the MENA region's fossil fuel shift

As electricity demand is projected to rise by another 50% by 2035, the way the Middle East and North Africa (MENA) region generates its power is changing dramatically, with solar energy at the forefront of this transformation, and driven by the Stated Policies Scenario (STEPS) and Announced Pledges Scenario (APS).

**Solar PV eases grid pressures as MENA's rising midday temperatures drive cooling demand.**

The MENA region has long stood at the heart of the global energy landscape, underpinning international markets with its vast fossil fuel resources. For decades, its oil and gas exports have shaped economic and geopolitical dynamics far beyond its borders. In 2024 alone, the region supplied more than 30% of the world's oil and nearly 20% of its natural gas, cementing its role as a critical energy hub.

Collectively, MENA countries produce around one-third of global oil output and one-fifth of natural gas, while accounting for half of all oil traded internationally and 15% of traded gas. However, this enduring dominance, which underscores the region's pivotal influence in fuelling economies and stabilising global energy supply chains, is set to change, as the region harnesses its phenomenal natural potential to scale up solar power.

### WHAT'S DRIVING THE SOLAR SURGE IN MENA?

Outlined in the International Energy Agency's report *The Future of Electricity in the Middle East and North Africa*, the MENA region has an unparalleled natural advantage being strategically situated in the Sunbelt, benefiting from some of the highest levels of solar irradiation globally. The vast theoretical potential for solar photovoltaic (PV) generation is estimated to be up to 65,000TWh per year, far exceeding the region's projected electricity demand.

Countries like Algeria (14,446TWh/year potential), Saudi Arabia (12,132TWh/year potential), and Libya (10,477TWh/year potential) possess immense solar resources coupled with large tracts of available land.

For MENA's oil and gas producer economies, deploying solar PV is a critical strategic effort to free up valuable hydrocarbons for higher value uses or export. By diversifying the power mix, these nations strengthen their fiscal stability and reduce vulnerability to global oil price volatility.

Net energy importers within the region (such as Egypt, Jordan, and Morocco) view renewables as essential for boosting energy security, lowering dependence on imported fuels, and mitigating exposure to volatile global energy prices. Historically, renewables deployment was led by these import-dependent countries, but since 2020, self-sufficient countries like Saudi Arabia and Oman have driven over 50% of new capacity additions, largely to curb domestic fuel consumption and increase exports.

Cost competitiveness is another motivating factor. Falling technology costs globally have made clean electricity technologies, particularly utility-scale solar PV, increasingly attractive. Competitive auctions—the most widespread policy tool for renewable deployment in MENA—have delivered some of the lowest awarded bid prices worldwide.

Projects have been awarded at prices below $20/MWh in countries including Qatar, Saudi Arabia, and the UAE, reflecting competition, economies of scale, and favourable local conditions like low labour costs and advantageous financing.

The integration of solar PV is uniquely beneficial in MENA because its peak output often coincides with the midday peak in electricity demand driven by space cooling. Cooling already accounts for nearly half of peak electricity demand, and average temperatures are rising at more than twice the global rate. Leveraging solar PV during the hottest hours helps ease pressure on thermal plants and enhances overall system resilience.

Furthermore, there is growing policy momentum across the region to diversify the electricity mix. Morocco, Oman, and Saudi Arabia have set ambitious targets, aiming for 52% (Morocco by 2030), 60% (Oman by 2034), and 50% (Saudi Arabia by 2030) renewables penetration in their electricity mix or capacity. While five MENA countries (Jordan, Oman, Tunisia, the United Arab Emirates, and Yemen) endorsed the COP28 pledge to triple global renewable capacity by 2030.

**Morocco leads North Africa's transition, with its renewable share target of 52% of installed electricity capacity by 2030.**

**MENA's solar PV capacity has already surged, rising from 3GW in 2018 to 18GW in 2023.**

### THE FORECAST: EXPONENTIAL GROWTH THROUGH STEPS AND APS

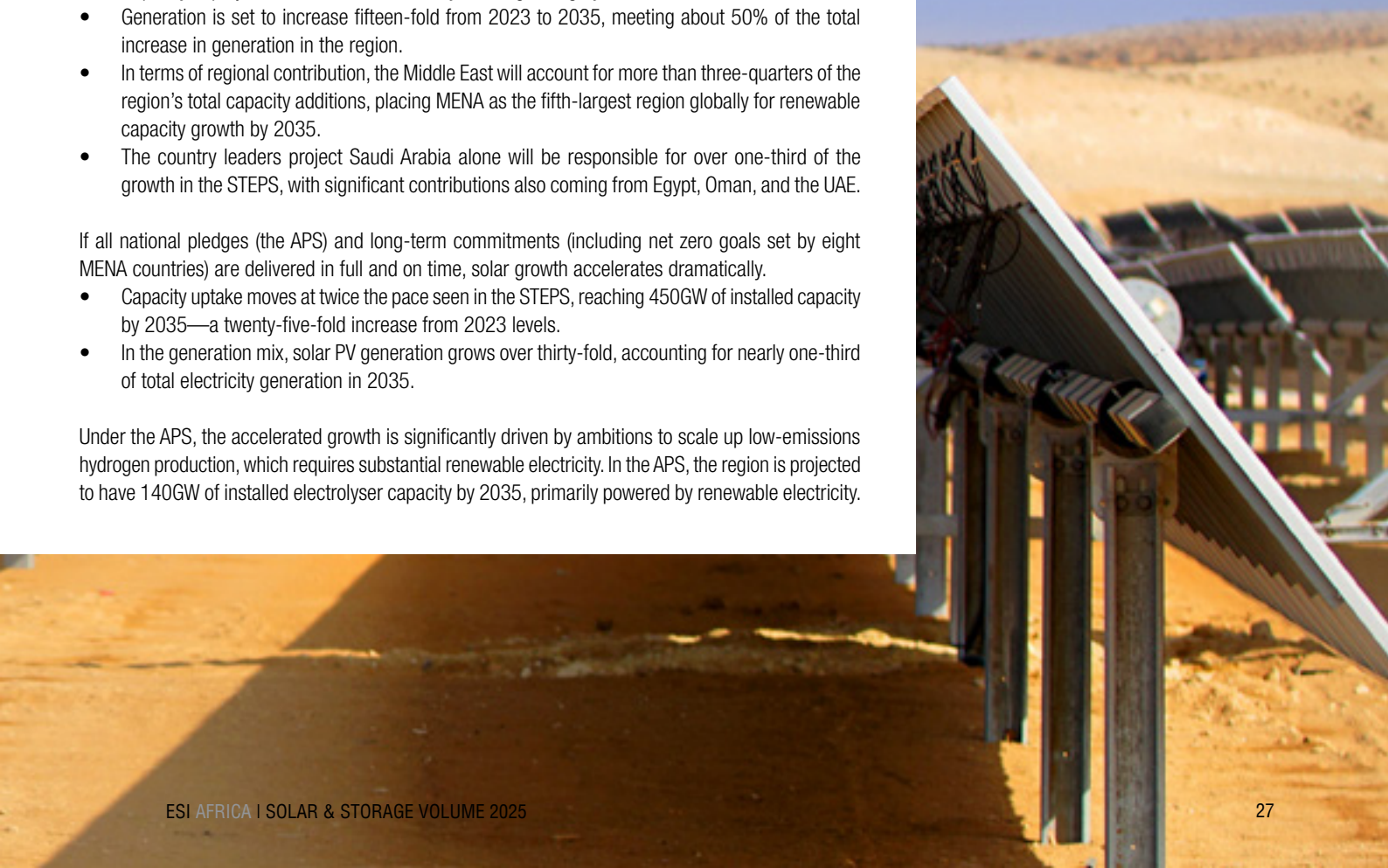
Solar PV capacity has already surged, rising from 3GW in 2018 to 18GW in 2023. Based on current policy settings (the STEPS), solar PV capacity is set to lead the massive growth in low-emissions sources.

- Capacity is projected to increase tenfold by 2035, growing by 200GW.
- Generation is set to increase fifteen-fold from 2023 to 2035, meeting about 50% of the total increase in generation in the region.
- In terms of regional contribution, the Middle East will account for more than three-quarters of the region's total capacity additions, placing MENA as the fifth-largest region globally for renewable capacity growth by 2035.
- The country leaders project Saudi Arabia alone will be responsible for over one-third of the growth in the STEPS, with significant contributions also coming from Egypt, Oman, and the UAE.

If all national pledges (the APS) and long-term commitments (including net zero goals set by eight MENA countries) are delivered in full and on time, solar growth accelerates dramatically.

- Capacity uptake moves at twice the pace seen in the STEPS, reaching 450GW of installed capacity by 2035—a twenty-five-fold increase from 2023 levels.
- In the generation mix, solar PV generation grows over thirty-fold, accounting for nearly one-third of total electricity generation in 2035.

Under the APS, the accelerated growth is significantly driven by ambitions to scale up low-emissions hydrogen production, which requires substantial renewable electricity. In the APS, the region is projected to have 140GW of installed electrolyser capacity by 2035, primarily powered by renewable electricity.



**Algeria 14,446TWh/year and Libya 10,477TWh/year boast some of the world's largest theoretical solar PV potentials.**

## UNPEGGING NORTH AFRICA FROM MENA

Across North Africa, solar power development reflects a complex interplay of policy ambition, regulatory reform, and practical constraints. While Algeria, Egypt, Libya, Morocco, and Tunisia share immense solar potential, their approaches to renewable energy deployment differ according to institutional capacity and national priorities.

In Algeria and Tunisia, utility ownership remains the only procurement model that has successfully commissioned large-scale solar projects. By contrast, competitive auction systems—adopted to attract private investment—have struggled with delays. Winning projects from initial tenders in both countries have yet to be commissioned, while Algeria continues to issue requests for proposals without selecting winners. Nonetheless, Tunisia achieved a record-low tariff of $29/MWh for a utility-scale PV project in 2024, signalling progress toward cost competitiveness.

Administrative bottlenecks remain a key constraint, with permitting and construction times in Tunisia exceeding four years, reflecting complex authorisation procedures. To encourage smaller-scale deployment, Tunisia has rolled out several supportive frameworks. Its PROSOL programme offers subsidies and low-cost loans for residential solar systems, while a 2024 remuneration policy allows excess electricity from self-consumption to be sold back to the grid at utility-set rates.

Egypt and Morocco have been the region's most active players in expanding renewable capacity. Egypt, in particular, has emerged as a leader in renewable energy growth over the past decade, deploying large-scale solar PV to help slow the expansion of oil- and gas-fired generation. Egypt was also among the first in the region to introduce a feed-in tariff system in 2013—although it was later discontinued due to challenges in setting sufficiently attractive prices for developers. Egypt and Tunisia both have remuneration mechanisms for distributed solar, while Morocco (since 2015) and Algeria have policy frameworks in place but face varying levels of implementation.

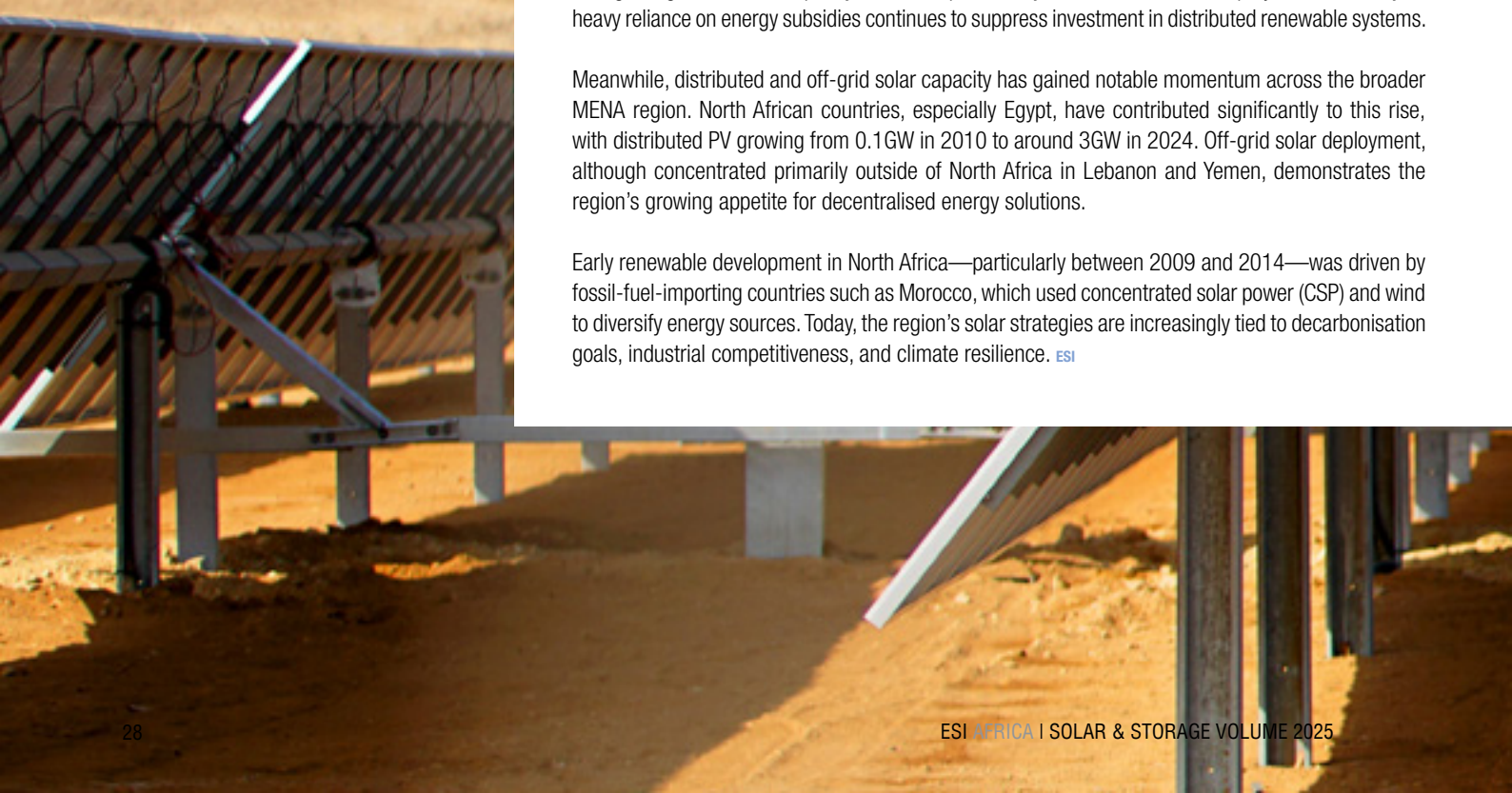
Morocco continues to lead North Africa's transition, with its renewable share target of 52% of installed electricity capacity by 2030 and a favourable regulatory environment that supports corporate Power Purchase Agreements (PPAs)—a model allowing energy sales directly to industrial consumers. Most of the region's corporate PPAs originate in Morocco, which has also pioneered large-scale solar and wind projects to reduce reliance on coal imports. However, the lack of access to low-voltage grid connections remains a persistent obstacle for distributed solar expansion. Morocco's ambitions now extend beyond electricity to include a green ammonia project involving a 500MW wind plant and 2,000MWh storage system, developed by a Saudi renewables company, illustrating its move into solar-linked hydrogen production.

Further east, Algeria and Libya boast some of the world's largest theoretical solar PV potentials—14,446TWh/year and 10,477TWh/year, respectively. Yet, actual deployment remains limited. Algeria is beginning to see new capacity additions, particularly linked to desalination projects, while Libya's heavy reliance on energy subsidies continues to suppress investment in distributed renewable systems.

Meanwhile, distributed and off-grid solar capacity has gained notable momentum across the broader MENA region. North African countries, especially Egypt, have contributed significantly to this rise, with distributed PV growing from 0.1GW in 2010 to around 3GW in 2024. Off-grid solar deployment, although concentrated primarily outside of North Africa in Lebanon and Yemen, demonstrates the region's growing appetite for decentralised energy solutions.

Early renewable development in North Africa—particularly between 2009 and 2014—was driven by fossil-fuel-importing countries such as Morocco, which used concentrated solar power (CSP) and wind to diversify energy sources. Today, the region's solar strategies are increasingly tied to decarbonisation goals, industrial competitiveness, and climate resilience. ESI

**Access the IEA report *The Future of Electricity in the Middle East and North Africa***



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# BATTERY STORAGE BLUEPRINT
# Inside WAPP's framework for Battery Energy Storage System integration

In a decisive move toward an integrated energy future, the West African Power Pool (WAPP) is spearheading a project to deploy Battery Energy Storage Systems (BESS) across the Economic Community of West African States (ECOWAS) region. Speaking with *ESI Africa*, **ABDOULAYE DIA**, secretary general of WAPP, says this initiative reflects both a professional milestone and a regional turning point.

**We want to ensure that West Africa can manage BESS projects independently, efficiently, and sustainably for the long term.**

*Abdoulaye Dia*

The importance of BESS is its capacity to provide services that are necessary for frequency regulation, voltage control, time-shifting of energy, reduction of congestion on transmission networks, black start capability, and to minimise the negative impacts of variable renewable energy sources on the network while increasing their integration and benefiting from their potential positive impacts.

Thus, central to WAPP's BESS initiative is the Regional Environmental Framework (REF), a robust guideline designed to ensure that every aspect of battery storage deployment in West Africa is socially responsible, environmentally sound, and economically viable.

Developed collaboratively by WAPP, the ECOWAS Regional Electricity Regulatory Authority (ERERA), and the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE), the framework supports the development of a low-cost investment plan and regulatory framework for BESS deployment. Together, these initiatives aim to stabilise the grid, enable cross-border energy trade, and maximise renewable energy potential while safeguarding communities and ecosystems.

## A STRATEGIC TURN TOWARD BATTERY STORAGE

Dia sees his leadership as an opportunity to advance sustainable, accessible, and reliable power for millions. "This role is both an honour and a daunting responsibility," he notes. "It's a chance to contribute meaningfully to the region's development through clean energy."

At the heart of this vision is the strategic choice of battery energy storage. Dia explains that while renewable sources like solar and wind are indispensable, their intermittent nature can destabilise grids. "BESS provides the balance—storing excess power when supply is high and releasing it when it's low," he says. "They reduce fossil fuel reliance and make regional electricity exchanges smoother."

In a region still expanding its electrification footprint, BESS represents a catalyst for energy security, economic growth, and climate resilience. The initiative also dovetails with WAPP's operational experience in managing major generation assets such as the Manantali (200MW), Félou (60MW), and Gouina (140MW) power plants across Mali, Senegal, and Mauritania through the Société de Gestion de l'Énergie de Manantali (SEMAF).

## BUILDING A FRAMEWORK FOR SUSTAINABILITY

According to Dia, the REF is the backbone of responsible deployment. "When we talk about infrastructure today, environmental and social considerations can no longer be an afterthought," he stresses.

The REF lays out a harmonised roadmap for BESS rollout across the 14 ECOWAS member states. It includes clear guidelines for environmental impact assessments, social safeguards, safety measures, and waste management, especially for batteries at the end of their life. The framework also aligns with both international best practice and national legislation, ensuring that projects are "locally appropriate and globally acceptable."

Developing the REF was no small task. WAPP began the process in December 2022 with a regional kickoff meeting to align expectations, followed by a comprehensive policy review and an ambitious consultation process across all member countries. "We engaged energy utilities, environmental ministries, and civil society groups," Dia recalls.

The journey wasn't without challenges. Initial engagement with environmental and gender institutions was limited, but the team addressed this through regional workshops—in Saly, Senegal (June 2023) and Accra, Ghana (November 2023)—culminating in a validation workshop in Lomé, Togo (May 2024). "These consultations enriched the document and gave us regional ownership of the process," says Dia.

## CRITERIA, GOVERNANCE AND LOCAL VALUE

Beyond environmental principles, the REF provides technical, financial, and socio-environmental criteria for evaluating BESS technologies. Dia explains that the selection process "goes beyond storage capacity or response time" to include energy performance, lifecycle costs, environmental footprint, and safety risks.

While lithium-ion batteries dominate the market, the framework also encourages consideration of alternative technologies with potentially lower environmental impacts or stronger local manufacturing prospects. Equally important is the management of battery waste. "We must safely handle, recycle, or repurpose batteries once they're no longer usable," Dia emphasises. "That's how we keep BESS truly sustainable."

## STRENGTHENING THE LOCAL VALUE CHAIN

The REF places strong emphasis on battery lifecycle management and local value creation. Dia notes that the region's sustainability goals require a holistic approach: "We cannot promote batteries as green solutions while ignoring their environmental costs."

To this end, the framework promotes recycling, second-life applications, and sound disposal practices. It also encourages local content development, including assembly and future manufacturing of batteries within the region. With West Africa rich in critical raw materials like lithium and cobalt, the REF advocates for responsible mining and value addition to foster industrialisation and job creation.

## A GOVERNANCE STRUCTURE BUILT ON ACCOUNTABILITY

"Governance is a cornerstone," Dia affirms. The REF clearly defines the roles of national ministries, environmental agencies, independent power producers, consultants, and financiers. It introduces an Environmental and Social Management Plan (ESMP) to guide engagement, safety, and emergency preparedness, as well as an Environmental and Social Management Framework (ESMF) for site screening and project evaluation.

"These structures ensure that decisions are transparent, inclusive, and accountable," says Dia.

A distinctive feature of the REF is its Complaint Management Mechanism, a system designed to reinforce social legitimacy. "Sustainability is not only about technical soundness; it's also about trust," he explains. The mechanism gives every stakeholder—whether a resident, worker, or partner—access to a safe, confidential, and effective grievance channel. It includes informal resolution options, formal complaint committees, and, where necessary, judicial recourse.

Crucially, the mechanism is built on participation, non-discrimination, and cultural appropriateness, ensuring that communities remain central to the transition process.

## BUILDING CAPACITY AND SHAPING THE ENERGY FUTURE

The REF is also designed to empower stakeholders through training and capacity building. "A framework is only as effective as the people implementing it," Dia says.

Through the Stakeholder Capacity Building Programme, WAPP will conduct training sessions on ESMP implementation, environmental and social screening, health and safety standards, and complaint handling. Participants will include utilities, regulators, local authorities, and civil society groups.

"Our goal is to build local expertise," Dia adds. "We want to ensure that West Africa can manage BESS projects independently, efficiently, and sustainably for the long term."

The wider impact of this effort extends far beyond storage technology. Dia describes the REF as "a blueprint for transformation," laying the foundation for an integrated, resilient, and sustainable electricity market. By making large-scale renewable integration viable, reducing carbon emissions, and creating new economic opportunities, the initiative sets West Africa apart as a leader in clean-energy innovation.

"Through BESS and the REF," Dia concludes, "we're proving that West Africa can lead the clean-energy transition [and] on our own terms, with our own frameworks, and for our own people." ESI

**Access the *Report on the Regional Environmental Framework, June 2024***

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PROJECTS AND PEOPLE

# THE ELITES SOLAR & STORAGE LEADERSHIP NOMINATIONS

## Experts keen on delivering tangible solutions

Preview a selection of leadership nominees in the solar & storage sector for the 10th annual *African Power & Energy Elites: Projects and People* magazine.

**Mbiko Banda**

**Nchena Mothebe**

**Tinyan Ogiehor**

### MBIKO BANDA, RESEARCH LEAD, AFRICA GREENCO, ZAMBIA

**Mbiko Banda** is an Electrical Engineer with an MSc(Eng) in Electrical Power Systems, currently pursuing a PhD in Control Engineering at the University of Mauritius focused on optimising the integration of renewable energy and storage systems into interconnected grids.

At Africa GreenCo, Banda serves as research lead, strategic partnerships. In this role, she contributes to strategic energy planning across Southern Africa, including work on Battery Energy Storage Systems (BESS) deployment in Zambia, facilitating the integration of renewables under changing resource and regulatory conditions. She is additionally fluent in English and French, enabling her to engage broadly across diverse policy, academic, and investment environments.

Her interests include designing energy market mechanisms, power trading arrangements, and finance/contract models that make renewables plus storage solutions commercially viable, and resilient under grid stress. Though early in her PhD, Banda is already contributing to policy-relevant research and stakeholder engagement to reduce barriers for clean energy infrastructure across the region.

### NCHENA MOTHEBE, DEPUTY PERMANENT SECRETARY, BOTSWANA

**Nchena Mothebe** is a seasoned Electrical Engineer with over 30 years of experience in the energy sector. He holds a Bachelor of Engineering (Electrical and Electronics) from the Birla Institute of Technology, Mesra, India, and an MBA from the Graduate School of Business at the University of Cape Town. He is a Professional Engineer registered with Botswana's Engineering Registration Board and a Chartered Engineer and Member of the Institute of Engineering Technology (IET), UK.

Currently serving as the deputy permanent secretary for Green Technology and Energy Security in Botswana's Ministry of Mineral Resources, Green Technology and Energy Security, Mothebe plays a pivotal role in shaping national energy policies. His leadership is instrumental in advancing Botswana's transition to renewable energy, with a particular focus on large-scale solar power projects.

Notably, he has been involved in the development of the Mega Solar project, a collaborative initiative between Botswana and Namibia aimed at generating up to 5GW of solar power. Additionally, he has contributed to the implementation of the Botswana Renewable Energy Scale-Up Support Project, in partnership with the World Bank, to enhance the country's renewable energy infrastructure.

### TINYAN OGIEHOR, SENIOR STAKEHOLDER ENGAGEMENT MANAGER, NTU INTERNATIONAL, NIGERIA

With over 15 years' experience in renewable energy, **Tinyan Ogiehor** is a driving force in solar and battery storage deployment for Healthcare Facility Electrification (HFE) across Nigeria. Since 2012, he has spearheaded projects that have electrified over 500 health centres, delivering a combined installed capacity exceeding 10MWp.

His responsibilities include leading on designing and implementing solar and storage systems that guarantee 24/7 power for critical healthcare operations. Previously as off-grid outcomes manager at Power Africa, he founded the Coalition for HFE Experts, now institutionalised as the National Stakeholders' Dialogue on Powering Healthcare under the Federal Ministry of Health.

Ogiehor's collaborative approach has mobilised over $80 million in funding from UKAID, USAID Power Africa, EU, UK PACT, and Nigeria's Rural Electrification Agency, delivering resilient, scalable solar infrastructure that powers both health facilities and nearby communities. ESI

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# THE ELITES SOLAR & STORAGE PROJECT NOMINATIONS
# Which of these project nominees will feature?

An alphabetically listed preview of solar & storage project nominees vying to feature in the 10th annual *African Power & Energy Elites: Projects and People* magazine.

AFRICAN POWER & ENERGY ELITES

PROJECTS AND PEOPLE



## ANGOLA: GRID CONNECTED BAILUNDO SOLAR PARK

The Bailundo Photovoltaic Park was officially inaugurated in early September 2025, bringing clean, reliable electricity to the central highlands of Angola. The facility, with a capacity of 8MWp, forms part of Angola's ambitious 370MWp national solar programme, which includes seven solar parks strategically spread across the country.

Developed by a consortium led by Portugal's MCA Group and US-based Sun Africa, with consultancy from Dar Al-Handasah, the project represents a significant step in reducing the nation's reliance on diesel.

Infrastructure at the Bailundo site includes a modern 15kV switching station and a 1.4-kilometre overhead transmission line linking the plant to the Bailundo 60/15kV substation, ensuring efficient integration into the regional grid. For the local population of approximately 373,000, long plagued by unreliable electricity supply, the solar park promises a more stable and sustainable energy source.

Beyond improving access, the project delivers substantial environmental benefits. Collectively, the seven solar plants across Angola provide renewable electricity to nearly 2.4 million people, prevent the emission of roughly 1 million tonnes of $CO_2$ annually, and eliminate the consumption of 1.4 million litres of diesel each year.

Angola's electricity access rate was 51.1% in 2023, representing a 2.6% increase from 2022, according to the World Bank. The country's government had set itself a goal to achieve a 60% electrification rate by 2025.

## CHAD: NOOR CHAD SOLAR AND BATTERY PLANT

Chad has taken a major step toward energy security and sustainability with the commissioning of its first grid-scale solar power plant equipped with battery energy storage. The 50MW Noor Chad Solar Facility, developed by Abu Dhabi-based Global South Utilities (GSU), is now operational in the capital, N'Djamena.

The project comprises more than 81,000 solar panels, 158 inverters, and a 5MWh Battery Energy Storage System (BESS) designed to stabilise power output and improve grid reliability. Once fully integrated, the facility is expected to supply electricity to over 270,000 homes, marking a significant reduction in the country's dependence on imported diesel.

GSU will operate the plant, which CEO and managing director Ali Alshimmari described as a landmark for both the company and Chad. He said it was GSU's first project to move "from signature to commissioning in Africa," demonstrating what can be achieved through determination and effective partnerships. Alshimmari added that at its core, the project is about "enabling families, communities, and nations to thrive with the stability that clean power brings."

The Noor Chad facility is part of GSU's broader clean energy portfolio across Africa, which aims to support sustainable development in the Global South. The company said the project will serve as a template for future renewable developments in Chad and across the region.

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## NIGERIA: CAPTIVE SOLAR AND BATTERY HYBRID POWER PLANT

A solar and battery storage plant has been commissioned to provide electricity to the foremost military training institution in Nigeria. It has been described as a landmark development, as the West African country continues to advance a targeted programme aimed at rolling out renewable energy projects at tertiary institutions.

Implemented by the Rural Electrification Agency (REA) of Nigeria with funding support from the World Bank, the 2.5MW captive solar hybrid power project was launched in May 2025 at the Nigerian Defence Academy (NDA) in Kaduna, in the north-west.

The project falls under the Energising Education Programme (EEP) Phase II. The plant integrates solar photovoltaic (PV) technology with battery storage and diesel backup systems. The project's socio-economic and infrastructure impact includes:

- 403 jobs created during the construction and installation phase
- 20 female STEM cadets trained in solar installation and renewable energy technologies
- 7 transformers installed to support broad-based power distribution across the Academy
- 288 solar-powered streetlights were installed, covering 9 kilometres of internal roadways, improving night-time security and mobility

The initiative provides uninterrupted electricity to academic buildings, staff residences, barracks, and critical facilities within the Academy, directly impacting over 12,368 people – including cadets, faculty, and administrative personnel.

## SENEGAL: WALO STORAGE AND SOLAR PROJECT

Senegal has taken a major step in West Africa's renewable energy development with the commissioning of the Walo Storage project, the region's first solar photovoltaic (PV) facility integrated with lithium-ion battery storage.

Located in Bokhol, the €40 million (~$46 million) project combines 16MW of solar power with a 10MW/20MWh Battery Energy Storage System (BESS) dedicated to frequency regulation and grid stability. Developed by Africa REN, the facility is connected to the National Electricity Company of Senegal (Senelec) grid under a 20-year take-or-pay public-private partnership (PPP) agreement.

The project was completed in 12 months, with commercial operations beginning in 2025, and Eiffage Énergie Systèmes RMT serving as the technical partner. Using monocrystalline solar modules, a single-axis tracker system, and string inverters, the installation supports frequency regulation and provides backup during grid loss events.

During construction, 217 local jobs were created, and 30 permanent positions are expected during operation. Africa REN also implemented several community initiatives, including solar electrification of local pumping stations, extension of potable water supply to five nearby villages, and technical training for local workers in battery maintenance.

## SOUTH AFRICA: SHALAZILE MICROGRID AND BESS PROJECT SITE

In August 2023, survivors of a devasting fire at the Usindiso building in Marshalltown, Johannesburg, South Africa were relocated to a temporary settlement at Shalazile Camp, which had no access to electricity or public lighting.

Utility company City Power was tasked with delivering the electricity and opted for a faster solution in the form of a microgrid. Within 12 months, the project was designed, constructed and commissioned. This is an achievement that normally takes three to five years under conventional methods.

Built on an 8,380m² site, with the solar microgrid covering over 4,000m², the system powers 273 households and reduces strain on Johannesburg's already challenged grid. The Shalazile Microgrid includes:

- 1,812 Canadian Solar panels (550W each), with a total installed capacity of 1MW, generating approximately 1,652MWh annually,
- 1.2MWh of lithium-ion batteries for storage, housed in two secure 12m containers,
- Hybrid ATESS inverters with 1.2MW capacity, fully compliant with national standards,
- An integrated security and CCTV system for round-the-clock protection, and
- Fibre optic telecommunications for real-time monitoring and control.

The project, budgeted at R79.2 million, is an electrification and socioeconomic development initiative whereby more than 45 local residents were employed through the Expanded Public Works Programme and small businesses were contracted, ensuring economic benefits stayed within the community. ESI

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## Solar & storage coverage from the *ESI Africa* website



### CLEAR PATH FOR FAST-PACED C&I ENERGY AND STORAGE MARKET

*ESI Africa* caught up with Pitso Sekhoto, a middle manager at the National Transmission Company of South Africa (NTCSA) where he focuses on substation automation and integration. He is also an advisory board member of the **C&I Energy+Storage Summit** (4-5 November 2025, Johannesburg).

Sekhoto highlighted that the country's focus has moved beyond power outages to the next phase of energy transformation. This shift unfolds two key burning issues for C&I players: grid access and policy clarity. "The real concern now is around accessing the actual grid; how companies connect and integrate with it and navigating policies and regulations," he explained.

These concerns will be addressed at the C&I Energy+Storage Summit, which features leading voices from across South Africa's energy ecosystem including NTCSA CEO Monde Bala, who will deliver a keynote address. Apart from the keynote, "the discussions on scaling storage systems, from backup to grid services, are also going to be very interesting for me."

Storage, he explained, has become a cornerstone of C&I resilience and flexibility. "We're going to learn how storage can move from being a backup tool to playing a real role in grid services." Other topics on the Summit's agenda include market development between the private sector and the grid, and how projects can be deployed at scale through innovation.

For Sekhoto, one of the most anticipated discussions will revisit South Africa's recent success in avoiding loadshedding. "People want to know how we made it out," he said. "Some believe it's because we have more solar panels and more IPPs." The Summit will unpack how much impact these renewable energy systems and private-sector projects have had in improving the grid, and how scalable innovation and collaboration can accelerate South Africa's energy transition even further.

### MAURITANIA APPROVES DREAM PROJECT AND LAUNCHES FIRST SOLAR-WIND HYBRID PPP

In September 2025, Mauritania signed its first public-private partnership (PPP) in the energy sector for the construction of a 60MW hybrid solar and wind power plant, marking a milestone in the country's clean energy transition.

The project, to be fully financed and operated by Ewa Green Energy, will be developed under a receipt-and-payment contract that safeguards investor returns without adding to public debt. Construction is expected to take 12 months. Once operational, the facility will expand national electricity generation capacity while supporting Mauritania's efforts to diversify its energy mix, cut carbon emissions, and enhance power supply reliability.

Mauritania's renewable energy potential positions it to power key industries such as mining, which currently relies heavily on fossil fuels. The government aims to achieve universal electricity access by 2030, with rural electrification set to double by 2024.

The solar-wind PPP forms part of a broader national strategy that includes the World Bank–backed

DREAM Project (Development of Energy Resources and Mineral Sector Support), approved in March 2025, which will finance the country's first large-scale battery energy storage facility, promote additional renewable projects, and advance institutional reforms. Together, these initiatives support Mauritania's Mission 300 Energy Compact, designed to deliver affordable, sustainable electricity to all citizens by the end of the decade.

## SOUTH AFRICA: KEEN ON BATTERY MANUFACTURING AS THE NEXT FRONTIER IN ENERGY

With South Africa's electricity supply showing signs of stability, Western Cape Premier Alan Winde believes that battery manufacturing should become the next strategic focus. "Battery manufacturing has got to be the next frontier," he said, adding that it aligns with the geopolitical interests of markets like the EU and the US, which are seeking to diversify away from concentrated supply sources.

However, noting that local battery assembly companies currently import most of their components from Asia, he asked: "Why are we not manufacturing batteries here in Sub-Saharan Africa?"

Referencing the International Energy Agency's Renewables Report, Winde highlighted that global renewable generation capacity surpassed coal for the first time in 2025, with solar and battery technologies leading new investments. He also linked energy security to agriculture and water resilience, noting that farms across the Western Cape are increasingly installing solar-powered irrigation systems with battery storage to secure operations.

Ulwin Hoffmann, technical director at Red Rocket, cautioned that localisation policies must be carefully structured. "Stability and opportunities to make reliable returns" are what will ultimately attract the private sector to invest not just in project development but in local manufacturing capacity. He advocated for policy feedback mechanisms that can identify and correct unintended consequences in the system.

Both agreed that industrialisation opportunities lie in scaling up local production for solar and battery systems. Hoffmann said he hopes the public and private sectors "can get together to create value for customers and actual industrialisation in the medium to long term."

## AN EAST AFRICAN GOVERNMENT GREENLIGHTS SOLAR AND BATTERY DEPLOYMENT

Uganda has approved the development of a 100MW solar power plant with 250MWh of battery energy storage in Kapeeka Sub-County, Nakaseke District, marking the country's most significant step yet toward large-scale solar-plus-storage deployment.

The project, to be developed by US-based Energy America and its regional arm EA Astrovolt, is the first phase of a national programme aimed at installing over 1GW of solar and battery capacity. Issued as a Gazetted Policy Direction under the Electricity Act, it supports the goals of Vision 2040 and the National Energy Policy 2023, which seek to deliver universal, reliable and affordable electricity.

The plant will use high-efficiency solar modules and utility-grade batteries designed for tropical conditions to enhance grid stability, provide power during peak demand, and strengthen energy resilience. Feasibility studies and tariff determinations will be overseen by the Electricity Regulatory Authority, while a Power Purchase Agreement will be concluded with the Uganda Electricity Transmission Company.

Energy America's subsidiary Ganymede Utilities will handle construction and commissioning, and its technology division Centauri will provide solar and battery engineering. The project also expands US–Uganda energy cooperation, fostering investment, job creation, and technology transfer across the clean energy sector. ESI

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