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The Hormuz crisis exposes a hidden vulnerability in the energy transition

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Dear Editor,

The Strait of Hormuz links major Gulf energy producers with global markets, making it a critical chokepoint in energy trade. In 2025, around 20 million barrels of oil and 112 billion cubic meters of LNG passed through the strait each day, accounting for roughly one-quarter of global seaborne oil trade and one-fifth of LNG trade.[1] Major exporters, including Saudi Arabia, Iraq, Kuwait, Iran, Qatar, Bahrain, and the United Arab Emirates, depend heavily on this route. Only Saudi Arabia and the United Arab Emirates have limited pipeline capacity to bypass the strait for crude exports, leaving most others with few alternatives. LNG dependence is also high, with around 93% of Qatar's and 96% of the United Arab Emirates' exports passing through the strait.[1]

In February 2026, the US-Iran war brought the Strait of Hormuz close to closure, turning this transport concentration into a global energy shock. Within a week of the crisis, shipping traffic through the Strait of Hormuz fell by 97%,[2] sharply disrupting oil and LNG flows. The supply shock quickly spilled into prices, with crude oil and LNG spot prices approaching twice their pre-war levels (Figures 1A-D). This disruption reinforced expectations that a Hormuz closure could accelerate the global energy transition, and some studies framed the crisis as an opportunity to reduce fossil-fuel dependence and advance clean-energy deployment.[3–6] Yet these transition incentives represent only one side of the crisis. Policy responses, industrial-chain disruptions and rising macroeconomic stress can simultaneously raise the barriers to clean-energy development, leaving the net effect on the transition far from unambiguous.

This letter examines the two-sided transition effects of the Hormuz crisis and what shapes their balance. The analysis shows that fossil-fuel shocks can strengthen transition incentives, while policy intervention, embedded material dependence and macroeconomic stress can simultaneously constrain clean-energy development. These countervailing forces expose a hidden vulnerability in the energy transition, leaving the net effect of the crisis uncertain.

A TWO-SIDED TRANSITION SHOCK

The Hormuz crisis can support the energy transition by strengthening both economic incentives and energy security. Tighter supply and higher prices raise fossil-fuel costs, improving the competitiveness of low-carbon options. For countries heavily dependent on Gulf oil and gas, expanding clean-energy sources can also reduce exposure to supply disruptions and price spikes. The result is a dual gain in economic benefits and energy security.

Yet the crisis can also hinder clean-energy development through several indirect channels (Figure 1E). One is policy intervention that weakens the price signal for the energy transition. Some governments have used fuel subsidies, tax relief and price caps to limit the pass-through of rising international oil prices into domestic energy prices.[7] China, for example, repeatedly limited increases in domestic fuel prices; Brazil expanded diesel subsidies and cut fuel taxes; and Japan capped average gasoline prices while subsidizing electricity and gas. These measures can ease short-term costs for households and firms, but they also dampen the transmission of the external shock through the domestic energy system. This partly offsets the crisis-driven economic incentives for transition.

A less visible constraint lies within clean-energy industrial chains. Clean-energy components and storage systems require large amounts of critical minerals, such as copper, cobalt, nickel, lithium and rare earths. Extracting and processing some of these minerals relies on sulfuric acid, produced from sulfur, an industrial by-product of oil refining and natural-gas processing. As a major oil- and gas-producing region, the Middle East has become a key center of global sulfur production. Disruptions to the strait tighten sulfur supply and raise sulfuric acid prices, with knock-on effects on mineral refining and processing. This can create input shortages for clean-energy components, raising both project costs and industrial-chain risks. The energy transition therefore retains an embedded material dependence on fossil fuels. Through industrial-chain linkages, the Hormuz crisis can translate this dependence into material bottlenecks for clean-energy development.

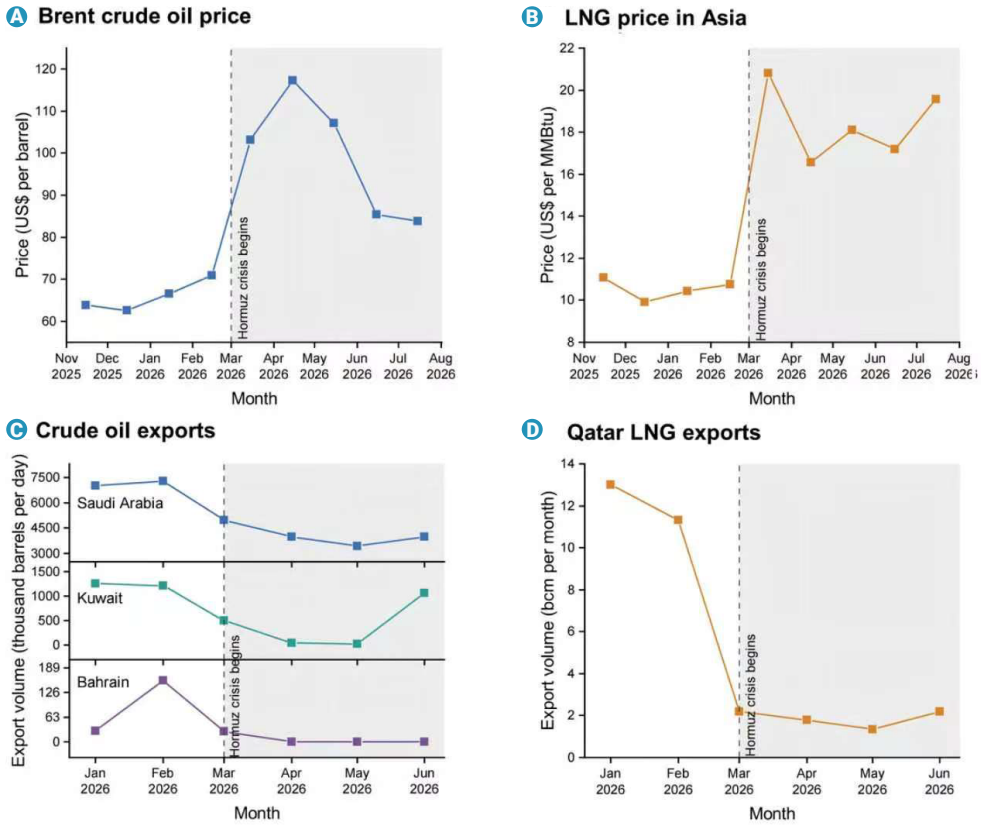
The Hormuz crisis can also raise the cost of clean-energy investment and deployment. Because clean-energy projects are capital intensive, they are particularly sensitive to financing conditions. The IEA estimates that a two-percentage-point increase in the cost of capital can raise the levelized cost of solar and wind power by around 20%.[8] The energy-price shock and inflation triggered by the crisis can intensify these pressures by raising transport, production and living costs while squeezing government fiscal space. Tighter financing and weaker investment capacity make clean-energy projects costlier, especially in macroeconomically stressed countries. This can ultimately slow the transition.

WHAT SHAPES THE NET EFFECT?

The net effect of the Hormuz crisis on the energy transition emerges from the interplay of the two-sided mechanisms and depends on several conditions, including crisis duration, shock exposure, policy response and energy-system resilience. Crisis duration shapes when and how strongly different mechanisms operate, making the overall effect potentially nonlinear. In the short term, energy shortages and higher prices emerge, strengthening incentives to substitute away from fossil fuels. As the crisis persists, however, its effects spread through industrial chains and the wider economy. Industrial-chain bottlenecks, inflation and financing pressures accumulate, raising clean-energy project costs and weakening or even offsetting the initial transition incentives.

Shock exposure shapes the strength of both positive incentives and negative constraints a country faces from the crisis, helping explain why its effects on the energy transition vary across countries.[9] The degree of shock exposure depends on a country's reliance on Gulf oil and gas, key transport routes and petrochemical inputs, as well as domestic energy endowment and clean-energy industrial capacity. Countries that depend heavily on Gulf oil and gas imports are more directly exposed to the energy shock, whereas those with abundant domestic energy resources or strong clean-energy industrial capacity may see more stable transition dynamics during the crisis.

A country's policy response affects the intensity and manner in which international energy shocks are transmitted to domestic markets. In response to rising global fossil fuel prices, some governments intervene to limit their pass-through to domestic consumers. Price caps, broad fuel subsidies and tax reductions can suppress energy prices, but they also weaken the transition incentives created by higher fossil-fuel costs. In contrast, targeted measures such as cash transfers, electrification support and assistance for vulnerable groups distort energy prices less and preserve more of the original price signal. The transition effects of the Hormuz crisis may therefore vary across policy regimes, depending on the type, design and objective of



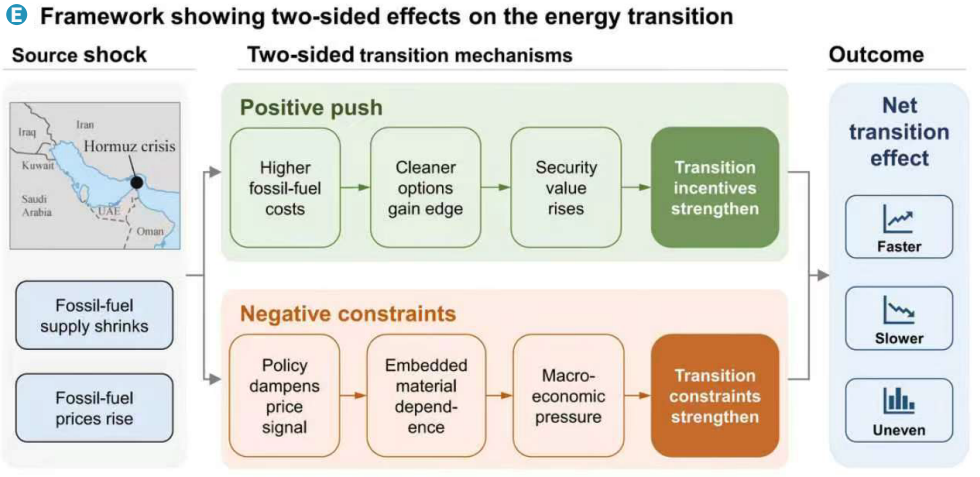


Figure 1. Summary of energy-market disruptions and two-sided transition effects of the Hormuz crisis (A) Brent crude oil price. (B) LNG price in Asia. (C) Crude oil exports from Saudi Arabia, Kuwait and Bahrain. (D) Qatar LNG exports. (E) Framework showing the two-sided effects of the Hormuz crisis on the energy transition. Crude oil and LNG price data are from the US Energy Information Administration and the IMF Primary Commodity Prices database, respectively. Export data are from the Joint Organizations Data Initiative.

government intervention.

Energy-system resilience also shapes the net effect, but different forms of resilience can work in different directions. Stronger fossil-fuel supply resilience can cushion the short-term impact of oil and gas shortages, yet it may also reduce the pressure and incentive to accelerate the transition. By contrast, stronger clean-energy industrial-chain resilience, underpinned by domestic production, diversified supply, material inventories and recycling, can ease constraints from critical-input shortages and rising costs.

KEEPING THE TRANSITION ON TRACK

First, crisis-response policies should ease pressure on households and firms while preserving, as far as possible, the transition price signals. Broad fuel subsidies, price caps and prolonged tax relief can quickly lower energy costs, but they also reduce incentives for electrification and clean-energy substitution. In comparison, targeted support for vulnerable groups and key industries can protect basic energy needs without broadly suppressing fossil-fuel prices or obscuring transition signals. Governments should therefore favor targeted support over broad subsidies, protecting incomes and essential energy needs rather than fossil-fuel prices.

Second, energy-security policy needs to expand. Traditional energy security focuses largely on fossil-fuel reserves, but the Hormuz crisis shows that this is insufficient. Energy-security policy should also cover clean energy and its industrial chains. Critical minerals such as copper, nickel and cobalt, together with chemical inputs such as sulfuric acid, are hard to substitute in clean-energy equipment production and underpin industrial-chain operation. Energy-security frameworks should therefore pay greater attention to vulnerabilities in clean-energy industrial chains and take targeted measures to strengthen strategic reserves, risk assessment and emergency preparedness at vulnerable points.[10]

Finally, clean-energy system resilience should be strengthened, alongside greater flexibility and adaptability in the associated industrial chains. To prevent a localized geopolitical shock from becoming a long-term bottleneck for the energy transition, dependence on single regions, transport routes or production pathways for critical inputs to clean-energy deployment should be reduced. On the one hand, supply pathways for critical inputs should be diversified through broader trade and transport routes, greater domestic production, larger inventories and stronger recycling. On the other hand, processes and technological innovation should also develop alternative production routes and reduce dependence on critical materials and specific processes.

Taken together, the Hormuz crisis is not necessarily a catalyst for the energy transition. Energy crises can strengthen economic and security incentives to reduce dependence on fossil fuels, but policy intervention can weaken these price signals, while shrinking fiscal space can limit the capacity to act on them. More importantly, critical inputs for clean-energy development still depend partly on industrial chains that use fossil fuels as feedstocks, leaving the energy transition partly embedded in the conventional fossil-energy system. Whether the Hormuz crisis becomes an opportunity for the energy transition will ultimately depend on how effectively these constraints are managed.

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AUTHOR CONTRIBUTIONS

Xiquan Zhao: Writing – original draft, Visualization, Formal analysis. Wei Chen: Conceptualization, Writing – review & editing, Supervision, Funding acquisition. Zhaoyuan Yu: Writing – review & editing, Funding acquisition. All authors contributed to and approved the final version of the manuscript.

DECLARATION OF INTERESTS

The authors declare no competing interests.

DATA AND CODE AVAILABILITY

All data in this paper are available upon request.