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Energy markets and geopolitics

FORTIFYING ENERGY INFRASTRUCTURE AND SUPPLY CHAIN RESILIENCE IN A FRAGMENTED WORLD

As global energy markets face increased geopolitical uncertainty and volatility, the need for a secure, stable and resilient energy future has never been more important. ADIPEC has launched this **Energy markets and geopolitics** series to provide market insights into the impact of the ongoing conflict on global energy markets and the way forward for the industry.

The series provides decision-makers with informed analysis, helping the industry navigate disruption, assess risk, and identify pathways to resilience in an increasingly complex energy landscape.

Thought leadership

Building resilience: why energy infrastructure is the new industrial imperative

As global energy markets navigate a period of supply uncertainties, the state of energy infrastructure and supply chains has transitioned from a policy objective to a critical industrial imperative. The current volatility has demonstrated that resilience cannot be achieved through emergency measures alone; it requires a structural overhaul of how nations prioritise infrastructure and manage supply chains. In this interview, H.E. Tarek El-Molla, former Minister of Petroleum and Mineral Resources, Egypt, provides a pragmatic framework for this transformation.

H.E. El-Molla advocates for a "realism-first" approach for the industry, emphasising that while the expansion of renewables and storage technology is important, the reliability of baseload hydrocarbons remains the bedrock of industrial stability. From the strategic role of LNG infrastructure to the collaborative efforts of the industry, he outlines a roadmap for fortifying infrastructure and supply chains against future shocks.

> "Security is about more than just emergency reserves; it is about a balanced energy mix and infrastructure capabilities."

H.E. Tarek El-Molla, former Minister of Petroleum and Mineral Resources, Egypt

Thought leadership

Your Excellency, we are witnessing a global shift where energy security has reclaimed the spotlight. From your perspective, how has the current landscape changed the way nations must prioritise their energy infrastructure and supply chains?

Energy security is now the absolute priority. We have seen how geopolitical conflict forces countries to take drastic measures. Initially, the release of strategic petroleum reserves (in March) — coordinated by the IEA and various nations — helped lower oil prices after they spiked to nearly US$120. But security is about more than just emergency reserves; it is about a balanced energy mix and infrastructure capabilities. We are seeing an accelerated path to increasing capacities in thermal, nuclear, and renewables. Technology must now play a lead role in optimising every molecule and improving consumption efficiency to shield economies from the inflation and GDP impacts of volatile pricing.

In a world of fragmented supply chains, what specific strategies do you recommend for building energy infrastructure that is truly resilient for the next decade?

Resilience requires a marriage of incentives and realism. While energy transition is the buzzword, the reality is that we haven't seen sufficient funding or encouragement from investment banks to meet the goals. We must be realistic: we will never stop needing oil and gas for baseload power. At the same time, we need strategies that offer accelerated incentives for businesses to invest in new energies such as solar, which is the most efficient entry point. A resilient system is one that integrates renewables, advanced storage and battery technology while maintaining a strong, optimised foundation of hydrocarbons.

> "A resilient system is one that integrates renewables, advanced storage and battery technology while maintaining a strong, optimised foundation of hydrocarbons."

How do you see the evolving role of natural gas in strengthening energy security and diversifying the global energy system? Why is the Eastern Mediterranean a strategic factor in this regard?

The world has agreed that natural gas is the "accepted" transition fuel. The Mediterranean basin is now a focal point for supermajors because of its existing, high-quality infrastructure — our LNG plants, extensive pipeline networks, and deep-water ports. We are seeing a new level of collaboration between Egypt, Cyprus, Israel, and Greece. Whether it's connecting Cypriot gas to Egyptian facilities or exploring new frontiers in Libya and Algeria, the Eastern Mediterranean is the future of energy for Europe. This isn't just about electrification; it's about the molecules needed for fertilisers and petrochemicals that keep the global economy running. ■

Fortifying energy infrastructure and supply chain resilience in a fragmented world

Executive summary

Global energy systems are entering a structurally new phase defined by the primacy of energy security and systemic resilience over cost optimisation. In an increasingly fragmented geopolitical environment, energy infrastructure is being redefined as a strategic asset, with chokepoints, supply chains, and industrial capacity functioning as core determinants of national and regional power.

This shift is driven by the high concentration of global oil and LNG flows through a limited number of maritime corridors, where disruptions can rapidly propagate through pricing, logistics, and supply security. In response, states and producers are pursuing a dual-track strategy: reinforcing hydrocarbon-based systems while simultaneously scaling electrified and digital energy infrastructure.

At the same time, the system is becoming more fragmented and multipolar, with growing reliance on regional energy hubs, redundancy mechanisms, and alternative routing infrastructure. Industrial supply chains are also emerging as a parallel layer of vulnerability, characterised by long lead times, supplier concentration, and capacity constraints.

Together, these dynamics point to a transition away from a globally optimised energy system toward a more complex, multi-layered architecture defined by redundancy, optionality, and geopolitical control over infrastructure.

> “Global energy policy has entered an era of energy realism, in which energy security and systemic resilience have overtaken cost optimisation as the dominant decision framework.”

The year of energy realism

Global energy policy has entered an era of energy realism, in which energy security and systemic resilience have overtaken cost optimisation as the dominant decision framework. In an increasingly fragmented geopolitical environment, energy systems are being redesigned around reliability, redundancy and control over critical infrastructure. Infrastructure is therefore no longer viewed as a neutral technical network of pipes, wires, and grids, but as a strategic asset that underpins national security and geopolitical leverage.

This shift is driving a dual-track system strategy: reinforcing and securing existing hydrocarbon-based energy security while simultaneously scaling investment in electrified and digital energy systems. Global energy investment, which exceeded US$3 trillion in 2025, increasingly prioritises grid reinforcement, domestic production capacity, redundancy, and security of supply. This marks a clear departure from a previous policy era defined by cost minimisation and the optimisation of efficiency gains.

The central policy question is now centred on a new narrative: not what is cheapest, but what remains reliable under disruption.

76%

Of global oil supply is transported via maritime routes

20%

Of global shipping tonnage is accounted for by tankers

Infrastructure as geopolitical leverage

A major reason for the new energy realism framing is the fact that energy infrastructure has emerged as a core determinant of global power distribution. Around 76% of global oil supply (~80 million barrels per day) is transported via maritime routes, making a small number of shipping corridors critical to global energy stability. Tankers (used for transporting oil, chemicals, and LNG) account for nearly 20% of global shipping tonnage, which underscores the dependence of the global energy system on constrained maritime infrastructure.

This concentration creates systemic chokepoint vulnerability, where localised disruptions propagate rapidly through global pricing, inventory cycles, and expectation-driven market repricing. Key maritime arteries, such as the Strait of Hormuz, the Bab el-Mandeb, and the Suez Canal, serve as critical pressure points within this system.

Empirically, the consequences of disruption are immediate and

systemic. During the 2021 Suez Canal blockage, an estimated US$9.6 billion of trade per day was disrupted, including 9% of crude oil and 8% of LNG flows transiting between Asia, Europe, and the Middle East. More recently, the Red Sea crisis reduced Suez-related traffic by around 50% in early disruption phases, forcing widespread rerouting around the Cape of Good Hope and significantly increasing voyage times, freight costs, and insurance premiums, particularly for oil and LNG cargoes.
As a result, infrastructure is no longer a passive conduit of trade, but an active mechanism of geopolitical leverage and risk transmission. Control over, or exposure to, these corridors increasingly shape alliance structures, regional security postures, and pricing power across energy markets.

The bypass strategy and infrastructure redundancy

Faced with chokepoint exposure, states and producers are actively developing redundancy architectures and bypass strategies. However, the global system remains structurally constrained.
The Strait of Hormuz (~20 mbpd) remains the most critical global oil chokepoint, including LNG exports from Qatar and the UAE. The Bab el-Mandeb Strait (4–9 mbpd) connects the Indian Ocean to the Red Sea corridor, and the Suez Canal and SUMED pipeline (~5 mbpd combined) form the northern gateway to Europe. Together, these chokepoints represent systemic single points of failure in global energy logistics.
Existing bypass infrastructure provides only partial mitigation. Only ~3.5–5.5 mbpd can bypass Hormuz via alternative pipelines. This remains far below the ~20 mbpd transiting the Strait of Hormuz.
Key bypasses include Saudi Arabia's East–West Pipeline (Petroline), Egypt's SUMED pipeline, and the UAE's Fujairah export terminal system, which function as continental "pressure release valves" enabling partial rerouting of flows during disruption events.

407 MTPA

Reached in the global LNG trade in 2024

~3.5-5.5 mbpd

Can bypass Hormuz via alternative pipelines

The central implication is that resilience does not come from avoiding chokepoints entirely, but by layering redundancy, flexibility and control across the system — accepting higher structural complexity as the cost of energy security.

Dual-track energy system: hydrocarbons and electrification

The structural response to chokepoint exposure is not about route substitution but about expanding the system into a dual-track architecture.

On the hydrocarbon side, LNG has become a central balancing mechanism in an increasingly fragmented system. Global LNG trade reached 407 million tonnes in 2024, which reflects continued expansion under tight supply conditions and rising regional divergence. LNG demand is expected to grow by over 50% by 2040, driven primarily by Asian import growth, fuel switching away from coal, and declining domestic gas production across multiple regions.

Crude oil remains the dominant physical vector of global energy trade, with approximately 80 mbpd transported via seaborne routes, reinforcing the importance of maritime chokepoints in global energy logistics. The coexistence of oil and LNG flows through the same constrained corridors amplifies systemic exposure to disruption, as a single geopolitical shock can simultaneously affect multiple energy carriers.

In parallel, the electrification of end-uses is accelerating as a second structural layer of the system. Global grid investment is projected to exceed US$600 billion annually by 2030, driven by electrified transport, industrial electrification, cooling, and rapidly expanding digital energy demand, particularly data centres and AI-related load growth.

This creates a system in which hydrocarbon logistics and power infrastructure evolve side by side, rather than sequentially.

50%

The percentage that LNG demand is expected to grow by 2040

US$600 bn

The amount that global grid investment is projected to exceed by 2030

Multi-molecule infrastructure evolution

As systems expand rather than transition, infrastructure itself is becoming multi-molecular. Assets originally designed for oil or gas are increasingly adapted to accommodate hydrogen, carbon flows, and future fuels.

Clean hydrogen demand is projected to reach around 150 million tonnes by 2030, while global carbon capture capacity has already exceeded 40 million tonnes of CO_2 annually, signalling early-stage scaling of new energy carriers.

This shift implies a structural transition

from static infrastructure optimisation to infrastructure optionality, where assets are designed for repurposing across multiple energy systems over time.

Hydrocarbon supply chains: structural concentration risk

Beyond physical transport corridors, hydrocarbon systems face additional vulnerability in upstream and midstream supply chains. Critical components such as subsea systems, LNG liquefaction modules, and high-pressure compressors are highly specialised, capital-intensive, and produced by a limited number of global suppliers concentrated in the US, Europe, and East Asia.

This creates manufacturing bottlenecks that mirror physical chokepoints, where supply constraints arise not from resource scarcity but from manufacturing capacity limits and long lead times, which are typically up to 24 months for major components, and several years for full offshore developments. The result is a structurally rigid system in which responsiveness to demand shocks is constrained by industrial bottlenecks rather than geological availability.

In response, governments and firms are increasingly embedding energy security into industrial policy through supplier diversification, localisation of manufacturing, strategic stockpiling, and vertical integration of supply chains.

40 MTPA

Of CO_2 already exceeded annually in global carbon capture capacity

150 MTPA

The demand that clean hydrogen is projected to reach by 2030

Strategic convergence: ADNOC as a system example

ADNOC offers a practical illustration of how these dynamics converge at the corporate level. Its infrastructure resilience is anchored by a Fujairah-linked export system that bypasses the Strait of Hormuz, reducing exposure to a key global chokepoint. This is reinforced by industrial localisation via the In-Country Value programme, which expands domestic manufacturing capacity and reduces external dependency, alongside investments in hydrogen and CCUS. At the same time, ADNOC is investing in carbon management, capturing around 1.5 million tonnes of CO_2 annually, with plans to scale this to up to 10 million tonnes per year by 2030, embedding carbon management into its long-term operating model.

Overall, this reflects a broader strategic shift: energy resilience is increasingly defined not by individual fuels, but by integrated control over infrastructure, supply chains, and emerging energy systems.

The strategic imperatives for 2026 and beyond

Infrastructure is emerging as the central determinant of energy security in a fragmented global energy system. As energy markets shift from efficiency to resilience, control over infrastructure, supply chains, and critical transit routes increasingly defines national security and economic power. In this era of energy addition rather than substitution, the most resilient actors will be those that operate simultaneously across hydrocarbons, electrified systems, and digital energy networks integrating molecules, electrons, and intelligence into a coherent strategic architecture capable of absorbing disruption rather than avoiding it.

1.5 MTPA

Of CO_2 captured annually by ADNOC as part of their carbon management investment

Sources and acknowledgments:

ADNOC; Argus Media; Atlantic Council; EIA; GECF;

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