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*"QS Quo Vadis? Technology, Transformation and Tomorrow"*

# POWERING AFRICA'S FOURTH INDUSTRIAL REVOLUTION

*The role of renewable energy and battery storage in closing Africa's power deficit — and the quantity surveying and project management disciplines that turn ambition into abundant, self-sufficient, sustainable power*

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## Abstract

Africa's fourth industrial revolution rests on a precondition that is not yet in place. Roughly six hundred million people across the continent still lack electricity access; sub-Saharan African economies lose between one and five per cent of gross domestic product each year to power interruptions; and industrial and digital ambitions — manufacturing corridors under the African Continental Free Trade Area (AfCFTA), agro-processing value chains, data centre infrastructure, and mobile and fintech platforms — depend on firm, scalable power that outpaces basic access targets. The African Development Bank estimates that closing the access gap alone requires incremental annual investment in the order of fifteen billion United States dollars; the sums required to make the continent's power supply also firm, industrial-grade and bankable are multiples of that.

This paper argues that the technical direction of travel is clear: solar photovoltaic and wind generation, paired with battery energy storage systems (BESS), are the fastest and cheapest path to new capacity, and are increasingly capable of delivering firm, dispatchable, industrial-grade power. Storage growth on the continent could reach seven hundred per cent between 2025 and 2030, and the technology itself has matured — lithium iron phosphate cells, sub-millisecond grid-forming inverters, and turnkey costs that have fallen sharply since 2022. The technical case is no longer the constraint.

The constraint is delivery. Between the technical concept and the operating asset lies the delivery gap: underestimated capital cost, offtaker credit risk, weak cost baselines, slow due diligence, and schedule slippage that erodes lender and investor confidence. This is precisely the domain in which the quantity surveyor and the project manager — the disciplines of cost and delivery — determine whether the ambition of a policy paper becomes electricity flowing to a hospital, a factory or a data centre. The African quantity surveying profession, coordinated through the Association of African Quantity Surveyors (AAQS) and its member institutes, has

both the tradition and the technical language to make African power investment bankable. That contribution is what this paper explores.

The central answer to the conference's question — *QS Quo Vadis?* — from the perspective of the African power sector is that the profession is heading exactly where the continent needs it: into the making of infrastructure financeable, deliverable and repeatable at scale.

Keywords: African power sector; renewable energy; battery energy storage; cost engineering; project management; quantity surveying; 4IR; AAQS; AfCFTA; bankability; infrastructure delivery.

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## 1. Introduction

The theme of the AAQS / INQS 2026 conference is *QS Quo Vadis? Technology, Transformation and Tomorrow*. This paper offers one specific answer to that question by looking at the sector that most sharply determines Africa's fourth industrial revolution: electrical power. Without firm, affordable, bankable electricity, the digital economy, industrial expansion under the AfCFTA and the productivity gains that underpin job creation for the continent's young workforce cannot proceed at scale. The relationship between power and every other 4IR ambition is not analogical; it is direct. A single mid-sized data centre can rival a small town's load. A manufacturing corridor delivering export-grade goods needs power that is not only present but predictable and competitively priced.

That reality places power infrastructure at the top of the continental delivery agenda. And it places the quantity surveying and project management professions — the disciplines of cost and delivery — at the centre of the effort to translate ambition into asset.

The paper is structured as follows. It begins with the scale of Africa's power deficit and the true cost that unreliability imposes on households and firms. It then explains why the 4IR era raises the stakes above simple access targets, before setting out the generation mix that is emerging: solar, wind and hydro, and the transformative role of battery energy storage in converting variable renewable output into firm, dispatchable power. It describes the technology inside a modern battery energy storage system in enough detail for the professional reader to interrogate a project engineer's claims. It then sets out the destination — a self-sufficiency framework built on sovereign generation, firm supply, sustainable growth and regional integration.

The second half of the paper turns from technology to delivery. It examines where projects stall, and then argues in detail that the cost engineering and project management professions are the discipline that closes the gap between ambition and bankable execution. It sets out the institutional dimension — the role of AAQS, of its member institutes, and of continent-wide standards harmonisation in giving lenders and development finance institutions a consistent basis to trust African cost information. It closes with a practical call to action and a conclusion tied to the conference's own question: for the African quantity surveyor, the answer to *Quo Vadis?* is that the profession is going, quite literally, into the room where the continent's power is being decided.

Where sources appear, they are drawn from the leading recent industry and multilateral analyses — the International Energy Agency, the African Development Bank, Rystad Energy, Rho Motion, Watson Farley & Williams, and the CSIR / FTI Consulting studies of Southern African load-shedding costs — and are cited in full at the end of the paper.

## 2. Africa's Power Deficit, at Scale

The starting point is a set of numbers that no infrastructure paper on this continent can avoid.

Approximately six hundred million people across Africa still lack electricity access. The continent accounts for roughly three per cent of global electricity consumption despite hosting about twenty per cent of the world's population. More than sixty-five per cent of installed capacity sits in just two sub-regions — South Africa and North Africa — leaving the majority of the continent's landmass and a substantial share of its population served by systems that are structurally under-powered. The International Energy Agency has estimated that reaching universal access alone will require incremental annual investment of the order of fifteen billion United States dollars (IEA, 2025).

These are the well-known headline figures. What matters for the argument of this paper is the way in which the deficit has changed in nature. It is no longer only an access gap; it has become a growth constraint. Population and electrification are growing in step, but industrial and digital ambitions — the manufacturing corridors, agro-processing hubs, and data infrastructure on which the AfCFTA depends — require firm, scalable power that outpaces basic access targets. Access to a household lightbulb and a phone charger is a legitimate development priority. But an integrated regional value chain, a competitive export sector, a modern hospital network or a serious data economy requires several orders of magnitude more power, delivered continuously, priced predictably, and free of the volatility that has historically deterred long-horizon investment.

That distinction matters for the professional response. A universal access programme demands one kind of engineering and financing. A firm, industrial-grade, digital-era continental power system demands a different one — larger, more capital-intensive, more dependent on private and blended finance, and correspondingly more demanding of the cost and delivery disciplines this paper will turn to in its later sections.

## 3. The Cost of Unreliability

The scale of the deficit is only half of the picture. The other half is the cost imposed by the unreliability of what already exists.

Studies across sub-Saharan Africa consistently estimate that between one and five per cent of national gross domestic product is lost each year to power interruptions (Oxford Policy Management; African Development Bank, 2026). South African load-shedding studies conducted by the Council for Scientific and Industrial Research (CSIR) and by FTI Consulting have suggested that each stage of load-shedding costs the country's economy approximately one billion rand per day. Firm-level surveys undertaken in the worst-affected African markets have found that firms report losing as much as thirty-one per cent of sales to unreliable supply. In Nigeria, the Center for Global Development has estimated that around seventy-one per cent of firms now own or share a diesel generator simply to remain operational.

These headline losses understate the true cost. Behind them sit a set of hidden costs that fall hardest on the parties least able to absorb them. Spoiled cold-chain inventory in retail and pharmaceuticals. Damaged capital equipment from voltage surges and brown-outs. Foregone investment as prospective entrants avoid markets with power risk they cannot price. Diesel backup running at several multiples of grid tariffs, eroding operating margins for the small and medium firms that create the majority of the continent's jobs. And in lower-income households, the compounding cost of appliance damage, food spoilage, and lost income when a home-based enterprise cannot operate.

The professional relevance of these numbers is direct. When a quantity surveyor prepares a life-cycle cost analysis of a hospital, a school, a shopping centre or a manufacturing facility on the continent, the cost of unreliable power is one of the largest and least well-captured line items. Every avoided hour of outage is a saving that accrues to the owner and the tenants for decades. The professional case for renewable and storage investment therefore does not need to rely only on tariff comparisons with existing utility supply; it can be made against the true, full cost of the status quo, which is invariably higher than the invoice from the utility suggests.

## 4. Why This Matters Now — The 4IR Era Raises the Stakes

The urgency has shifted because the demand side has shifted. Three related forces make the current decade categorically different from previous investment cycles in African power.

The first is the emergence of the digital economy. Cloud computing, artificial intelligence workloads, financial technology and mobile money infrastructure all require firm, twenty-four-hour power. A single mid-sized data centre can rival a small town's electrical load. As African cities become nodes in continental and global digital value chains, the calibre of power they can offer determines whether they win or lose the investment.

The second is industrialisation under the AfCFTA. The African Continental Free Trade Area, in the process of being progressively implemented since 2021, promises a single continental market of approximately 1.4 billion consumers and combined GDP in the order of USD 3.4 trillion. Its ambition — the intra-African trade in value-added goods rather than raw commodities — is credible only if manufacturers on the continent have access to electricity that is competitively priced and predictably available. A garment factory in Lesotho, an automotive assembly plant in Morocco or a pharmaceutical manufacturer in Ghana all compete against operators in East Asia, in Central Europe, and increasingly in South America. They cannot compete if they are paying two to three times the going rate for electricity, and cannot run when the grid fails.

The third is jobs. Africa's population is young and growing; every year, tens of millions of new entrants seek work. Unreliable power forces firms onto expensive diesel backup, eroding margins and directly discouraging the foreign direct investment on which industrial job creation depends. The connection between power reliability and youth employment is not indirect; it is causal.

Against this backdrop, the trajectory of new capacity is encouraging. Rystad Energy has reported that roughly seventeen gigawatts of new capacity is expected across Africa in 2026, of which approximately half is solar (Rystad Energy, 2026). Solar photovoltaic has become the fastest-growing single technology on the continent, and — with battery storage — is the principal mechanism through which the pace of new firm capacity can be accelerated to match 4IR-era demand.

## 5. The Generation Mix — Renewables as the Fastest, Cheapest Path

The technical case for a renewables-led capacity build has become, over the last few years, almost self-evident from a cost engineering perspective.

**Solar photovoltaic** has the shortest construction lead time of any large-scale generation technology. A utility-scale solar plant can move from financial close to commissioning in roughly twelve to eighteen months, against three to five years for a conventional thermal plant and considerably longer for hydroelectric or nuclear. Solar module prices fell by approximately sixty-six per cent between 2022 and 2024, and continue to trend downward as global manufacturing capacity expands. In most African markets, utility-scale and distributed solar is now the default new-build technology for private and utility procurement alike.

**Wind** complements solar's daily generation profile and is strongest in the coastal corridors of South Africa, Namibia, Mozambique, Kenya, Morocco, Egypt, etc. When co-optimised with solar in a portfolio, it improves overall grid load factor and reduces the size of storage needed to firm the combined output.

**Hydropower** remains Africa's traditional baseload backbone, particularly along the Nile, the Congo and the Zambezi basins. It is, however, increasingly exposed to hydrology risk as climate change alters rainfall patterns and increases drought frequency. Recent drought episodes in Southern Africa have reduced hydroelectric generation to a fraction of its rated capacity for extended periods. This reinforces the case for diversified, storage-backed portfolios rather than for reliance on any single technology.

The technical constraint that has historically limited renewable penetration is intermittency. Solar generates only during daylight; wind is variable in ways that are only partly predictable; both can be curtailed by grid conditions. In the past this constraint meant that renewables could displace fuel consumption at the margin but could not deliver the firm, dispatchable capacity that industrial and digital users require. That constraint is what battery energy storage systems have been built to close.

## 6. Inside the Technology — How Battery Energy Storage Actually Works

Because the quantity surveying profession will increasingly be asked to price, benchmark and value-engineer battery energy storage projects, it is worth setting out how these systems actually work.

A modern utility-scale battery energy storage system has four principal components.

**Battery cells.** Lithium iron phosphate — LFP — is now the default chemistry for utility-scale storage. Unlike earlier lithium nickel manganese cobalt oxide (NMC) chemistries, LFP contains no cobalt (with associated supply-chain and ethical exposures), and offers stronger thermal stability, reducing fire risk. Modern LFP cells routinely achieve four thousand to six thousand or more full charge-discharge cycles at eighty per cent depth of discharge, translating into operating lives of ten to fifteen years or more depending on utilisation profile.

**The power conversion system.** The bidirectional inverter that converts DC battery power to grid-compatible AC — and vice versa when charging — operates at ninety-six to ninety-nine per cent conversion efficiency. Modern inverters can operate in *grid-following* mode (matching the frequency and voltage set by other generators) or in *grid-forming* mode (synthesising voltage and frequency directly, which lets the BESS stabilise weak or islanded grids the way spinning thermal generators traditionally did). Grid-forming inverters are increasingly specified for African deployments precisely because they allow storage to substitute for the grid-stabilising services of retiring or unreliable thermal plant.

**The battery management system.** This monitors the state of every cell — voltage, temperature, current — in real time, enforces safe state-of-charge limits, and can trigger curtailment within milliseconds of a fault. The battery management system is what makes a lithium storage installation safe at scale.

**The energy management system.** This is the dispatch intelligence layer. It reads load, weather forecast, tariff structure, ancillary-service prices and grid conditions to decide when to charge, when to discharge, and when to hold state of charge for a particular grid service. The energy management system is where the commercial value of the BESS is realised.

A useful shorthand set of parameters for a professional to have to mind, when interrogating a BESS proposal:

- **Duration:** typically two to four hours of full-power output.

- **C-rate:** typically 0.25 to 1.0, describing the ratio of power to energy.

- **Round-trip efficiency:** approximately ninety to ninety-five per cent for the full charge and discharge cycle.

- **Response time:** less than twenty milliseconds — orders of magnitude faster than any thermal generator.

- **Cycle life:** four thousand to six thousand or more full cycles at typical depth of discharge.

- **Turnkey cost:** approximately USD 150 to USD 320 per kilowatt-hour of installed energy capacity, and falling.

## 7. BESS as the Enabler — Variable Renewables Made Firm

The functional role of BESS on an African grid is to convert variable, weather-dependent renewable generation into firm, dispatchable capacity. Four dispatch modes make this concrete.

First, storage **shifts solar and wind generation from peak production to peak demand**. A solar plant produces its output over the middle of the day; peak grid demand is typically in the early evening. A BESS charged mid-afternoon and discharged from six to ten in the evening turns midday abundance into evening firmness.

Second, storage **provides frequency and voltage stability services** to weak or islanded grids. On many African networks the reserve margin is small, and even short-duration frequency deviations can trigger cascading outages. A grid-forming BESS responds to those deviations in milliseconds, holding the grid stable while slower generators respond.

Third, storage **displaces costly diesel backup** for mines, industry and commercial and industrial (C&I) users. A mine in Botswana or a shopping centre in Kenya that has historically relied on diesel generation for three to five per cent of its annual energy — at three to five times grid tariff — will typically find that a solar plus storage installation pays back within three to seven years and continues to yield savings for the following decade.

Fourth, storage **de-risks power purchase agreements** by smoothing the output volatility to which offtakers would otherwise be exposed. A utility signing a PPA on a firm, storage-backed profile is signing a fundamentally different commercial contract than one signing on a variable renewable profile — and the cost of capital reflects it.

The market outlook reflects this. Rho Motion's African BESS forecast, cited by Watson Farley & Williams in early 2026, projects that installed BESS capacity on the continent could grow by roughly seven hundred per cent between 2025 and 2030, with annual additions of 1.5 to 2.5 gigawatts expected from 2026 onward, led by South Africa, Egypt and Morocco (Rho Motion, 2026; Watson Farley & Williams, 2026). Analysis by NextG Power (2026) reaches broadly consistent conclusions, suggesting that African BESS is entering the same commodity-style deployment phase that Europe and North America saw between 2020 and 2024.

## 8. From Deficit to Abundance — A Self-Sufficiency Framework

Taken together, the technical, cost and market trajectories point to something more ambitious than closing the access gap. They point to the possibility of an African power system organised around abundance rather than scarcity — one built on four intersecting pillars.

**Sovereign generation.** Domestic renewable capacity reduces exposure to imported fuel prices and to foreign-exchange denominated energy bills. Every megawatt of solar or wind installed on the continent is a megawatt whose fuel cost — sunlight, wind — is priced in local currency and cannot be blockaded, sanctioned or subject to commodity price shocks. For a continent whose current-account positions are frequently strained by fuel imports, this is not a peripheral benefit; it is a strategic one.

**Firm, dispatchable supply.** Storage and grid flexibility technologies convert intermittent renewables into baseload-equivalent, industrial-grade power. The distinction between "renewable" and "firm" — historically a real trade-off — is dissolving, and with it the argument that only fossil generation can serve heavy industry, hospitals or data centres.

**A sustainable growth path.** Lower-carbon capacity additions position African economies competitively at a moment when global capital, and increasingly global buyers of manufactured goods, are favouring lower-carbon industrial output. Africa's opportunity is not to industrialise in the way China did between 1990 and 2015; it is to industrialise in the way that positions African products favourably against the border adjustment mechanisms and procurement rules that are already appearing in European, North American and Asian markets.

**Regional integration.** Cross-border power pools and interconnectors — the Southern African Power Pool, the West African Power Pool, the East African Power Pool, the Central African Power Pool — let surplus renewable generation in one country reach deficit markets in another, smoothing continental supply and reducing the storage requirement any single national grid must self-fund. Regional integration under the AfCFTA is not only a trade agenda; it is an energy agenda.

Abundance, in this framework, is not simply *more* megawatts. It is power that is reliable, affordable, and *bankable* enough to sustain 4IR-era industries. That last word — bankable — is the bridge from the technical part of this paper to the professional part.

## 9. The Delivery Gap — Ambition is Not the Constraint

If the technical direction is clear and the market outlook is favourable, why is the pace of installation not several times faster? The answer is not ambition. Every African finance ministry, utility, and multilateral has ambitious power plans. The answer is delivery.

Four categories of failure explain most of the projects that stall between announcement and commissioning.

**Underestimated capital expenditure and schedule slippage.** Projects consistently exceed their bid-stage cost and schedule assumptions. When they do, investor confidence at financial close erodes, sponsors renegotiate returns, and the equity ticket enlarges — sometimes fatally. In an environment where debt is scarce and expensive, an under-engineered cost estimate at feasibility stage is the single most common reason for a project to fail to reach financial close, or to reach it on terms that make the tariff uncompetitive.

**Offtaker credit risk.** African utilities have historically had mixed payment track records, and the pricing of that risk by lenders inflates the cost of debt and equity across a project's life. Utility payment delays — real and perceived — flow directly through to lender covenants, credit spreads and required returns. A project that could otherwise be delivered at a competitive tariff becomes uncompetitive because its cost of capital is priced against the worst-paying offtaker in the region rather than the specific one it is contracted to.

**Weak cost baselines and slow due diligence.** Development finance institutions (DFIs) and commercial lenders are conservative by mandate. When cost estimates arrive without clear benchmarks, without defensible contingency allowances, and without traceable derivation from comparable African builds, the response is longer, more expensive due diligence and more conservative terms. The absence of a widely trusted African cost data pool is one of the profession's most consequential failures — and one of AAQS's clearest opportunities.

**Execution delays that push projects past bid-stage tariff and currency assumptions.** A project bid on a particular tariff profile, priced against particular currency and interest-rate assumptions, becomes commercially different if commissioning slips by twelve or eighteen months. In a rising-rate environment, or in a currency depreciation, that slippage alone can make the project uncommercial.

The remedy for each of these failure modes is not a technical breakthrough. It is a professional discipline. Rigorous benchmarked cost estimating from feasibility through final investment decision. DFI and blended finance structures — for example, ATIDI's Regional Liquidity Support Facility and similar credit enhancement mechanisms — that price offtaker risk down. Disciplined schedule and interface management across EPC, grid connection and land acquisition. Transparent change control and reporting that lenders can rely on after financial close.

These are the disciplines of the quantity surveyor and the project manager. It is to their role that this paper now turns.

## 10. The Cost Engineer's Discipline — Making Power Financeable

The cost engineer — the quantity surveyor operating within the power sector — is the discipline that makes a project bankable. The word *bankable* is used precisely here: it means that a lender's or DFI's technical, commercial and legal advisers can, on the basis of the project's cost information, extend debt on terms that make the project commercially viable. Without bankability, no amount of technical merit or policy ambition produces installed capacity.

Four inter-related activities define the modern cost engineer's contribution to a renewable and storage project.

**Estimating and benchmarking.** Class-appropriate capital and operating cost estimates — from Association for the Advancement of Cost Engineering (AACE) Class 5 at concept through Class 1 at final investment decision — must be prepared for the full scope: solar photovoltaic modules and mounting, inverters, transformers, land preparation, grid connection, storage systems, control systems, and balance of plant. Each estimate must be benchmarked against comparable African builds so that the assumptions can be defended in due diligence. This is where the absence of a continent-wide African cost data pool matters most: every project's cost benchmarks currently have to be reconstructed by its own advisors, at cost, and with less confidence than a consolidated database would allow.

**Levelised cost of energy and value engineering.** The cost engineer stress-tests design choices against the levelised cost of energy (LCOE) — the discounted lifetime cost of the plant divided by its discounted lifetime output. LCOE analysis identifies the trade-offs between upfront capital cost and long-run tariff competitiveness: a larger array with slightly cheaper modules; a two-hour storage duration versus a four-hour duration; a grid-forming inverter versus a grid-following one. The value engineering that flows from LCOE analysis is where the quantity surveyor's professional judgement most directly determines the tariff at which the project can be bid.

**Cost control and change management.** From financial close through commissioning, the cost engineer tracks commitments against budget, flags variance early enough for corrective action, and manages the change control mechanism through which unforeseen conditions are converted into approved additions to scope. On a large solar-plus-storage project, weekly cost reporting is standard; monthly reporting is often too slow to enable useful intervention. Lender covenants — the ratios and thresholds a project must maintain to avoid technical default — depend on the cost engineer's numbers being right.

**Risk-adjusted contingency and escalation.** The most difficult craft in cost engineering is not the estimate itself; it is the contingency allowance. Too little contingency, and the project is exposed to lender remedies at the first significant variation. Too much, and the tariff becomes uncompetitive and the project loses at bid. Modern practice uses probabilistic techniques — Monte Carlo analysis, expected-value risk registers — to build defensible contingency and escalation allowances that satisfy lender and DFI scrutiny.

The cost engineer's contribution is often invisible in press releases and photographs of commissioning ceremonies. It is nonetheless the discipline without which none of those ceremonies take place. Every megawatt of new African renewable capacity that reaches commercial operation is the product, in part, of a defensible cost estimate that a lender could trust.

## 11. The Project Manager's Discipline — Turning Bankable into Built

If the cost engineer is the discipline that makes a project financeable, the project manager is the discipline that turns bankable into built. Four elements define the professional contribution.

**Schedule and interface control.** A renewable and storage project has a small number of high-risk workstreams — grid connection, land acquisition, environmental permitting, engineering design, procurement, construction, commissioning — and the project manager's craft is to sequence them so that delays in one do not cascade into the whole. A typical failure mode is that grid connection studies take longer than land acquisition, or that permitting extends past module delivery, so that fully paid-for modules sit in a Durban or Mombasa warehouse accumulating storage cost while the site is not yet ready. Interface management — the discipline of managing the boundaries between workstreams — is where a project's schedule is either preserved or lost.

**Stakeholder and offtaker alignment.** The project manager coordinates utilities, regulators, communities, offtakers, funders and DFIs so that technical progress and financing conditions move in step. This is not a soft skill; it is a discipline in its own right. A project that has met all its technical milestones but not obtained a particular ministerial approval is not, in commercial terms, a delivered project. Aligning stakeholder timelines with EPC timelines is one of the least glamorous and most consequential functions of the project manager's role.

**Risk and contract management.** The project manager owns the EPC and O&M contract risk allocation. Performance guarantees, liquidated damages for delay, availability guarantees, capacity payments — all are only meaningful to the extent that they are enforced. A well-drafted EPC contract with unenforced performance guarantees is functionally equivalent to a poorly drafted one. Modern practice in African renewable projects has raised the standard of contract management materially over the past decade, and the direction of travel is clear: performance guarantees are enforced, liquidated damages are collected, and the contractual bargain the sponsors negotiated at financial close is preserved through commissioning.

**Commissioning to commercial operation date.** The COD — the date on which a plant is deemed commercially operational and starts earning revenue under its PPA — is the moment at which the lender's model becomes reality. The project manager drives grid-code testing, commissioning of solar, wind and storage assets, and the sign-off procedures that convert an under-construction asset into an operational one. Every day of delay at COD is a day of foregone revenue that the lender modelled at bid stage; a project manager who lands COD to schedule protects the entire commercial architecture of the project.

## 12. Cost Plus Delivery — Bankable, Replicable Projects

The two disciplines described above are complementary, not sequential, and the projects that reach commercial operation on time and on budget are almost invariably those in which the cost engineering and project management functions have worked together from feasibility onwards.

Four stages of a project illustrate the joint contribution.

**Feasibility.** The cost engineer sets the estimate baseline; the project manager scopes the execution plan and risk register. Both feed into the same document that will later be examined by lenders in due diligence.

**Financial close.** The joint cost and schedule package gives lenders and DFIs a defensible basis for terms and covenants. A cost estimate without an execution plan is a promise without a mechanism; an execution plan without a cost estimate is a mechanism without a check on itself. Together they constitute the analytical basis on which a lender's credit committee can approve the transaction.

**Construction.** Through execution, cost control and interface management keep budget and schedule aligned. Change orders — inevitable on projects of this scale — are priced against the estimate baseline and managed against the schedule float, and their cumulative effect is transparent to the lender's monitoring agent.

**Operation.** After commercial operation, actuals feed back into future project benchmarks. Each project completed with clean cost and schedule reporting sharpens the next deal's bankability. This is the mechanism by which African renewable delivery becomes cumulatively easier to finance and quicker to execute — the professional equivalent of a learning curve, driven by the discipline with which each project is closed out.

This is the same discipline that development finance institutions and commercial lenders already expect on Zanzibar-style solar-plus-storage builds, on Kenyan PPA-backed transactions, on the Redstone solar CSP project in South Africa, on Egypt's Benban solar park, and on Morocco's Noor programme. The task is to apply the same discipline at continental scale.

## 13. The African Institutional Dimension — AAQS and the Bankable Continent

The point at which this paper connects most directly with the theme of the AAQS / INQS 2026 conference is here. If the cost engineer's benchmarks and the project manager's execution discipline are what make African power investment bankable, then the professional institutions that shape and standardise those disciplines across the continent are, in a real sense, part of the enabling infrastructure of the African energy transition.

The Association of African Quantity Surveyors (AAQS), together with its member institutes — the Association of South African Quantity Surveyors (ASAQS), the Nigerian Institute of Quantity Surveyors (NIQS), the Institute of Namibian Quantity Surveyors (INQS), the Institute of Quantity Surveyors of Kenya (IQSK), the Ghana Institution of Surveyors and their peer bodies elsewhere — has three specific contributions to make to African power delivery.

The first is the harmonisation of measurement and cost management standards. The ASAQS Standard System of Measuring Building Work, the NIQS Building and Engineering Standard Method of Measurement, and their sister national frameworks are each defensible on their own terms, but they diverge in ways that make cross-border project delivery — for example, on regional interconnector projects, on cross-border solar farms, or on multi-country wind portfolios — unnecessarily costly. AAQS's work on continental standard-setting, and on the SADC Mutual Recognition Protocol for the quantity surveying profession, is directly relevant to the cost of delivering cross-border renewable and storage capacity.

The second is the coordination of a continental cost database. A properly maintained pool of anonymised African renewable and storage cost benchmarks — contributed to by member firms, curated by AAQS or a designated agent, and made available under appropriate access rules to lenders, DFIs and cost engineers — would materially shorten due diligence timelines and lower the cost of capital on African power projects. The absence of such a pool is currently one of the single most consequential structural weaknesses in the continent's power delivery machinery. Building it is well within the profession's collective capability.

The third is the professional development of the cost and project management capacity required to serve a substantially larger African renewable pipeline. If BESS capacity grows by seven hundred per cent between 2025 and 2030, the number of quantity surveyors and project managers with sector-specific experience must grow correspondingly. The professional bodies, working with African universities — Wits, Pretoria, Cape Town, Nelson Mandela University, the University of Lagos, Ahmadu Bello, Kwame Nkrumah University of Science and Technology (KNUST), the University of Nairobi, and the Namibia University of Science and Technology — are the institutional vehicles through which that capacity is built.

These are practical, unglamorous tasks. They are also the tasks that will determine whether Africa's 4IR power dividend is realised or dissipated.

## 14. Call to Action — A Practical Path to Power Abundance

Four actions, together, would materially accelerate the pace at which African renewable and storage capacity is delivered.

**First, prioritise storage-paired renewables.** Utilities and independent power procurers should mandate battery storage co-location on new solar and wind tenders, converting variable output into firm, creditworthy capacity from the outset rather than as a subsequent retrofit. This aligns the technical direction with the commercial reality: the market values firm capacity, and the technology is available to deliver it.

**Second, standardise bankable cost baselines.** Consistent, benchmarked cost-engineering practice should be deployed across the project pipeline, drawing on AAQS-coordinated standards and the continental cost data pool advocated above. The objective is to shorten DFI due diligence timelines and to price African project risk against African benchmarks rather than against off-continent proxies.

**Third, strengthen delivery governance.** Disciplined project management practice — schedule control, interface management, contract risk allocation and enforcement, commissioning to commercial operation date — should be embedded from feasibility to hand-over. Where local capacity is under-developed, capacity-building should be structured into the transaction rather than treated as a post-hoc concern.

**Fourth, scale blended and regional finance.** DFI and multilateral credit enhancement instruments — ATIDI's Regional Liquidity Support Facility, the African Guarantee Fund, the World Bank's Multilateral Investment Guarantee Agency, the AfDB's Africa50 vehicle, and their peers — should be expanded, and cross-border power pooling under the AfCFTA and the regional power pools accelerated, to unlock private capital at volume.

None of these actions is technically novel. Each is understood in principle by every serious participant in the African power sector. What has been missing is the professional infrastructure — the standards, the data, the disciplines — that operationalises them at scale. Building that professional infrastructure is where the quantity surveying and project management professions, coordinated through AAQS and its member institutes, contribute most directly.

## 15. Conclusion — Abundant Power is Africa's 4IR Dividend

Africa's fourth industrial revolution has a precondition: abundant, reliable, affordable electricity. The technology to deliver it — solar photovoltaic, wind and battery energy storage — is mature, is falling in cost, and is being deployed at accelerating scale. The market outlook is favourable: seventeen gigawatts of new capacity expected in 2026, roughly half of it solar; BESS capacity potentially growing seven hundred per cent by 2030.

The constraint is delivery. And delivery is a professional discipline. The quantity surveyor and the project manager, working together — the discipline of cost and the discipline of execution — are the professions on which the bankability, and therefore the buildability, of African power infrastructure depends. The African quantity surveying profession, coordinated through AAQS and its member institutes, has both the technical language and the institutional platform to lead this work at continental scale.

The theme of this conference asks *QS Quo Vadis?* — where is the quantity surveying profession going? The answer, from the perspective of the African power sector, is unambiguous. The profession is going, quite literally, into the room where the continent's power is being decided: the estimating meeting where a project's tariff is being priced; the due diligence room where a lender's credit committee is deciding whether to extend debt; the site office where a commissioning schedule is being defended against a slipping grid connection; the boardroom where a portfolio strategy is being set for the next decade.

Abundant power is Africa's 4IR dividend. Renewables and storage set the technical direction. Cost engineering and project management make it financeable, deliverable, and repeatable — at the scale self-sufficiency requires.

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