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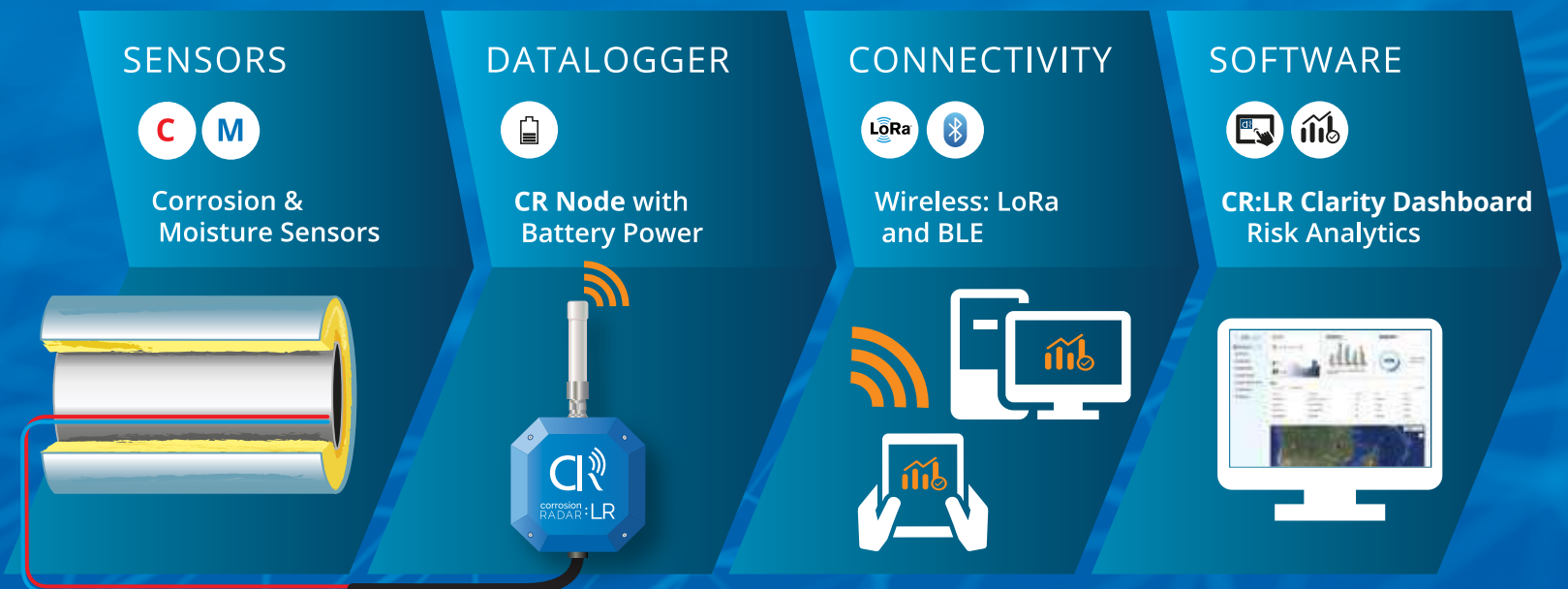


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MIDEAST ENERGY TRANSITION FACES KEY CHALLENGES

**Concerns mount over
regional security and Strait
of Hormuz stability**

BY ABDULAZIZ KHATTAK

THE Middle East and North Africa (Mena) region faces a highly complex energy transition landscape characterised by structural fractures, deep geographic imbalances, and extremely uneven progress across national territories.

According to the Energy Transition Index 2026 report, published by the World Economic Forum in collaboration with Accenture, the global transition has broadly flatlined despite record international clean energy investment reaching \$3.3 trillion.

Overall regional security scores dropped by 2.2 per cent to 65.85, representing a stark systemic vulnerability that was brutally exposed by the disruption to energy flows through the Strait of Hormuz.

This critical maritime chokepoint handles approximately 20 million barrels of oil per day, representing 25 per cent of the entire global seaborne oil trade, and 19 per cent of the global liquefied natural gas (LNG) trade.

The sudden bottleneck sent shockwaves through energy markets, demonstrating the extreme fragility of current supply chains and forcing import-dependent nations to rethink their long-term strategies.

GCC'S DISPARATE TRAJECTORIES

Project execution in the GCC is led prominently by Saudi Arabia, where the overall country score increased by 1.5 per cent to reach 57.4.

Riyadh aggressively accelerated its clean energy transition enablers, expanding future readiness by 5.3 per cent as massive renewable energy investments surged from \$6.6 billion in 2024 to \$11.9 billion in 2025.

Some 20.6 gigawatts (GW) worth of



Regional drives like the Saudi Green Initiative aim to strengthen long-term system resilience

projects were tendered under the National Renewable Energy Programme, achieving world-leading low solar tariffs alongside major commitments to large-scale battery storage infrastructure.

Other GCC states maintain moderate but stable positions on the index, with the UAE scoring 59.1, Qatar at 56.6, Oman at 54.0, and Bahrain registering at 50.6.

Conversely, Kuwait recorded a sharp 10 per cent decline in energy efficiency due to domestic consumption and highly subsidised pricing policies.

POLICY EXECUTION GAPS

The underlying decision drivers behind these increasingly disparate regional trends stem directly from deep macroeconomic pressures, strict institutional constraints, and vastly varying fiscal capacities.

While Mena's wealthy oil-exporting nations possess the necessary capital to navigate complex economic restructuring, non-oil economies face severe fiscal limitations.

For nations such as Tunisia, Jordan,

Lebanon and Egypt, acute fiscal stress and immediate, pressing energy security concerns have significantly delayed critical policy implementations and weakened regulatory consistency, rather than entirely reversing their long-term ambitions.

Furthermore, there was a sharp drops across the region in regulation and political commitment, which fell by 3.8 per cent, while infrastructure declined by 2.4 per cent.

Looking ahead, the regional transition will be increasingly dictated by how successfully these diverse countries manage to balance legacy fossil fuel architectures with clean infrastructure investments, all while mitigating severe, unpredictable supply chain and geopolitical risks.

As fragmentation intensifies, regional leaders are urgently compelled to prioritise supply chain resilience and aggressively expand carbon management frameworks, especially considering that 80 per cent of all seaborne crude passing through these regional routes is destined for rapidly expanding Asian markets. ■

14 killed in Aramco's Ras Tanura air crash

FOURTEEN people, all Saudi nationals, were killed when a helicopter operated by Saudi Aramco crashed in Ras Tanura.

"The Ministry of Energy extends its deepest condolences and sincere sympathies to the families of the martyrs, praying that Almighty Allah grants them mercy and forgiveness and accepts them as martyrs," it said.

Aramco had resumed crude oil loadings at its Ras Tanura terminal after a halt of nearly four months.

Ras Tanura, on Saudi Arabia's eastern Gulf coast, is one of the world's most important oil export hubs and a cornerstone of the Kingdom's energy industry.

The terminal handles a significant share of Saudi Arabia's crude oil exports and also includes one of the country's largest refineries.

A full investigation has been launched to determine the cause of the crash.

LNG leaders urge EU for review

IN a strong joint statement, energy leaders from Qatar, the US, Nigeria, and Algeria have demanded swift amendments to the EU Methane Regulation.

Representing the EU's primary liquefied natural gas suppliers, the coalition said that critical technical elements remain undefined ahead of the January 2027 enforcement deadline.

The regulatory void threatens long-term contracts valued in the tens of billions of euros, the statement said.

The suppliers are demanding a stop-the-clock mechanism, grandfathering for new contracts, and the removal of non-compliance penalties during a transitional period to prevent supply disruptions and secure Europe's energy future. ■



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Oman is restructuring its energy assets for a dual-track hydrocarbon and green future

OMAN RESTRUCTURES STATE ENERGY FIRMS TO SECURE SUSTAINABLE GROWTH

Strategic consolidation and capital optimisation across upstream and downstream sectors position the Sultanate to advance both hydrocarbon yields and regional green hydrogen infrastructure development

BY ABDULAZIZ KHATTAK

OMAN is executing a comprehensive, dual-track structural transformation of its public energy architecture, deliberately balancing the capital-intensive lifecycle extension of mature hydrocarbon reservoirs with a state-mandated acceleration into low-carbon infrastructure.

Under the strategic framework of Oman Vision 2040, the state is aggressively pursuing economic diversification while systematically unbundling and optimising its massive national oil companies (NOCs) to insulate public finances from global commodity volatility.

Rather than relying on direct state subsidies, the Sultanate has established independent holding entities designed to command distinct bal-

ance sheets, access international debt capital markets autonomously, and drive structural efficiency across the entire energy value chain.

This institutional shift is reconfiguring the traditional relationships between state-backed heavyweights, global corporate joint-venture partners, and global financial markets as the nation navigates a shifting global landscape.

CAPITAL RECLASSIFICATION & UPSTREAM OPTIMISATION

According to Energy Development Oman's (EDO) financial statement for the year ended December 31, 2025, significant milestones have been achieved in balance sheet rationalisation despite facing a compressed global pricing environment.

EDO reported revenues of \$14.77 billion for 2025, a decrease from the \$16.07 billion earned in 2024.

The net profit earned was \$523 million due to a highly substantial cost profile dominated by \$5.2 billion in royalty expenses alongside \$4.12 billion in rising depreciation, depletion, and amortisation charges.

However, the corporate entity dramatically fortified its core balance sheet resilience, expanding its total equity base to \$11.63 billion, up from \$10.20 billion in 2024.

EDO commands the absolute cornerstone of the conventional energy economy of the Sultanate, holding the 60 per cent state participating interest in Block 6, an expansive hydrocarbon concession covering approximately 90,000 sq km.

This asset block represents approximately 55 per cent of the total oil and condensate reserves of Oman and yields three-quarters of its aggregate hydrocarbon production.



The operational execution of this concession remains under the stewardship of Petroleum Development Oman (PDO), which functions as a premier exploration and production joint venture between the Government of Oman holding 60 per cent, Shell holding 34 per cent, TotalEnergies holding 4 per cent, and PTTEP holding 2 per cent.

To control escalating operating expenses, which included production expenses rising to \$1.27 billion, PDO is deploying advanced automated well-management digital ecosystems across its fields.

Oman's mature reservoirs increasingly demand complex, capital-intensive enhanced oil recovery (EOR) methodologies, such as polymer flooding and sophisticated thermal recovery installations, to extract crude from geologically challenging tight formations.

Simultaneously, the upstream mandate has been extended into future green molecules through the establishment of Hydrogen Oman (Hydrom), a specialised subsidiary designated as the master planner and central orchestrator for the renewable hydrogen ecosystem of the nation.

Operating as the institutional custodian of public lands for the transition, Hydrom has initiated its critical third auction round, managing the competitive zoning and allocation of massive renewable concession blocks within the industrial hub of Duqm.

To ensure long-term off-take securi-

ty and establish global supply linkages, the entity has finalised structural agreements to operationalise the first commercial liquid hydrogen maritime corridor connecting the Port of Duqm directly with the major European logistics hubs of the Port of Amsterdam and the Port of Duisburg.

DOWNSTREAM CHEMICAL INTEGRATION

Complementing the upstream resource management of EDO, OQ Group has executed an expansive corporate consolidation to manage assets spanning from upstream exploration to performance chemicals across seventeen nations.

As disclosed in the group's annual report for 2025, the integrated energy giant demonstrated immense financial resilience amidst heightened market volatility, delivering a consolidated earnings before interest, taxes, depreciation, and amortisation of \$1.348 billion.

The group locked in a net profit of \$641 million, representing an impressive 25 per cent year-on-year surge in net profitability driven by deep operational efficiencies, successful portfolio transformation initiatives, and historical revenue growth.

These strong baseline results allowed OQ Group to secure an investment-grade credit rating of BBB- with a stable outlook from S&P Global, complementing an identical investment-grade rating previously elevated by Fitch Ratings, thereby enhancing its

capacity to raise non-recourse project financing on the international market.

The upstream and infrastructure segments of OQ Group have pursued a deliberate monetisation and structural unbundling strategy to unlock latent capital.

Its upstream arm, OQ Exploration and Production, maintains critical strategic interests across 14 onshore and offshore concessions, leveraging its specialised technical expertise in tight gas extraction and localised production methodologies to form cross-border technical partnerships, including bilateral ventures within North African and Libyan hydrocarbon provinces.

Concurrently, midstream assets have been entirely decoupled through OQ Gas Networks, which serves as the exclusive, regulated open-access transportation operator for the natural gas infrastructure of Oman.

OQ Gas Networks is directing targeted capital allocations toward the expansion of its high-pressure gas pipeline grid to supply growing industrial energy demand inside the Special Economic Zone at Duqm and the Sohar Free Zone.

Upstream operational drilling campaigns are executed via Abraj Energy Services, the leading domestic oilfield services provider, which deploys automated drilling rigs to maximise efficiency across tight gas plays.

In the downstream sector, OQ Group has focused heavily on upgrading basic molecules into high-margin performance chemicals rather than exporting unrefined feedstocks.

OQ Refineries and Petroleum Industries has maximised petrochemical integration by driving optimal asset throughput at the extensive Liwa Plastics Industries Complex, converting refinery byproducts into highly profitable polymers.

This downstream footprint is further strengthened by the full operational ramp-up of the Duqm Refinery and Petrochemical Industries Company, known commercially as OQ8, which represents a landmark \$7-billion equal joint venture between OQ Group and Kuwait Petroleum International (KPI).

Situated strategically within the Special Economic Zone at Duqm, the refinery processes highly complex crude oil feedstock blends, benefiting from direct access to global shipping lanes outside the volatile Strait of Hormuz.

Basic chemical manufacturing is managed by OQ Base Industries, which utilises local methane streams to synthesise low-carbon methanol and ammonia molecules for export.

This integrated product value chain is optimised commercially by OQ Trading, operating from transactional hubs in Dubai and Singapore to capture cross-regional arbitrage spreads.

Furthermore, the clean energy transition within the group is led by OQ Alternative Energy, which acts as the national champion for commercial renewables, energy efficiency pro-

grammes, and green molecule projects.

In its sustainability drive, OQ expanded its renewable energy portfolio by more than 2,000 megawatts (MW) and secured power purchase agreements for over 740 MW of solar and wind capacity.

OQ Alternative Energy is deeply embedded alongside global industrial consortia in the development of the multi-gigawatt HyPort Duqm project.

HyPort achieved a foundational structural milestone when global energy supermajor bp acquired a 49 per cent equity stake to propel the construction of its large-scale solar and wind-powered green ammonia production facility.

EMISSIONS MITIGATION

Oman LNG continues to maximise long-term export value while executing a highly targeted capital investment program directed at comprehensive asset decarbonisation.

As detailed in the official publication titled Oman LNG Sustainability Report, the company is systematically integrating high-technology modifications across its core liquefaction trains located at the port of Sur.

Capitalising on newly finalised long-term supply agreements signed with premium European and East Asian off-takers, the state-backed industrial entity is structured to elevate its aggregate production and export capacity beyond eleven million tonnes per annum.

This operational volume expansion is being executed alongside stringent environmental mitigation frameworks designed to lower the carbon intensity of the produced LNG.

To achieve its mandated target of a 30 per cent reduction in lifecycle greenhouse gas emissions per unit of LNG produced, the operator is installing advanced automated heat recovery units and deploying artificial intelligence (AI) driven process monitoring sensors to optimise overall thermal efficiencies across its processing infrastructure.

This twin-track strategy allows the sovereign state to protect its immediate export revenues in a competitive global gas market while ensuring compliance with intensifying global corporate environmental, social, and governance compliance standards.

By embedding these processing refinements directly into its midstream asset base, Oman LNG safeguards its commercial relevance during the structural transition toward lower carbon energy commodities, matching the structural actions visible across the portfolios of EDO and OQ Group.

The coordinated execution of these public energy strategies confirms that Oman is actively transforming its state assets to sustain fiscal resilience, optimise asset utilisation, and capture a highly defensible and resilient market position in the emerging low-carbon economy. ■

Global firms are key players in Oman's energy renaissance

International oil companies and independent operators are deploying specialised capital, advanced technology, and corporate realignments to shape the Sultanate's post-transit economy

THE structural evolution of the Sultanate of Oman's energy architecture offers a master-class in how an oil-dependent state can systematically deploy foreign private capital, highly specialised technical intervention, and strategic joint-venture frameworks to prolong its mature basins while building a bridge to a decarbonised future.

While national oil companies (NOCs) such as OQ and Petroleum Development Oman (PDO) maintain domestic custodianship, the operational heavy lifting increasingly falls to a sophisticated group of international oil companies (IOCs) and agile regional independent operators.

Oman's geological profile is inherently complex, characterised by tight, low-permeability reservoirs and highly viscous heavy oil accumulations.

Overcoming these barriers requires substantial capital and specialised technologies.

Private energy companies have moved beyond their traditional roles as simple equity partners to become core co-architects of Oman's national energy security, driving innovation across enhanced oil recovery (EOR), deep tight gas manufacturing, and green maritime infrastructure.

Nowhere is this technical symbiosis clearer than in Occidental Petroleum's (Oxy Oman) long-term commitment to the Sultanate.

As the country's second-largest hydrocarbon producer, Oxy has carved out a unique position by tackling some of the region's toughest subsurface challenges.

This commitment was reinforced by Occidental Mukhaizna landmark 15-year extension of its Exploration and Production Sharing Agreement (EPSA) for the massive onshore Block 53.

Block 53 represents one of the Middle East's largest mechanical and thermal steam-flood EOR initiatives.

The renewal of this asset allows Oxy and its partners to target an estimated expansion of 800 million gross barrels.

By integrating advanced pattern



Public-private partnerships accelerate Oman's energy sector transformation

optimisation, machine learning (ML) diagnostics, and automated thermal distribution systems, Oxy aims to squeeze maximum recovery from a field that has already produced over 640 million barrels from approximately 3,500 active wells.

This aggressive investment program underscores a broader corporate strategy: Even as global majors rebalance their asset portfolios, private capital continues to treat Oman's proven, complex heavy-oil reserves as foundational, high-margin assets.

TIGHT GAS INFRASTRUCTURE

Simultaneously, the race to secure Oman's domestic gas pipeline network has transformed unconventional gas extraction into a massive manufacturing exercise.

BP Oman's operations in Block 61, encompassing the technically complex Khazzan and Ghazeer tight gas fields, demonstrate the immense value of private operational expertise.

Utilising ultra-staged hydraulic fracturing and high-density cluster spacing, BP has unlocked deep, highly pressurised formations that were once considered inaccessible.

Recent operational data indicates that Block 61 delivers an astounding 547.5 billion cu ft (bcf) of natural gas annually, maintaining a daily output floor of roughly 1.5 bcfpd.

This massive volume accounts for approximately 35 per cent of Oman's total domestic gas consumption, supplying power to local heavy industries, processing plants, and desalination facilities.

Furthermore, bp's operational efficiency is paired with top-tier environmental standards, earning an Oil and Gas Methane Partnership (OGMP) Level 5 ranking for its accurate, real-time methane monitoring.

To ensure long-term commercial sustainability, these production achievements are backed by structural legal updates, including a newly signed 9-year, 1 million tonnes per annum (mtpa) liquefied natural gas (LNG) offtake agreement with Oman LNG.

LOWER-CARBON COMMERCIAL CORRIDORS

This upstream gas security is driving a major transformation in Oman's downstream and marine infrastructure.

TotalEnergies, in a strategic joint venture with OQ Exploration and Production (OQEP), is spearheading the Marsa LNG project in Sohar.

This innovative \$1.6-billion venture is designed to build a modern, fully electric, low-carbon LNG bunkering hub to serve international shipping routes along the Gulf of Oman.

The project recently achieved a key milestone with the successful

'air-raising' of a 631-tonne steel roof for its 165,000 cu m full-containment concrete LNG storage tank.

With total construction progress tracking at 39 per cent, the asset is on schedule for commercial commissioning by the mid-2028 window.

By replacing conventional marine fuel oil with lower-carbon LNG, TotalEnergies and OQEP are leveraging private project-execution capabilities to establish Oman as a vital hub for cleaner global shipping.

Oman's open and collaborative regulatory environment has also created a highly active secondary market for corporate joint ventures.

A clear example is Japanese conglomerate Mitsui and Company's divestment of its upstream Omani portfolio via its subsidiary Mitsui E&P Middle East for \$148 million.

This transaction allowed Kistos Energy Middle East Limited to absorb these minority stakes, reshaping the partner dynamics beneath primary operators like CC Energy Development and Occidental.

This smooth transition of assets shows that Oman remains highly attractive to IOCs.

New operators like Kistos can step in to optimise production, while veteran players like Tethys Oil pivot toward fresh exploration frontiers, including its anticipated commercial campaign in Block 56.

Ultimately, this dynamic ecosystem of private and foreign energy companies provides the technology, capital, and operational speed necessary to sustain Oman's energy sector, proving that private enterprise is essential to the nation's long-term fiscal health and industrial transformation.

OPERATIONAL INTEGRATION: THE BLOCK 10 CONDUIT

A critical legislative foundation for this private-sector growth was established via Royal Decree No. 28/2025, which formally ratified the historic Marsa Protocol. This decree provides the legal and commercial architecture connecting Shell Integrated Gas Oman B.V.'s upstream operations in Block 10 directly to downstream transport infrastructure. Under an integrated Gas Sales Agreement with the Integrated Gas Company (IGC), Block 10 delivers 150 million standard cubic feet per day (mmscfd) of natural gas, creating a reliable supply chain that feeds downstream industrial transformation and maritime decarbonisation projects. ■

Asset / Concession Location	Historic Partnership Structure	New Realignment Structure	Active Designated Operator
Blocks 3 & 4 (Onshore Eastern Oman)	CCED (50 per cent) / Tethys (30 per cent) / Mitsui (20 per cent)	CCED (50 per cent) / Tethys (30 per cent) / Kistos Energy (20 per cent)	CC Energy Development (CCED)
Block 9 (Onshore Western Oman)	Oxy Oman (50 per cent) / OQEP (45 per cent) / Mitsui (5 per cent)	Oxy Oman (50 per cent) / OQEP (45 per cent) / Kistos Energy (5 per cent)	Occidental of Oman



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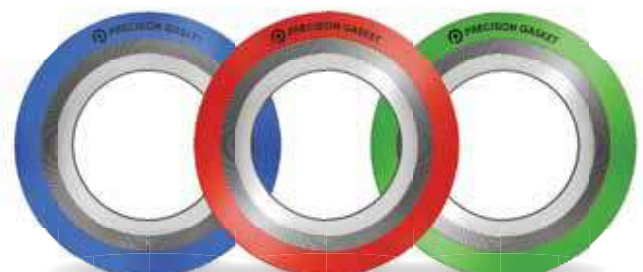
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Driving performance excellence in Oman: Nabors sets new benchmarks in drilling

It takes more than a rig to deliver; performance is built on people, proven processes, and top-tier equipment, Ashish Gupta, Vice-President, Nabors Eastern Hemisphere Drilling Operations, tells **OGN**

WITH a legacy spanning over four decades in Oman, Nabors continues to play a pivotal role in advancing drilling performance, safety, and operational efficiency in one of the region's most established energy markets.

Built on long-standing partnerships, strong localisation efforts, and a commitment to innovation, Nabors' operations in Oman stand as a testament to what can be achieved when technology, expertise, and collaboration come together.

At the core of Nabors' success in Oman is its enduring relationship with a major operator, a partnership that has consistently delivered high-performance outcomes while maintaining a strong focus on safety and sustainability.

In 2025, this commitment was further recognised when Nabors Oman secured four prestigious awards at the annual operator HSE Awards, highlighting excellence in safety leadership, operational discipline, and a culture deeply rooted in zero harm.

Operationally, Nabors continues to push the boundaries of drilling performance in Oman.

Recent achievements demonstrate not only efficiency gains but also the ability to consistently outperform planned targets.

One standout milestone includes a rig delivering a record 1,054 ft drilled per day that led to the completion of drilling operations in just 15.25 days compared to the planned 23.7 days.

The completion activities followed with equal precision, finishing in 5.44 days versus a planned 6 days.

This performance translated into an overall 30 per cent reduction in drilling time, marking the fastest delivery recorded for this well type.

Beyond the numbers, it reflects a deeper capability, including seamless coordination across teams, optimised processes, and the integration of advanced technologies that enable smarter execution in complex environments.

Crucially, this acceleration in drilling and completion timelines directly translates into substantial cost savings for the customer, reducing operational time and associated costs for services, logistics, and rentals.

This collectively results in a significant reduction in overall well delivery costs, while enabling earlier production and improved project



More than a rig ... built by people, enabled by process, and powered by equipment

economics.

Additional field results further highlight Nabors' consistent execution in Oman.

In a recent drilling campaign completed in March 2026, a well was delivered in just 20.41 days versus 23.48 days planned, achieving delivery

3.07 days ahead of schedule.

The operation was completed with zero harm, zero NPT (non-productive time), demonstrating that Nabors delivers far more than drilling equipment, but integrated performance, safety leadership, and execution certainty.

These results are part of a broader trend: Between 2021 and 2026, Nabors Oman has drilled over 1 million ft of conventional wells while reducing average drilling time per well from 22.82 days to 17.40 days.

Another milestone was delivered South of Oman with a well reaching

a total depth of 14,621 ft in just 13.9 days, saving 4.42 days against plan.

The campaign also established a new footage-per-day benchmark of 1,048 ft, while achieving the best 2026 drilling performance in both the 8.5-inch section at an average of 166 ft per hour and the 5-7/8-inch section at 153 ft per hour, demonstrating continuous improvement and operational consistency across campaigns.

However, a rig is only part of the equation, and behind every successful delivery is the expertise of the people, the discipline of processes, and the strength of equipment, powering every step: 'Built by people, enabled by process and powered by equipment', because it takes more than a rig to deliver.

CONTINUOUS IMPROVEMENT THROUGH TECHNOLOGY

Central to Nabors' advancements are digital tools such as the SmartROS® rig operating system and the RigCLOUD® digital platform, which provide real-time data visibility, enhance decision-making, and improve operational control.

These technologies reduce manual interventions and non-productive time, contributing to safer and more efficient drilling operations.

Nabors and Halliburton's ground-breaking collaboration is transforming drilling operations in the Middle East.

Together, the two industry leaders are deploying their suite of advanced automation and digital technologies, including the Nabors' SmartROS® rig automation technology, and the RigCLOUD® digital platform alongside Halliburton's LOGIX™ automation and remote operations.

These integrated solutions have already proven their success in Halliburton's operations in Iraq and Oman, delivering improved drilling efficiency, and greater overall performance.

Further strengthening regional manufacturing capabilities, Canrig secured the API 8C license in Dubai, enabling full top drive manufacturing locally.

Building on this achievement, the team recently completed the first Top Drive manufactured in the UAE under Canrig's API 8C certification, a significant milestone that reinforces local manufacturing strength and enhances support for drilling operations across the region.

Canrig® Top Drives are engineered to enhance drilling safety, reduce operational risk, and optimise performance.

Available in a wide range of configurations, from 275-tonne to 750-tonne units, they deliver exceptional durability and torque performance across applications, from newbuild AC rigs to retrofit installations.

Complementing this, Canrig's



Nabors sets new benchmarks in drilling

15,000 sq m advanced manufacturing facility in Dammam plays a pivotal role in supporting Saudi Arabia's in-country value strategy.

The facility supports new builds, repairs, recertification, and upgrades for both Canrig and third-party equipment, and has recently delivered 8+ PC4000 and 11 PC8000 Automated Power Catwalks, with expansion to wheeled units planned by 2026.

This milestone reflects the expertise, dedication, and collaboration of the teams who continue to advance Canrig's manufacturing capabilities in the region.

ONE PROVIDER, MULTIPLE SERVICES

The acquisition of Parker Wellbore has enabled Nabors to offer an integrated service model encompassing drilling, tubular running services, machine shops, rentals, fishing services, and pressure control.

This 'one provider, multiple services' approach simplifies project execution for customers by reducing interfaces and costs while fostering strategic partnerships focused on value creation.

Beyond performance and integration, Nabors remains committed to sustainability and responsible operations.

Initiatives such as energy-efficient technologies and emissions monitoring systems are helping reduce the environmental footprint of drilling activities, aligning with Oman's broader energy transition goals.

By combining operational excellence with environmental responsibility, Nabors is supporting a more sustainable future for the industry.

As Nabors continues to build on its momentum in Oman, the focus remains clear: Delivering consistent, high-performance outcomes while advancing digital transformation, safety, and sustainability across operations. ■

Geoscientists partner on new approach to find commercial natural hydrogen sources

Even developing a small portion of hydrogen-producing geological formations could make a meaningful contribution to the low-carbon energy transition, Jonathan Watson tells **OGN**

THE need to find and transition to climate-friendly energy sources has seen attention increasingly shift to hydrogen ecosystems – a resource that can store up to three times more energy than oil.

Natural hydrogen, also known as “white gold” or “geologic” hydrogen, has emerged as a potentially commercially viable source, nevertheless the first large scale commercial-level discovery of natural hydrogen is yet to be made.

Metatek, a worldwide leader in geological exploration, has recently partnered with Natural Hydrogen Consultants Limited (NHSG), a specialist consultancy in natural hydrogen exploration, with a multidisciplinary team with backgrounds in conventional oil and gas and mineral exploration, supporting efforts to accelerate the race to find this resource.

By combining new technologies and insights, this partnership aims to enable successful future drilling programmes.

In an exclusive interview with **OGN** energy magazine, Jonathan Watson, Head of Interpretation and General Manager at Metatek, shares insights on this promising solution, as well as its challenges and opportunities in energy transition.

Why is it so challenging to find natural hydrogen?

Natural hydrogen exploration is still in the early stages. To date, only a small number of deep wells have been drilled specifically to target natural hydrogen, with much emphasis on near surface exploration and legacy oil and gas wells.

Successful exploration depends on variables including its generation rates and the ability of the subsurface to allow the accumulation and preservation of hydrogen in the gas phase, hence new exploration strategies need to be designed to explore for gas phase hydrogen at depth.

Natural hydrogen exploration faces additional challenges: Geophysical conditions complicate transport and storage, whilst identifying suitable source rocks and securing economic viability and licences to operate has delayed its adoption and driven up costs.

This is further complicated by potential climate impacts.

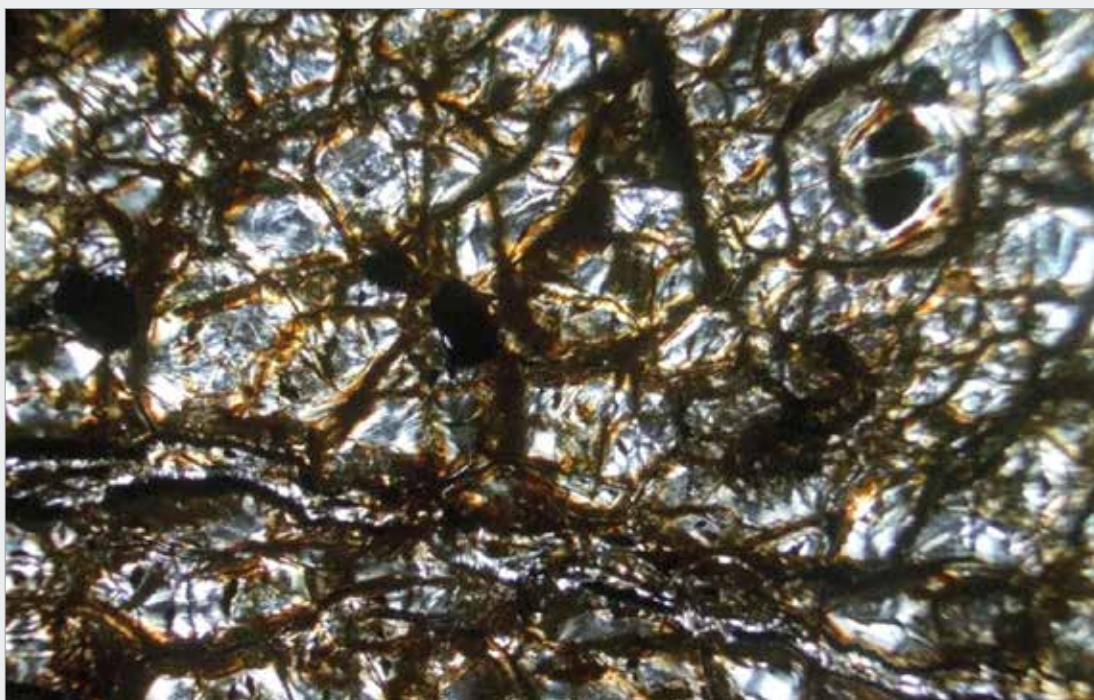
Because hydrogen reservoirs may contain methane, there is a risk that if it is not properly filtered during extraction, the methane could escape and persist in the atmosphere, contributing to global warming.

The use of start-of-the-art technology plays a key role in the field's exploration by identifying reservoirs through 3D modelling and mapping, saving both time and money.

How does your partnership with NHSG offer a new approach?

This collaboration aims to identify commercially viable subsurface hydrogen accumulations.

We're able to integrate NHSG's expertise in oil, gas, and mineral exploration, including its proprietary Hy-Eval® tool for hydrogen yield assessment, with Metatek's leading geophysical and multiphysics imaging and modelling technologies



Microscopic view of a fractured rock matrix showing a dense network of interconnected microcracks and mineral veins



Jonathan Watson

to create new exploration approaches.

Between us, we have the capabilities to offer new insights into the field and what constitutes a high-potential source rock, supporting more targeted exploration. Crucially, Hy-Eval can be used to evaluate the generation of hydrogen in the gas phase – critical for commercial development.

We have gained a clearer understanding of the key characteristics of high-potential hydrogen source rocks, enabling the development of integrated geological-geophysical workflows and proprietary technologies to evaluate subsurface protoliths and identify exploration targets in diverse geotectonic settings.

What's unique about your technologies and insights?

At Metatek we have developed tools for acquiring

both land and airborne high-resolution data, including enhanced full tensor gravity gradiometry (eFTG), with exclusive access to the latest generation of this technology – scalar gravity and magnetic and LiDAR data.

eFTG is the world's most advanced and highest-resolution airborne gravity gradiometry technology, providing geological insight and accuracy from near-surface through to deep basement.

Likewise, NHSG has proprietary technology that is unique in the market.

Its Hy-Eval tool can evaluate potential hydrogen generation in temperatures from 25-400 deg C.

At higher temperatures, serpentine minerals become unstable, and hydrogen production by fluid rock interaction is effectively negligible.

What factors could determine the commercial viability of natural hydrogen resources?

Natural hydrogen is produced within the Earth via a number of geological processes.

One of the most important is serpentinisation, in which underground water interacts with iron-rich rocks producing hydrogen.

Unlike industrial hydrogen, natural geologic hydrogen forms and is stored in underground rock formations, with some rising to the surface.

Methane released during extraction can be filtered whilst burning hydrogen may reduce the amount that would otherwise escape to the surface and the atmosphere.

Geologic hydrogen can be commercialised through a range of models depending upon the location, production capacity and market scale (local-regional developments and large-scale global operations).

Its effectiveness and commercial potential depend on the development of hydrogen resourc-

es with sufficient marketable quantities to attract potential investors.

These variables are measured against three parameters: Production rates sufficient to justify investment in infrastructure; hydrogen purity levels that meet market value requirements; and reserves with a high likelihood of commercial recovery under current economic and operational conditions.

Tell us about some of the joint studies you've worked on in recent years.

Aside from our recent natural hydrogen work, the NHSG/Metatek teams have collaborated on several conventional oil and gas exploration projects, including an offshore Morocco study conducted as part of the Ocean crust exploration project.

This research addressed key questions surrounding exploration on oceanic crust, namely source rock occurrence, thermal history and structural development.

Have you already supported any commercial projects?

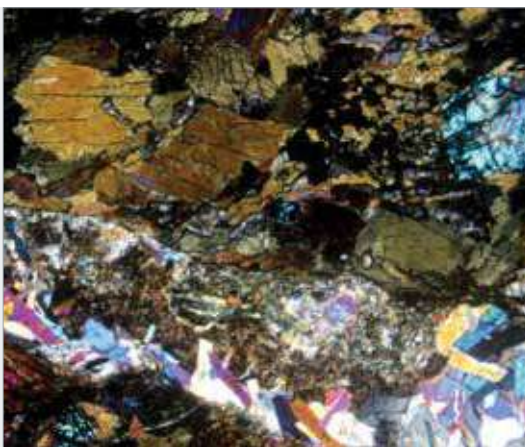
Yes, the NHSG/Metatek partnership has supported a project in the UAE for client RAK GAS in an exploration programme in the region that aims to study potential generation of hydrogen that is retained within the Semail Ophiolite.

This work has resulted in the identification of two hydrogen plays in the region: Natural hydrogen generated from deep underground rocks that have been cracked or deformed by strong forces; and hydrogen accumulated in fractured carbonates beneath the ophiolite.

This project involved the reprocessing and interpretation of legacy FTG data, geological fieldwork and data sample collection and analysis, providing new insights into the hydrogen system.

Metatek recently acquired a Magneto-telluric (MT) survey that provides data to assist in constraining the geometry of the ophiolite body in preparation for shallow drilling.

These studies will pave the way for the next phases and exploration and evaluation of natural



Typical view illustrating the serpentine network of yellow brown-hued sub-planar serpentine veinlets and relict clinopyroxene

hydrogen opportunities in the region.

How close do you think we are to making a big discovery?

In the past six months, several exploration wells have been drilled by companies, including Kolo-ma, Max Power, Gold Hydrogen, HyTerra and La Française De L'Energie (FDE).

While hydrogen has been observed in these recent wells, drilling only provides evidence of hydrogen in solution in the groundwater and no definitive free gas reservoirs have been tested.

Exploration for natural hydrogen in the subsurface remains in its infancy, but efforts and spend on exploration is increasing, with several new companies actively driving exploration forwards.

We believe that with the right exploration strategies, and a clear understanding of the processes by which hydrogen is generated and migrates in the subsurface, a discovery will be made.

What role do you think natural hydrogen could play in the energy transition?

In energy transition, it's important to consider the social and economic impacts, and to reduce risks for investors to ensure a successful and afford-

able shift to clean energy.

For natural hydrogen, this will require a rigorous environmental monitoring framework to track impacts and ensure regulatory compliance.

The village of Bourakébougou in Mali is, so far, the only location in the world currently extracting white hydrogen, with documented production of around 1,500 cu m per day (approximately 0.1 tonnes of hydrogen daily), representing the possibility of the region to generate electricity.

Studies suggest that even developing a small portion of hydrogen-producing geological formations could make a meaningful contribution to the low-carbon energy transition.

Progress in geologic hydrogen exploration will depend on where major finds are discovered, the availability of suitable infrastructure, and appropriate technology to access. ■



NHSG scientists on site of natural hydrogen exploration project

Innovar Solutions achieve record debris recovery in Oman

INNOVAR Solutions Middle East, in collaboration with Falcon OFS, completed a tubing-conveyed perforation clean-out operation in a deep horizontal well in Oman, retrieving a record 44.96 kg of metal debris in a single bottom hole assembly run.

"The operation addressed the critical challenge of post-perforation clean-up, which is vital for maintaining wellbore integrity and maximising reservoir productivity while ensuring absolute wellbore cleanliness," Qamar uz Zaman, General Manager - Innovar Solutions Middle East, tells *OGN* energy magazine.

"By achieving total retrieval within a single run, the operation demonstrated high efficiency and seamless coordination to support the energy sector in Oman with verifiable performance," he says.

According to a technical report from Innovar Solutions, the joint operation deployed four Innomag IM 27L HD 15AM heavy-duty string magnets, which are specifically engineered for high-capacity recovery inside 4 1/2-in tubing.



About 45 kg of metal debris was retrieved in a single bottom hole assembly run

These clean-out tools feature a maximum outer diameter of 2.63 in, a minimum inner diameter of 1 in, a fish neck outer diameter of 2 in, and a length of 1,540 mm.

Constructed from AISI 4145 body material, each 22.5-kg tool possesses a tensile yield strength of 86,000 pounds, a torsional yield strength of 1,470 ft-lbs, and is equipped with six magnet ribs.

The mechanical configuration allows for a flow-by area of 7.45 sq in inside a 4 1/2-in, 12.6-pound-per-ft casing, utilising a 1.5-in AMMT pin-by-box connection with a recommended make-up torque of 950 ft-lbs.

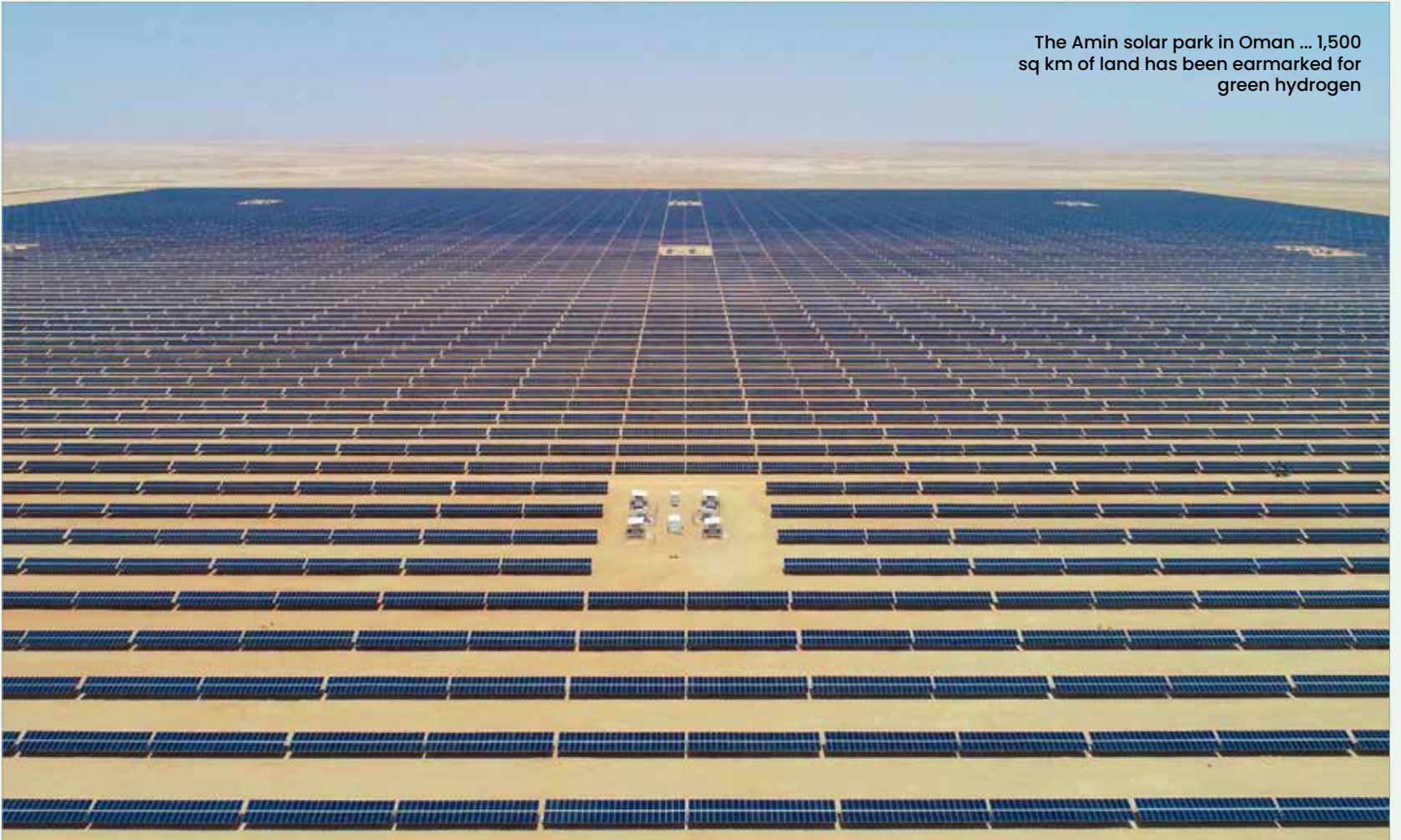
Operationally, the tools are rated for a maximum rotation of 150 revolutions per minute and possess an individual swarf capacity of 9 kilograms per tool.

The successful collection of 44.96 kg of metal debris across the four deployed tools confirms that the string magnets operated at near-maximum capacity to deliver cleaner wells, better performance, and stronger flow assurance. ■

Mena hosts largest clean energy pipelines as global financing doubles in pace

Regional partnerships, blended finance architectures, and targeted regulatory alignment remain absolutely essential to convert vast project pipelines into capital backed operational realities, James Schofield tells **OGN**

The Amin solar park in Oman ... 1,500 sq km of land has been earmarked for green hydrogen



BY ABDULAZIZ KHATTAK

THE Middle East and North Africa (Mena) is emerging as one of the world's most important growth regions for clean industry financing, with 84 announced projects representing \$642 billion in potential investment across clean fuels, fertilisers, steel, and aluminium.

The growth comes as clean industry plants globally are securing finance at the fastest pace on record, with 19 projects worth \$43 billion reaching final investment decision in the past six months alone, double the pace of a year earlier.

The scale of Mena's opportunity is highlighted in a new report, 'Clean Industry Rising: the foundation of resilient value chains', from Mission Possible Partnership, supported by the Industrial Transition Accelerator (ITA) and published alongside the latest Global Project Tracker.

In an exclusive interview with **OGN** energy magazine, James Schofield, Deputy Director, ITA, says: "Mena countries have the advantage of being able to draw on proven policy and regulatory instruments already tested in other markets to activate domestic demand in turn providing a level of revenue certainty."

Following are excerpts from the interview:

Despite a massive \$642 billion pipeline, only a



James Schofield

minimal fraction has reached a final investment decision (FID). What barriers are preventing regional developers from converting this pipeline into capital-backed, operational realities?

From a structural perspective, one of the key priorities is ensuring the rapid scaling up of affordable, reliable, and accessible renewable electricity

for industrial users.

While significant progress has been made across regional electricity markets, further action is needed to expand renewable energy deployment, strengthen grid access, and establish long-term mechanisms that provide the price certainty required to underpin investment decisions in low carbon industrial production.

This is particularly important as exporters seek to comply with evolving international regulatory frameworks, including access requirements for European markets.

Measures, such as carbon pricing, green public procurement, low carbon product standards, building regulations, and policies supporting the availability and uptake of sustainable feedstocks can help create the enabling conditions needed to unlock investment and accelerate market development.

The EU ReFuelEU Aviation mandate introduced in 2023 has already resulted in a sharp increase in sustainable aviation fuel projects reaching final investment decisions, with global capacity more than doubling in the last two years, demonstrating a clear supplier framework.

On the macroeconomic side, high sovereign and country risk ratings make external debt financing expensive, as international lenders price in a risk premium.

Access to private capital remains limited across most of the region outside the GCC.

Geopolitical and security conditions in specific corridors, such as North Sinai, have also directly stalled project development in otherwise resource rich areas.

The key fact remains that the region does hold a vast pipeline of projects, including many sustainable aviation fuel and chemicals projects, with the potential to create new clean industrial plants that can serve domestic and international markets.

How can Mena nations effectively compete for international private equity when global project tracker data confirms that China absorbed over 60 per cent of all clean industry FIDs in the last six months?

While GCC markets attract international private equity due to high sovereign credit ratings that reduce perceived risk premiums, the broader region faces challenges where weaker ratings make the business case harder.

For non-GCC markets, the critical lever is the blended finance architecture, utilising programmes like the Climate Investment Funds, multilateral development bank facilities, and platforms like TIDIP to provide first loss guarantees, concessional tranches, and credit enhancements.

This architecture improves the risk return profile sufficiently to attract private capital that would not otherwise deploy in these markets, as demonstrated by the Altera fund, which leverages concessional capital from the UAE to attract major institutional investors, such as Brookfield and BlackRock, because the blended structure makes the economics viable.

In parallel, strong policy signals build confidence and open opportunities for contracting offtake to unlock investment.

Given the capital-intensive nature of flagship regional developments, what specific risk-mitigation frameworks must Middle Eastern sovereign wealth funds introduce to satisfy international lenders?

A range of bundled de-risking tools can provide catalytic solutions.

Marsh, through ICIEC reinsurance, has already structured tailored political risk insurance (PRI) policies for solar projects in Egypt that catalysed significant equity injection, this model is replicable.

Furthermore, blended finance structures, such as first or second loss facilities and concessional loans, directly improve risk return profiles for commercial lenders.

Finally, export credit agencies, such as Germany's Euler Hermes, provide vital credit guarantees on senior debt tranches into higher risk jurisdictions, as demonstrated in the Neom Green Hydrogen Project, complemented by structural market incentives, carbon credits, and direct grants.

Since domestic markets lack localised carbon pricing mechanisms to mandate adoption, how can regional producers guarantee long-term off-takers for high-premium products like green steel or clean fertilisers?

Producers must capitalise on mature export markets like the EU, where the Carbon Border Adjustment Mechanism (CBAM) creates structural pricing advantages for zero liability regional commodities over grey competitors.

This regulatory environment, combined with exceptionally low levelised renewable energy costs from abundant solar resources, renders long term export agreements commercially credible, giving



The global clean energy industry is securing finance at the fastest pace on record

Credit: Juan Roballo/Shutterstock

regional producers a genuine competitive advantage to capture significant market share.

Given that the global surge in SAF investments is heavily reliant on binding Western regulations, are regional projects strictly dependent on foreign regulatory compliance to remain bankable?

Bankability represents strategic positioning rather than dependency, as geographical advantages and massive domestic transit hubs in Dubai and Abu Dhabi create a robust commercial foundation.

Growing corporate pressure regarding emissions ensures that near term regional demand remains an absolute high probability.

Does heavy reliance on foreign technology agreements and international off-takers leave Mena's export hubs commercially exposed if Western trade priorities or subsidy frameworks shift?

The global industrial transformation fosters deep commercial interdependencies rather than isolated exposure.

Because international technology deployment and green sourcing require mutual collaboration across geographies, diversifying the partner base across European, Asian, and Gulf off-takers effectively mitigates policy risks.

How can geographically adjacent Mena nations prevent a value-destructive regional subsidy war as they simultaneously target the exact same import markets in Europe and Asia?

Nations must strengthen regional industrial cooperation frameworks to maximise comparative advantages and prevent duplication.

Integrating cross border supply chains allows countries to capitalise on localised feedstocks, such as utilising regional cooking oil to support processing capacities in adjacent nations.

One such platform is the Integrated Industrial Partnership for Sustainable Economic Development (IIPSED), which brings together the UAE, Qatar, Egypt, Oman, Bahrain, and Türkiye.

How vulnerable are the region's high-capital assets to the intense localised geopolitical shocks and maritime disruptions detailed in the report?

Geopolitical risk cannot be entirely eliminated, but utilising comprehensive insurance structures and robust contractual frameworks allows active international investors and lenders to manage and price these profiles effectively.

To what extent will the execution of Mena's project pipeline remain reliant on Chinese supply chains, and does this compromise the "supply chain resilience" that the report champions?

MENA's clean-industry pipeline is China-enabled, but there is no reason for it to become China-dependent by design.

The resilience test is not whether Mena can avoid China altogether; it is whether MENA can use Chinese participation to build optionality: Local assembly, regional manufacturing niches, workforce capability, critical-mineral processing, diversified suppliers, non-Chinese technology partners, robust MRV systems, and bankable long-term offtake structures.

KAPSARC's work on GCC-China critical-minerals collaboration points in this same direction.

The Carboun institute critical-minerals brief is even more explicit: MENA is unlikely to replicate China's full-spectrum dominance, but it can target competitive niches, such as low-emissions mining, selective refining, and integration with regional renewable manufacturing.

Mena can build resilience through diversification and localisation at the margins that matter most, including critical spares, grid equipment, battery packs, selected electrolyser components, mineral processing, certification, O&M capability, and alternative supplier relationships.

Given Mena's strategic position along global maritime trade routes, what immediate infrastructure mandates must regional governments enact to ensure their ports do not fall behind the global clean fuel transition?

Governments must align rapidly with international emission reduction strategies whilst maintaining collaborative, open policies with leading maritime operators.

Providing structured incentives for bunkering infrastructure, retrofitting, and fuel storage attracts vital private capital, ensuring substantial long term revenue returns to the region. ■