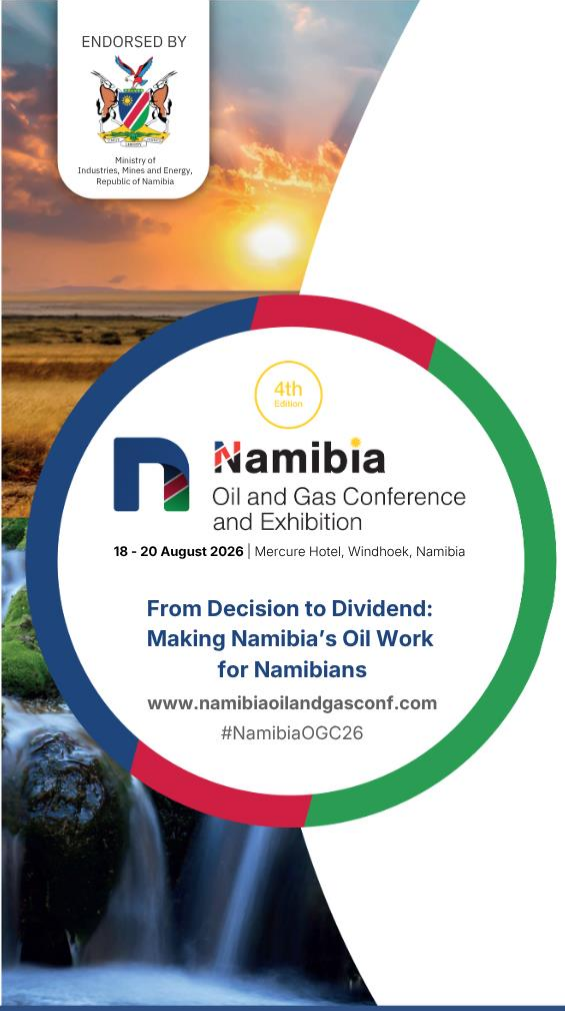


NOGC 2026 · TECHNICAL PRESENTATION · INFRASTRUCTURE, MIDSTREAM & REGIONAL INTEGRATION

Building Resilient, Flexible and Future-Proof Energy Infrastructure in Namibia

Lessons Learnt from Nigeria, the United States and Global Best Practice

Okeoghene Ugbehe
Umugini Pipeline Infrastructure Limited

Gas Monetisation | Pipelines, Terminals & Export | Regional Energy Integration

THE MOMENT WE ARE IN

Three global forces are reshaping energy at the same time

The AI Demand Shock

Artificial intelligence data centres are now the fastest-growing electricity load in history. Power demand is exploding faster than grids can grow.

The Energy Transition

The world is moving away from unabated fossil fuels towards broader energy opportunities. Assets built today must stay useful and bankable in a lower-carbon future.

Energy Geopolitics

Energy is again a strategic weapon in a divided world. Supply security now shapes national power and alliances.

Together, these forces are making yesterday's infrastructure inadequate everywhere technically, commercially and strategically. New builders like Namibia can design for this new world from day one.

NAMIBIA'S OPPORTUNITY

The Orange Basin has changed Namibia's future as the clock is ticking

10 bn+

Barrels of oil equivalent
Gross recoverable resources

4

World-class discoveries
Graff · Venus · Jonker · La Rona

2022–24

Discovery window
Among the decade's biggest deep-water finds

Top tier

Emerging producer
Southern Hemisphere significance

Beyond oil and gas

World-class solar and green hydrogen potential (HYPHEN project) means today's infrastructure choices must serve both hydrocarbons now and green exports later.

A narrow window
Once capital is committed and steel is in the ground, options are locked in for a generation.

The question is no longer whether Namibia becomes an energy producer, it is whether Namibia becomes a passive extraction story or an active and lasting regional energy hub.

THE STARTING POINT

Namibia's 'missing' infrastructure is actually its biggest advantage

What Namibia does not have today

- No operational LNG liquefaction facility
- No deep-water FPSO yet in production
- Limited onshore gas processing capacity
- No long-distance pipelines to regional markets

Why that is a gift, not a gap

Think of building a house: it is far cheaper to wire a new house properly than to rip open the walls of an old one.

Namibia is perceived as a blank slate. It can design world-class systems from first principles with no legacy assets, no path dependency, and no costly retrofit cycles.

Nations like Nigeria and the US are paying billions to fix what they built decades ago. Namibia can simply build it right the first time.

HOW THIS STUDY LEARNS

Two Views: One shows the past, one shows the future

CASE STUDY 1 — THE REAR-VIEW

Nigeria

Africa's largest gas holder shows what happens when infrastructure is built reactively flared gas, vandalized pipelines, and value left on the table for decades.

Lessons on gas monetisation, pipeline resilience and social licence

CASE STUDY 2 — THE FRONT HEADLIGHTS VIEW

United States

The world's most advanced grid shows what happens when technology outruns infrastructure and regulation reflecting an AI demand shock the system cannot absorb.

Lessons on digital readiness, transmission planning and regulation

Same conclusion from both views: infrastructure must be designed for the world of 2040–2075, not the world of today. Namibia can act on that lesson before pouring a single foundation.

CASE STUDY 1 · NIGERIA

The cost of waiting: rich in gas, poor in gas infrastructure

206 tcf

Proven gas reserves
The largest in Africa

300+ bscf

Gas flared every year
Burned into the sky, not sold

$2.5 bn

Value lost annually
Foregone revenue at conservative pricing

Why it happens : A farmer's story

Nigeria is like a farmer with the biggest harvest in the region but no road to the market ,so the crop rots in the field. Gathering and processing systems designed in the 1970s–80s no longer match today's fields: associated gas cannot reach processing plants, gas-to-power lines cannot hold pressure, and export capacity cannot absorb the volumes available.

The flare stack is not a technical detail , it is a burning banknote. Infrastructure that only moves gas, instead of monetizing it, guarantees decades of lost value.

CASE STUDY 1 · NIGERIA

Pipelines under pressure: a live dashboard of reactive management

5,000+ km
Trunkline network
Corrosion, sabotage, bunkering

1,200+
Incidents per year
NNPC reports, one year

72+ hrs
Average repair time
Per incident

200k bpd
Production deferred
Barrels not delivered daily

What every modern pipeline must be born with

Fibre-optic sensing (DAS/DTS)
Feels leaks & intrusion in real time

Smart cathodic protection
Remote monitoring, auto response

Smart pigging points
Inspect inside without shutdown

Community-aware routing
Social licence designed in

A pipeline is not a pipe, it is a nervous system. Nigeria proves that steel without sensors, and assets without community goodwill, run at a fraction of their promise.

CASE STUDY 1 · NIGERIA

Proof it can work: Nigeria LNG, a $100 billion success story

$100 bn+

Export revenue generated by NLNG's Bonny Island plant since inception

6 trains operating · **Train 7** adds 7.6 MMTPA

Why it worked

Designed with long-term commercial logic and run with institutional rigour proof that world-class infrastructure can thrive in Africa.

The catch

Its design was frozen in the early 1990s before AI process control, digital twins and small-scale LNG. Even success ages without upgrade paths.

Namibia's task is not to copy NLNG, it is to build the NLNG of 2050: modular, AI-ready, digital-twin enabled, and able to serve spot, long-term and regional markets at once.

CASE STUDY 1 · NIGERIA · FIELD EVIDENCE

Egbolom–Kwale: How a 'last-mile' bridge revived a stranded field

Egbolom field
Marginal field, production stranded

140 km trucking
Structured last-mile fleet

Kwale terminal
Umugini land terminal injection

Trunk pipeline
Into existing export network

Export & revenue
Deferred barrels recovered

92%
Fleet uptime achieved
Reliable, schedulable logistics

140 km
Last-mile haul distance
Truck-to-pipeline bridge

Viable
Cost per barrel
Commercial in elevated price markets

Resilience is a portfolio, not a monument: big trunklines for base flow, modular terminals for the last mile, and digital logistics tying it together, like a highway fed by good feeder roads.

CASE STUDY 1 · NIGERIA

Nigeria's gift to Namibia: mistakes already paid for

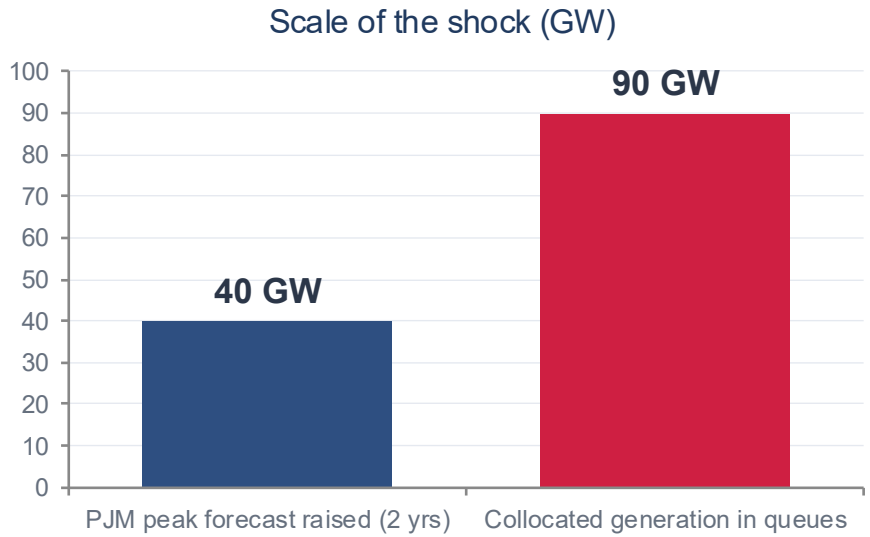
Avoid — what hurt Nigeria

- Building to evacuate gas instead of monetising it
- Steel without sensors — no digital intelligence
- Communities treated as bystanders, not partners
- Reactive repair culture instead of predictive care

Adopt — what worked

- Value-chain design from reservoir to point of sale
- NLNG-style institutional rigour and governance
- Portfolio midstream: trunklines + modular last mile
- Zero routine flaring hard-wired from first production

The AI demand shock: entire cities plugging in overnight



Hyperscale AI campuses
Microsoft, Google, AWS and Meta have rewritten demand forecasts in every major US power market.

90 GW behind the meter
Data centres are becoming their own mini-utilities gas turbines and batteries built on-site because the grid cannot keep up.

Rules from another era
Interconnection rules written for a pre-digital age cannot process the queue. Regulation, not steel, is the bottleneck.

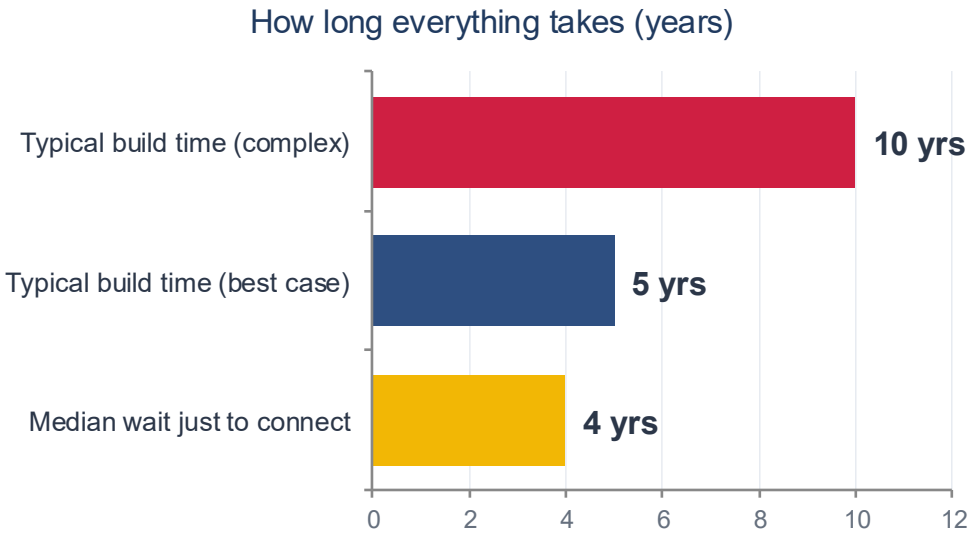
Imagine ten new cities asking to plug into your grid this year. That is AI demand. Namibia must assume this world exists before designing a single substation.

The waiting line: when the grid becomes the bottleneck

2,600 GW

of generation projects stuck in US interconnection queues — more than double the entire existing US power fleet

Lawrence Berkeley National Laboratory, 2024



The lesson is not to fear transmission — it is to plan and permit it ahead of demand, never in response to it. Namibia's regulator must move before the load arrives, not after.

CASE STUDY 2 · UNITED STATES

The retrofit trap: pay a little now, or pay a fortune later

America's path: retrofit later

Rewiring a 1960s–70s analogue grid for a digital world — transformers, switchgear, protection and comms across hundreds of thousands of kilometres.

$3 trillion+

estimated US grid modernisation bill over the next decade

Namibia's path: build smart now

Digital metering, wide-area monitoring, digital substations, automated fault recovery and AI demand forecasting — native from day one.

+15–25%

one-time premium on new transmission — a fraction of any retrofit

House-builder's rule: conduits, wiring and foundations cost little during construction — and a fortune once the walls are sealed. Grids obey the same rule.

Smart-by-design is not a luxury line item — it is the cheapest insurance policy Namibia will ever buy for its energy future.

CASE STUDY 2 · TURNING CRISIS INTO OPPORTUNITY

The prize hidden in the crisis: Namibia as a data-centre destination

Abundant clean power

World-class solar and green hydrogen potential for 24/7 clean supply

Gas-fired baseload

Orange Basin gas can anchor firm, reliable power for compute campuses

Subsea connectivity

Cable routes linking Africa to Europe and Asia land on Namibia's coast

Stable governance

Investment-grade stability that hyperscalers actively search for

As hyperscalers run out of grid capacity in the US, Europe and Asia, they are scanning the map for power-rich, stable locations. **AI-ready power infrastructure makes Namibia visible on that map.**

Build power infrastructure that is AI-ready and data-centre compatible from the outset — and turn America's bottleneck into Namibia's inward investment.

THE FRAMEWORK

Six design principles for a future-proof Namibia

Design for the lifecycle, not the launch date

P1

30–50 year horizons; modular, upgrade-ready by contract

Embed digital intelligence from day one

P2

Sensors, digital twins, cybersecurity — born in, not bolted on

Build for gas monetisation, not evacuation

P3

Sell the milk, don't spill it — value chain over volume

Architect for regional integration

P4

Size the shop for the neighbourhood, not just the household

Build social infrastructure in parallel

P5

Community benefit and local content are load-bearing walls

Write the rulebook before the hardware

P6

Regulatory certainty first — rules of the road before the buses

Six principles, one idea: every dollar of steel must carry a dollar of foresight. This framework is the paper's core contribution to Namibia's planners.

PRINCIPLE IN FOCUS · P3

From molecule to money: design the whole value chain, not just the pipe

Non-negotiables: meter every molecule from reservoir to point of sale · deliver spec-quality gas to several markets at once · zero routine flaring incentivised from first production.

A dairy farmer does not dig a channel to pour milk away he bottles and sells it. Every gas molecule must have a metered path to a paying customer.

THE REGIONAL PICTURE

Every neighbour has a gap Namibia can help close

South Africa

R1.2 trillion

GDP lost to load-shedding since 2008 — a decade-long generation deficit hungry for imports

Botswana

Coal, no water

Vast coal but limited water for thermal power; growing solar ambitions need firm backup

Zimbabwe

Variable hydro

Kariba hydropower rises and falls with rainfall — reliability needs a regional partner

Mozambique

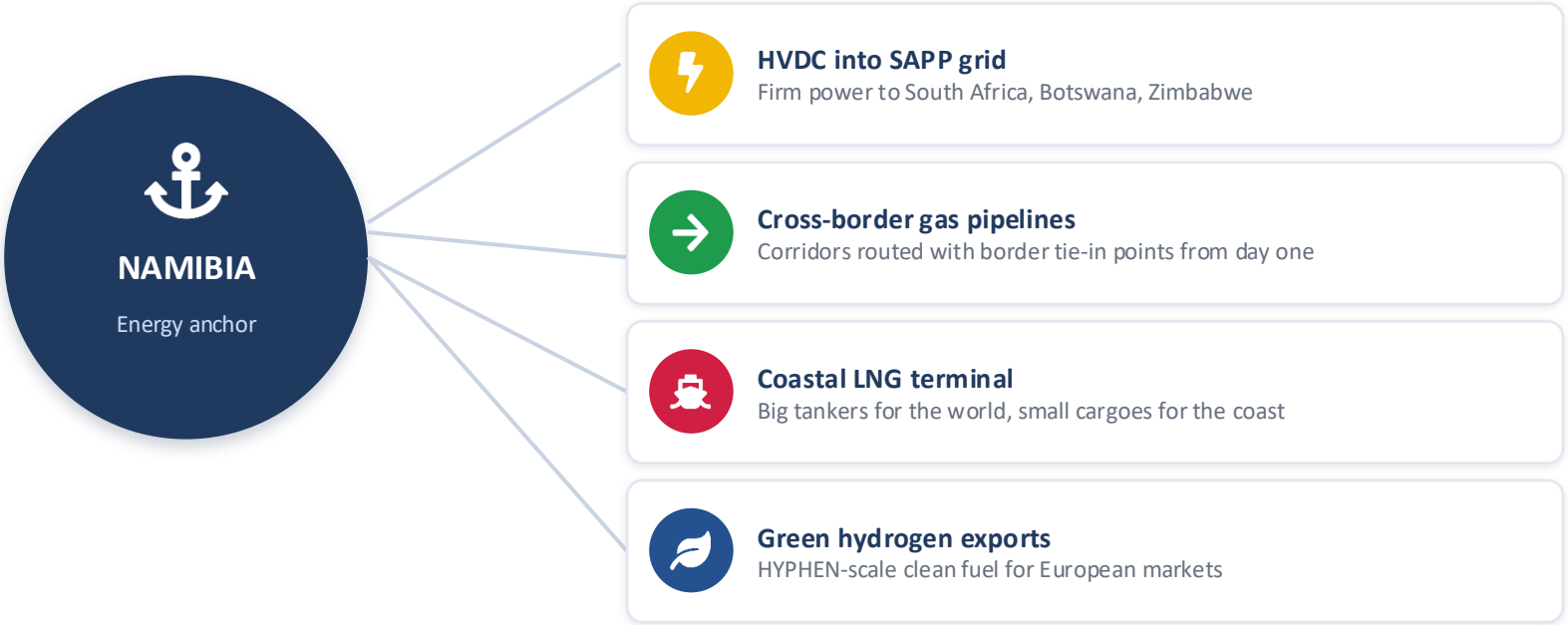
Gas, no roads

Large gas reserves but limited processing and export infrastructure of its own

Namibia sits at the centre of this puzzle: new gas, new power, Atlantic coastline and a stable platform the natural anchor of a Southern African energy security system built on the SAPP.

THE VISION

The anchor of a Southern African energy corridor



Enablers: bilateral supply deals (SAPP · BPC · ZETDC) · transit-fee & dispute frameworks · AfDB, DBSA and IFC project finance

What each player should do : Monday morning action

NAMCOR & Ministry of Mines and Energy

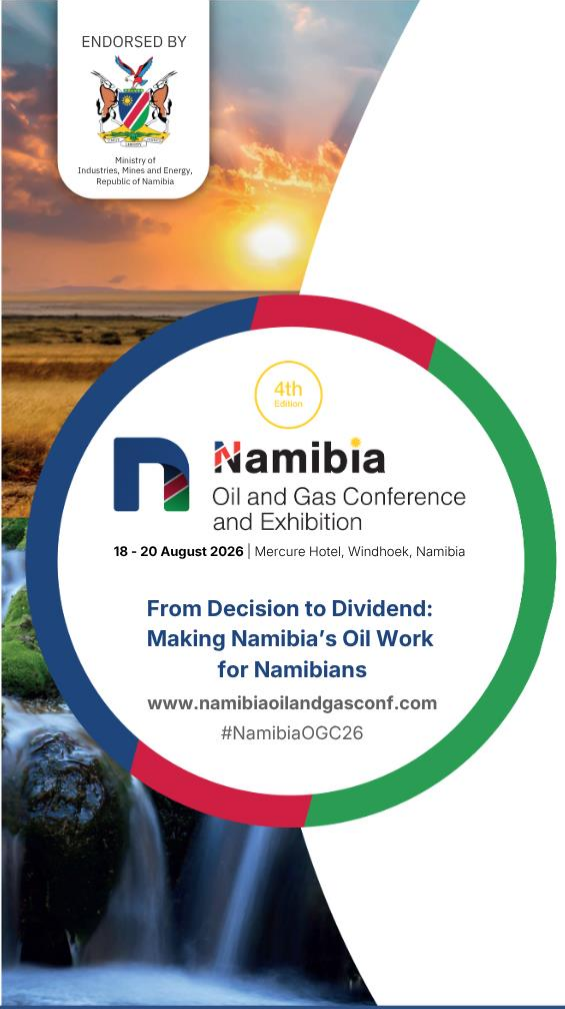
- 30–50 yr National Energy Infrastructure Master Plan (AI-demand & export scenarios)
- Zero routine flaring : legally binding from first production
- Gas Commercialization Framework: pricing, export allocation, LNG access
- Digital-by-design mandated in every EPC contract

Infrastructure developers

- Modular LNG / FLNG — grow capacity with proven reserves
- Route pipelines with cross-border tie-ins to Botswana & South Africa now
- Integrity systems beyond ASME B31.8S: smart pigging, fibre sensing, AI anomaly detection

SADC & regional policymakers

- Finalise the SADC regional energy protocol & cross-border agreements
- SADC Gas Infrastructure Corridor: routes, tariffs, harmonised rules
- AfDB / DBSA-backed Southern African Energy Integration Facility



NOGC 2026 · WINDHOEK · 18–20 AUGUST 2026

Thank You

"The lessons are available. The resources are confirmed. The decisions must now be made."

Okeoghene Ugbehe

Independent Energy Infrastructure Specialist

Infrastructure, Midstream and Regional Integration — Technical Category