



SAUDI ARABIA

**SCALING HYDROGEN FOR
GLOBAL EXPORT LEADERSHIP**



OPEN **HYDROGEN** INITIATIVE



S&P Global
Commodity Insights

The Open Hydrogen Initiative includes a broad range of stakeholders who are collaborating to develop open-source protocols that will unlock hydrogen's potential to decarbonize energy-intensive sectors. It was developed by GTI Energy and S&P Global Commodity Insights.

GTI Energy is focused on developing, scaling, and deploying energy transition solutions that improve lives, economies, and the environment.

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Executive Summary

Saudi Arabia enters 2026 as one of the most consequential prospective suppliers in the global hydrogen market, distinguished by project scale, access to capital, and its established role in global energy trade. Hydrogen is positioned primarily as an export industry that can extend the Kingdom's energy-market role into lower-emissions fuels.

The strategy is structured across two parallel tracks at unprecedented scale. The renewable pathway is anchored by the USD 8.4 billion NEOM Green Hydrogen Company (NGHC) project, which combines 4 GW of dedicated renewable generation with hydrogen production and ammonia conversion. Construction reached 90% completion across all sites by April 2026 and has since transitioned to commissioning and energization ahead of first ammonia production targeted for 2027, positioning NGHC as the world's largest green hydrogen facility [1], [2].

The natural gas pathway builds on the Jafurah gas field and planned carbon capture infrastructure, including the Jubail CCS Hub. Together, these investments are intended to support large-scale production of hydrogen and ammonia from natural gas with CCS [3], [4].

Saudi Arabia's advantages are substantial: low-cost energy resources, sovereign-backed investment, established industrial clusters, and extensive export infrastructure. Key constraints are increasingly market- and systems-based—renewable deployment, certification, and the depth of international demand rather than access to capital or technical capability. On the blue side, commercial viability remains uncertain, as global demand for certified blue hydrogen has been limited by cost premiums, leading to some scaling back of ambitions [5]. NGHC has secured long-term project-level offtake through Air Products, which was finalized in August 2026 [1]. Saudi Arabia's broader export ambitions therefore depend on building durable buyer relationships in Europe and Asia.

Overall, Saudi Arabia is best understood as an export supply hub seeking to translate its existing energy strengths into a new low-emissions export market. Long-term leadership will depend on how effectively production, infrastructure, certification, and demand develop together.

Overview and Key Takeaways

OVERVIEW

Policy & Regulatory Support



Offtake & Demand Development



Technology & Innovation Capacity



Geographic Strategic Location



Economic Viability



Social License & Stakeholder Alignment



KEY TAKEAWAYS

Investors	Policy & Government	General Audience
Bankable flagship project: NGHC secured USD 8.4B in financing, including USD 6.1B in non-recourse debt from 23 banks, demonstrating strong lender confidence in Saudi Arabia's hydrogen model [6]. Low-cost blue hydrogen potential: Aramco's Jafurah gas field underpins blue hydrogen production at a target cost of ~USD 1.50/kg, among the most cost-competitive globally [4]. Key risk - offtake market depth: NGHC's 30-year Air Products agreement covers project production, while TotalEnergies and Yara provide additional downstream channels. The remaining question is whether Saudi Arabia can develop a deeper buyer base at commercially sustainable prices for future projects [1]. Key risk – renewable buildout gap: Renewable deployment remains well below target (13 GW achieved vs. 130 GW targeted by 2030), constraining broader green hydrogen scale-up [7].	Policy framework structure: Saudi Arabia's hydrogen strategy is embedded within Vision 2030 and the Saudi Green Initiative, providing strong political backing but limited standalone legislative durability. Certification gap: Saudi projects have made early progress on third-party certification, and NGHC's dedicated renewable generation positions it relatively well for key RFNBO electricity-sourcing requirements. The larger gap is the absence of a nationally recognized certification and Guarantee-of-Origin system. For natural gas-based hydrogen, independently verified methane emissions, capture performance, product carbon footprint, and permanent CO₂ storage remain particularly important. Demand signal constraints: The absence of a carbon price or domestic demand mandate limits policy-driven uptake, leaving hydrogen demand reliant on voluntary corporate strategies and export market pressure.	Flagship project and export ambition: Saudi Arabia is developing the world's largest green hydrogen facility at NEOM, with hydrogen converted primarily into ammonia for international shipment. The model treats hydrogen as an energy carrier that allows Saudi renewable resources to reach overseas markets. High potential, dependent on execution: The strategy leverages existing energy export infrastructure, geographic advantages, and strong capital backing, but scaling beyond flagship projects will depend on renewable buildout and sustained market demand. Economic transition question: Hydrogen is positioned as a pathway to extend Saudi Arabia's role in global energy markets, but its ability to meaningfully complement or replace oil revenues remains uncertain.

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National Strategy & Regional Positioning

Hydrogen within a Broader Energy Strategy

Saudi Arabia is one of the few major hydrogen-aspiring nations that does not have a standalone national hydrogen strategy or roadmap. There is no equivalent to Colombia's 2021 roadmap, Chile's National Green Hydrogen Strategy, or Germany's National Hydrogen Strategy. Instead, hydrogen policy is embedded across three overlapping frameworks: Vision 2030 (2016), the Saudi Green Initiative and its net zero 2060 commitment (2021), and the Circular Carbon Economy framework developed under Saudi Arabia's G20 presidency in 2020 [8]–[10].

This structure reflects a broader industrial strategy rather than the absence of government direction. Hydrogen is tied to economic diversification, domestic value creation, and the goal of sustaining Saudi Arabia's role as a global energy exporter while expanding into lower-emissions fuels [10]. In practice, that gives the sector strong political backing, but fewer hydrogen-specific market rules and sectoral milestones than countries with dedicated roadmaps.

Saudi Arabia has announced targets of 2.9 Mt/year of clean hydrogen production by 2030 and 4 Mt/year by 2035, alongside an ambition to capture a significant share of global blue hydrogen supply [3], [11]. However, these targets are not supported by detailed sectoral allocations or implementation pathways in public planning documents. Their achievability depends on uncertain factors, including demand for blue hydrogen at premium prices,

HYDROGEN POLICY & MARKET TIMELINE

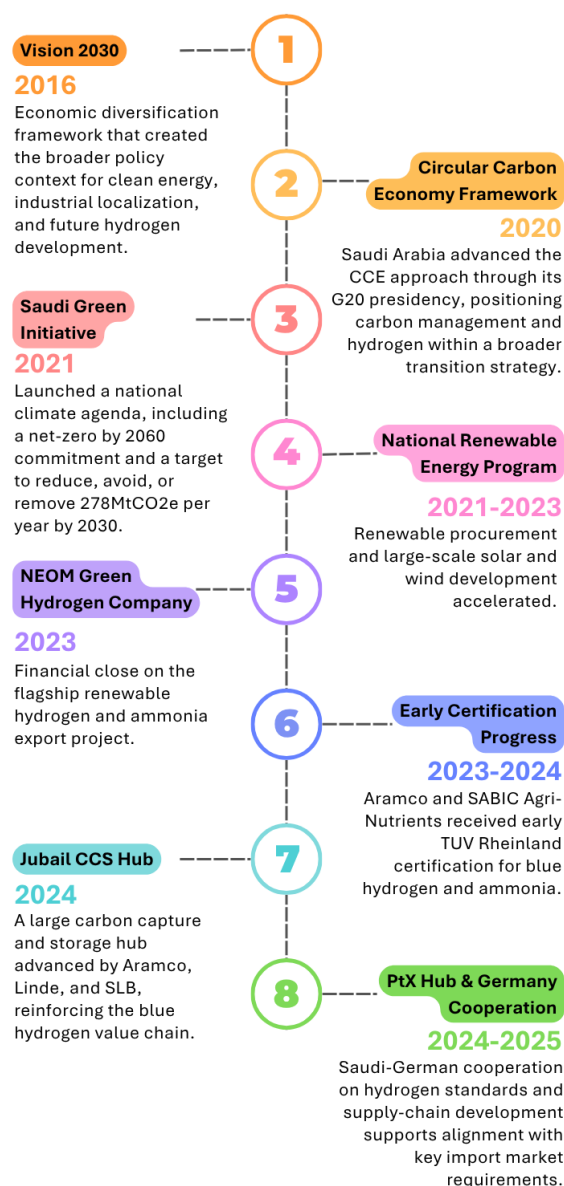


Figure 1. Hydrogen law, regulations and strategy timeline in Saudi Arabia [8]–[10],[13].

green hydrogen cost trajectories, and the pace of renewable energy deployment [12].

Saudi's Climate Commitment and the Strategic Paradox

Saudi Arabia's hydrogen strategy is closely linked to its broader climate commitments, but the alignment between the two remains complex. The country's 2021 NDC commits to reducing, avoiding, and removing 278 MtCO₂e annually by 2030, while the Saudi Green Initiative sets a net zero target for 2060 [9], [13]. For a major hydrocarbon-exporting economy, these commitments create a particularly important role for technologies that can lower domestic emissions while supporting industrial diversification.

Independent assessments nevertheless identify a gap between these goals and current policy implementation. The 2060 target is not yet supported by a detailed emissions-reduction pathway, and the NDC does not include emissions associated with exported fuels. Current policy therefore provides a strong strategic signal, but less certainty about how emissions reductions will be allocated across power, industry, transport, and the hydrocarbon sector over time.

This gap between ambition and implementation shapes the role hydrogen is expected to play. Saudi Arabia's climate framework links emissions reductions to continued hydrocarbon export revenues, creating a dual objective: lowering domestic emissions while maintaining its position as a major global energy supplier [10], [13]. Hydrogen is positioned within this context as a lower-carbon extension of the existing energy system rather than a full substitute for fossil fuels.

Industrial and energy system dynamics reinforce this trajectory. Large-scale investments in upstream gas production, including the Jafurah field, underpin the blue

hydrogen pathway and support long-term feedstock availability. At the same time, green hydrogen development is concentrated in export-oriented projects rather than domestic decarbonization applications. As a result, hydrogen deployment is driven more by export strategy than by internal emissions reduction requirements.

Certification and emissions accounting are therefore central to the credibility of Saudi Arabia's hydrogen exports. In the absence of comprehensive domestic carbon pricing, methane reporting, and legally binding emissions pathways, demonstrating lifecycle emissions performance will require robust project-level verification and alignment with international standards.

Positioning Saudi in the Regional Context

Structural Positioning: What the Evidence Shows

Saudi Arabia occupies a distinct position in the global hydrogen landscape. It is best characterized as an export-oriented energy incumbent: a country seeking to extend an established role in global energy trade into lower-emissions fuels. Its hydrogen system is centered on large, state-backed projects and international markets rather than domestic demand mandates. This orientation is consistent across policy and investment decisions. Domestic demand matters as a potential anchor, but the primary drivers are export strategy, existing trade relationships, and state-backed industrial capacity.

Cost Competitiveness and Structural Advantages

Saudi Arabia's production advantages are both real and specific. On the blue hydrogen side,

low-cost natural gas from the Jafurah field (~USD 1.50/kg H₂), existing CCUS infrastructure, and established ammonia export facilities provide a strong cost and infrastructure base [4]. On the renewable side, high solar irradiance, strong wind resources in the northwest, experienced project developers, and access to low-cost capital through state-backed entities support large-scale deployment [14], [15]. These advantages position Saudi Arabia among the most cost-competitive potential hydrogen producers globally.

Peer-reviewed modeling supports this cost advantage, although results vary by assumptions and project scale. At utility scale, modeled renewable hydrogen costs are approximately USD 3.27/kg at NEOM and USD 3.44/kg at Yanbu, while natural gas-based hydrogen with 90% carbon capture is modeled below USD 1/kg under Saudi conditions [14]. Smaller off-grid renewable systems remain more expensive [15]. The important point is not a single cost estimate, but the combination of low feedstock costs, scale, and financing that can place Saudi projects toward the lower end of global cost ranges. Cost competitiveness, however, does not necessarily translate into bankable demand.

Scale Gap Between Targets and Deployment Capacity

Saudi Arabia's production targets require a scale of renewable deployment that has not yet been reached. The Kingdom targets 130 GW of renewable capacity by 2030, while reported deployment and current projections remain materially below that ambition.

NGHC is partly insulated from national grid constraints because it uses dedicated renewable generation. Future renewable

hydrogen expansion, however, depends on broader wind and solar buildout, creating a gap between flagship project delivery and system-wide scale. The more consequential test is whether this accelerating renewable pipeline can support additional hydrogen developments beyond NGHC. Faster procurement, transmission expansion, and long-term offtake will determine whether projects such as Yanbu can replicate the flagship model.

Commercial Pathway: Export-Led from the Outset

Saudi Arabia's hydrogen strategy is export-led from the outset rather than built around phased domestic adoption. This model leverages existing energy infrastructure and long-standing trade relationships, particularly in Asia.

Hydrogen is also better understood here as an intermediate energy carrier than as the final traded product. NGHC converts renewable electricity into hydrogen and then ammonia because ammonia provides a more established pathway for storage and ocean transport. Driss Berraho, Head of Green Hydrogen Business Development at ACWA Power, describes the underlying objective as extending the reach of Saudi renewable resources to markets that cannot access the electricity directly.

The tradeoff is greater exposure to external market conditions. Buyer willingness to pay, certification requirements, shipping economics, and import policies can all affect project viability even when production costs are competitive.



We need to bring [green hydrogen] down to a level of cost that makes it basically unavoidable.

DRISS BERRAHO
Head of Green Hydrogen - Business Development,
ACWA Power, Saudi Arabia | Interview on "The
Hydrogen Leader Podcast"

Demand Constraints vs. Export Ambition

The commercial case for Saudi green hydrogen faces a demand-side constraint that has received insufficient attention in the promotional narrative. NGHC's 30-year offtake agreement with Air Products covers all production — on paper, this resolves the buyer problem entirely. In practice, Air Products must resell that ammonia internationally, and the company has struggled to find buyers willing to pay the green premium. TotalEnergies was the only confirmed major international end-buyer as of early 2026 [16]. As of August 2026, Air Products confirmed that Yara International had finalized a marketing and distribution agreement to commercialize the portion of NGHC ammonia not cracked into hydrogen by Air Products for European markets, partially resolving the downstream placement gap. The TotalEnergies and Yara agreements together provide clearer commercial coverage for NGHC's planned output, though the terms and pricing of the Yara arrangement have not been publicly disclosed. Fraunhofer ISE's Jan Frederik Braun has stated directly that 'Aramco is struggling to find buyers for its blue hydrogen

due to high costs' [3]. For a country whose hydrogen strategy is premised on large-scale export from day one, the pace at which buyer relationships have developed underscores the difficulty of the commercial environment—a challenge that regional neighbors have addressed more quickly: Oman's ACME Duqm project secured a long-term binding Yara offtake for 100,000 tonnes per year of green ammonia in March 2024, well before NGHC's downstream placement was resolved [17].

This creates a structural tension: Saudi Arabia has the capacity to produce at scale, but global markets for low-carbon hydrogen and derivatives are still developing. Without sufficient buyer commitment at required price levels, project expansion beyond initial developments may be constrained.

Industry perspectives suggest that demand formation depends on more than buyer willingness alone. Berraho argues that demand becomes viable when producers can offer large volumes at competitive prices, while Dr. Al-Shaal, Lead Technologist at King Fahd University of Petroleum and Minerals, emphasizes certification and receiving infrastructure as additional conditions for buyer commitment. Taken together, the interviews suggest that the commercial bottleneck sits across the full value chain rather than at the production site alone. Berraho states that the goal is to bring green hydrogen costs down to a level that makes adoption “basically unavoidable.”

KPI Comparison: Saudi Arabia vs. Regional Peers

Figure 2 compares Saudi Arabia with the UAE, Oman, and Qatar—regional producers developing export capacity for overlapping

Asian and European markets. The figures should be interpreted directionally because policy definitions, project scopes, and target methodologies differ across countries.

The Regional Competitive Landscape

Saudi Arabia's most direct hydrogen competitors are its immediate Gulf neighbors, each of which is developing export capacity on the same shipping corridors, targeting the same Japanese, South Korean, and European buyers, and racing to secure the same offtake agreements and certification approvals. Yemen sits on the same Red Sea coast but is not a competitor in any commercial sense: active conflict since 2015 has reduced its electricity sector to near-collapse and precludes any meaningful energy investment horizon.

UAE: Institutionally Ahead, Competing for the Same Markets

The UAE has moved further on formal hydrogen regulation. Its 2023 National Hydrogen Strategy sets explicit production targets, while the Low-Carbon Hydrogen Regulatory Framework and early certified ammonia exports provide a more structured policy and investment environment [18]. The UAE is also developing integrated industrial hubs that combine production, processing, logistics, and export infrastructure, giving investors a clearer view of how projects will connect to the wider energy system.

Saudi Arabia retains advantages in scale and feedstock cost, but the UAE's more developed regulatory architecture may provide greater contract certainty for early buyers.

	Saudi Arabia 	U.A.E. 	Oman 	Qatar 
 Development model	State-backed scale-up	Institution-led industrial hubs	Auction-led private development	LNG-linked export model
 Primary pathway	Renewable + natural gas	Renewable + natural gas	Primarily renewable	Primarily natural gas
 Commercial signal	Mega-project led	Early certified exports	Long-term offtake traction	Existing LNG customer relationships
 Policy/regulatory position	Enabling strategy, less formalized framework	Formal H ₂ framework	Transparent land allocation and auction model	Uses existing gas-sector framework
 Certification / offtake status	Early progress, limited confirmed buyers	Strong early market alignment	EU-oriented offtake conditions	Limited H ₂ -specific certification progress
 Domestic demand	~2.5 Mt/yr	~0.8 Mt/yr	~0.3 Mt/year	~0.9 Mt/yr
 Strategic differentiator	Low-cost, export-oriented scale	Buyer confidence and contract clarity	Competitive private-sector green pipeline	Gas infrastructure and indirect export flexibility

Figure 2. Key hydrogen economy indicators across the Middle East's principal markets.

The competition is therefore not simply about who can produce hydrogen most cheaply. It is also about which market can provide clearer certification, more predictable investment rules, and earlier alignment with the requirements of Japan, South Korea, and Europe.

[20]. Saudi projects are larger, but Oman's early buyer commitment demonstrates the value of pairing supply development with bankable demand. For Saudi Arabia, Oman is therefore a useful comparison: it has less scale and capital, but has moved quickly on market design and long-term offtake.

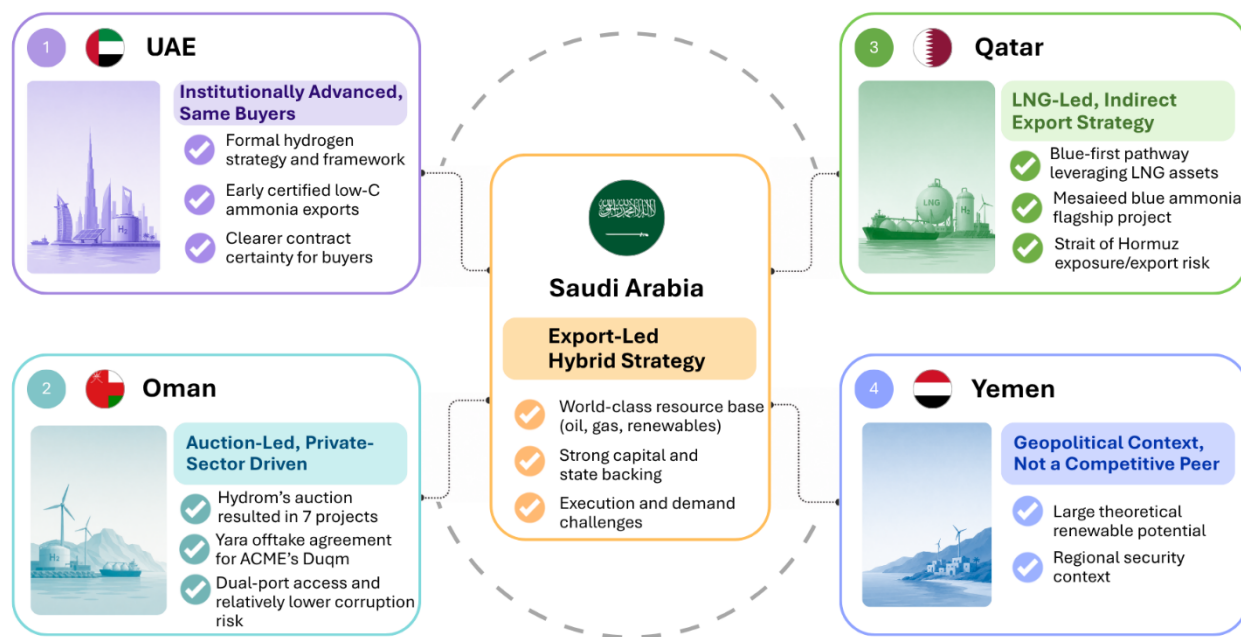


Figure 3. Competitive landscape showing key hydrogen economies in Saudi Arabia's vicinity.

Oman: The Underappreciated Competitive Threat

Oman represents a different model built around competitive auctions and private-sector-led development. Hydrom's land-allocation process has attracted a large pipeline of renewable hydrogen projects with access to both European and Asian shipping routes [19]. Rather than relying primarily on a few very large state-backed projects, Oman has used a centralized auction framework to create a portfolio of developer-led projects and clearer rules for land and infrastructure access.

The strongest commercial signal is the firm and binding long-term Yara offtake agreement for green ammonia from ACME's Duqm project

Qatar: Indirect Export Strategy via LNG

Qatar is not trying to build a domestic green hydrogen industry in the way Saudi Arabia or Oman are. Its strategy is structurally different: leverage LNG exports to enable importers — primarily in Japan, South Korea, and the UK — to produce blue hydrogen from Qatari LNG at their own facilities, rather than exporting hydrogen derivatives directly. This indirect pathway avoids the transport and liquefaction costs that constrain direct hydrogen export, and it builds on Qatar's existing position as the world's most trusted LNG supplier.

Qatar's structural constraint relative to Saudi Arabia is geography in one specific dimension: the Strait of Hormuz. Roughly 80% of Qatar's

LNG exports transit this chokepoint. Saudi Arabia's NGHC is on the Red Sea coast — outside the Strait — which gives it a material geopolitical advantage for European-bound cargoes in particular. Qatar is also not part of the IMEC corridor (India-Middle East-Europe Economic Corridor), which specifically includes Saudi Arabia and the UAE. For buyers seeking supply chain resilience, these are meaningful differentiators.

Yemen: Geopolitical Context

Yemen shares the Arabian Peninsula and the Red Sea coastline with Saudi Arabia and has exceptional theoretical renewable energy potential — solar irradiance of 1,800–2,200 kWh/m²/year, coastal wind speeds of 6–10 m/s, and a combined wind potential estimated at 308,000 MW [21]. Under stable conditions, Yemen's geography would make it a plausible future green hydrogen producer for the same European export corridors that Saudi Arabia is targeting. Under current conditions, it is not. The conflict that began in 2015 — in which Saudi Arabia has been a direct military participant — has destroyed more than half of Yemen's electrical infrastructure, left 40% electricity access rates, and produced the second-most fragile state ranking in the world (Fund for Peace Fragile States Index). Its relevance is primarily geopolitical, shaping regional stability and long-term strategic considerations rather than near-term competition.

Saudi Arabia's Distinctive Position

Within this competitive set, Saudi Arabia combines large-scale, state-backed project development with low-cost resources and established energy export infrastructure. Its flagship projects are larger than those of regional peers, and its Red Sea access provides a strategic advantage for some European-bound routes.

Its model is also more centralized and less formally regulated than some competitors. The UAE is ahead on regulatory architecture, while Oman has built a stronger auction-led private development model and secured early long-term offtake.

As the regional market develops, competitive positioning will increasingly depend on certification alignment, buyer confidence, and speed of commercial execution—not resource quality or project scale alone.

Qualification & Compliance Environment
Domestic Regulatory Framework

Saudi Arabia has strong institutional support for hydrogen development but a comparatively limited standalone regulatory framework. There is no dedicated hydrogen law, domestic carbon price, or comprehensive hydrogen certification system; projects instead operate through existing energy, industrial, investment, and special-zone institutions.

Instrument/Initiative	Status and Relevance
Vision 2030 (2016)	Framework document embedding hydrogen in economic diversification; no specific H ₂ targets or regulatory mechanisms
Saudi Green Initiative (2021)	Announced net zero 2060; 278 MtCO ₂ e/year reduction by 2030 NDC; green hydrogen referenced explicitly as a key mechanism. Not yet enshrined in law.

Circular Carbon Economy (CCE) Framework	G20-adopted framework (Saudi presidency, 2020) promoting CCS and carbon reuse as transition mechanisms; underpins blue hydrogen strategy; critics note it may delay fossil fuel phase-out.
National Renewable Energy Program (NREP)	Auction-based renewable procurement; 130 GW target by 2030; 13 GW achieved by 2025. NGHC uses dedicated off-grid renewables, not NREP.
No Standalone Hydrogen Law	Unlike Germany, Japan, or Chile, no dedicated hydrogen legislation. Projects proceed under existing energy and industrial investment frameworks
TÜV Rheinland Certification (2022)	Aramco and SABIC Agri-Nutrients received first-ever independent certifications for blue H ₂ and ammonia production, making it a global first-mover milestone for the blue pathway [22].
PtX Hub / Germany Partnership	Saudi-German collaboration on certification standards and hydrogen supply chain development; contributes to RFNBO alignment work [23].
No Carbon Price or Domestic H ₂ Mandate	No domestic carbon price, blending requirement, or green procurement standard. Domestic demand for low-carbon H ₂ is almost entirely voluntary or export-driven.
Jubail CCS Hub	Aramco/Linde/SLB partnership targeting 9 MtCO ₂ /year capture from Jubail industrial zone by 2027; central to blue hydrogen lifecycle GHG claims.
NEOM Regulatory Sandbox	NEOM operates under a special economic zone framework with significant regulatory autonomy, enabling NGHC to proceed outside standard Saudi permitting constraints.

Table 1. Saudi Arabia's hydrogen policy and regulatory architecture.

GHG Accounting: Domestic Capabilities vs. International Requirements

Saudi Arabia has made early progress on hydrogen certification. Initial certifications for natural gas-based hydrogen and ammonia demonstrate that Saudi projects can undergo international third-party verification, but a gap remains between these early certifications and the full requirements of major export markets.

For natural gas-based hydrogen, the key requirements are verified upstream methane emissions, high capture rates, and evidence of durable CO₂ storage. Peer-reviewed analysis shows how strongly lifecycle emissions depend on capture performance: modeled emissions fall from roughly 10.1 kgCO₂e/kgH₂ without CCS to about 2.8 kgCO₂e/kgH₂ at 90% capture [14]. That improvement is material, but the final lifecycle result also depends on upstream gas

emissions and how captured CO₂ is managed. Existing EOR-linked CO₂ management may require additional evidence to satisfy importing-market rules, while dedicated geological storage capacity is still developing.

The certification challenge differs across the two pathways. For renewable hydrogen, NGHC's dedicated generation places the project relatively well for requirements such as additionality and temporal matching. Dr. Al-Shaal identifies the more immediate gap as institutional: Saudi Arabia still lacks a national Guarantee-of-Origin and certification system that is broadly recognized by European buyers. Without one, producers may continue to rely on project-specific third-party verification, adding cost and complexity.

For natural gas-based hydrogen, the verification burden is more directly tied to measured lifecycle performance. Buyers need credible product carbon-footprint data covering

upstream methane emissions, actual capture rates, and the permanent storage of captured CO₂. Dr. Al-Shaal emphasized that verified operating data, rather than producer-reported assumptions or design specifications, will be particularly important for international acceptance.

Certification is therefore becoming a market-access function rather than simply an environmental reporting requirement. For renewable hydrogen, it affects eligibility for markets such as the EU. For natural gas-based hydrogen, credible measurement and verification determine whether buyers can treat the product as sufficiently low-carbon.

Demand Landscape

The Starting Point: Captive Industrial Demand

Saudi Arabia's hydrogen demand is currently concentrated in industrial applications, estimated at approximately 2.5 Mt/year and supplied almost entirely by gray hydrogen. Consumption is dominated by ammonia production, methanol, and refinery hydrotreating, with Aramco's refining system representing the largest share of demand [24]. This creates a substantial near-term opportunity for low-carbon hydrogen: substitution of existing supply at known industrial sites, rather than demand creation. The scale and concentration of this demand reduce early-stage commercial risk relative to smaller or more distributed systems.

Aramco's refining system and SABIC's Jubail operations are the largest demand centers. Facilities such as Jazan and the Jubail industrial cluster can absorb lower-emissions supply, and existing pipelines and industrial utilities can

reduce some integration costs. The challenge is not the absence of hydrogen demand; it is the absence of a strong economic signal requiring that existing conventional hydrogen be replaced with lower-emissions supply.

Policy-Created vs. Market-Driven Demand

Near-term demand for lower-emissions hydrogen is primarily market-driven rather than policy-mandated. It depends on corporate decisions, internal substitution economics, and export-market requirements rather than a domestic carbon price or hydrogen mandate.

Saudi Arabia currently has no carbon price, binding substitution requirement, or broad green procurement standard for hydrogen [25], [26]. Conventional hydrogen also benefits from low domestic energy prices, making voluntary substitution more difficult.

Market-driven demand is concentrated among a small number of state-linked companies, particularly Aramco and SABIC. This can support coordinated deployment because a small number of actors can make large procurement decisions and integrate hydrogen into existing industrial systems. It also creates concentration risk: demand growth depends heavily on corporate capital allocation, internal transfer pricing, and national industrial strategy rather than a broad set of independent buyers.

The practical implication is that Saudi Arabia has a large potential demand base but a weak policy signal for converting it to lower-emissions hydrogen. Without stronger incentives, carbon pricing, procurement requirements, or export-market pressure, domestic adoption is likely to remain incremental. This helps explain why the near-term strategy remains export-oriented even

though the country already consumes large volumes of hydrogen internally.

Downstream Sectors Most Likely to Drive Consumption

For export-oriented production, the relevant end market may be a derivative or downstream product rather than hydrogen itself. Ammonia, refining applications, steel, and synthetic fuels should therefore be treated as hydrogen demand pathways rather than assuming that hydrogen is always the final commodity traded. Across both the domestic and export demand picture, four downstream sectors stand out as the most likely near-to-medium-term drivers of hydrogen consumption in Saudi Arabia.

Petrochemicals and Ammonia

Petrochemicals and ammonia are the clearest near-term demand segment. SABIC's Jubail operations provide direct substitution opportunities, while planned blue ammonia capacity can leverage existing chemicals infrastructure and established export channels [3].

Oil Refining

Refining is another major captive market. Aramco refineries such as Jazan already use hydrogen for hydrotreating and hydrocracking, and the BHIG joint venture at Jubail is designed to supply lower-emissions hydrogen by pipeline. Without a carbon price, however, substitution remains dependent on corporate strategy.

Industrial Decarbonization: Steel and Cement

Steel and cement represent longer-term but potentially large demand segments. Hydrogen-based direct reduction could support lower-

emissions steel production and export-oriented green materials, but these applications remain earlier in commercialization and will depend on cost competitiveness and buyer demand.

Maritime Bunkering and Transit Fuels

Maritime fuels represent an emerging demand opportunity. Saudi Arabia's location along the Red Sea and major global shipping routes positions it as a potential hub for low-carbon bunkering fuels, including ammonia and methanol. Demand in this segment is driven primarily by international regulation and shipping sector decarbonization targets. While still developing, infrastructure decisions at major ports will play a determining role in capturing this market [27], [28]. Notably, Saudi Arabia was among the countries that opposed mandatory GHG charges on shipping emissions at IMO's MEPC 83 session in April 2025 — a position that sits in tension with its ambition to become a preferred supplier of low-carbon maritime fuels to the same international shipping market.

Supply Potential & Project Pipeline

The Resource Base

Saudi Arabia's hydrogen strategy is underpinned by a strong resource base across both renewable energy and natural gas. These assets support the dual-track approach to green and blue hydrogen development.

Utility-scale solar projects have achieved very low electricity prices, and site-level studies confirm strong solar conditions across the Kingdom [15]. Dhahran and other major industrial regions have strong solar resources, while NEOM's northwest location combines high solar availability with some of the country's best wind conditions. Wind is more

geographically concentrated, but the combination is valuable because solar-wind hybrids can improve electrolyzer utilization and reduce dependence on any single generation profile. This resource complementarity is one reason NEOM has emerged as the flagship renewable hydrogen location.

On the natural gas side, Saudi Arabia possesses one of the largest unconventional gas resources globally. The Jafurah field provides a low-cost feedstock base for blue hydrogen production, supporting competitive cost positioning. Existing and planned carbon capture infrastructure further reinforces this pathway. Operational facilities provide initial capture capacity, while planned expansions are expected to significantly increase total CO₂ management capability.

Taken together, these resources position Saudi Arabia as a structurally advantaged producer of both green and blue hydrogen. However, translating this resource base into large-scale production depends on the pace of renewable deployment, CCUS expansion, and integration with downstream infrastructure.

Saudi Arabia's Competitive Position

Structural Advantages

Saudi Arabia holds several structural advantages within the Gulf hydrogen market. On the blue hydrogen side, low-cost gas from the Jafurah field (~USD 1.50/kg H₂) provides a strong feedstock position, supported by existing CCUS infrastructure and established export capacity [4]. Peer-reviewed techno-economic modeling of blue hydrogen via steam methane reforming (SMR) confirms highly competitive production costs under Saudi conditions: SMR without carbon capture yields

hydrogen at approximately USD 0.53/kg, rising to USD 0.65/kg with 55% carbon capture and USD 0.90/kg with 90% capture, presenting certified low-carbon blue hydrogen and still among the lowest production costs globally [14], [15].

On the green hydrogen side, large-scale utility modeling finds levelized costs of hydrogen (LCOH) in the range of USD 3.27–3.44/kg at NEOM and Yanbu under optimal hybrid and solar-PV configurations, competitive within the global range for solar-driven green hydrogen [15]. Peer-reviewed sensitivity analysis confirms that green hydrogen LCOH in Saudi Arabia is most responsive to capital expenditure and the cost of electricity, with a 20% increase in CAPEX raising LCOH by approximately 15% for PV-based systems — meaning that scale-driven capex reductions carry disproportionate competitive weight as projects grow. Future cost reductions driven by electrolyzer learning rates are projected to be substantial: IRENA forecasts PEM electrolyzer CAPEX reaching approximately USD 200/kW by 2050, which would reduce green hydrogen LCOH at Saudi sites by 20–25% from current levels [14].

Saudi Arabia's advantage is not limited to resource quality. Berraho identifies the ability to mobilize land, streamline development, build at comparatively low construction cost, and raise large amounts of capital as important parts of the cost proposition. In his view, sovereign credit quality and experience financing large energy infrastructure are particularly important because hydrogen projects remain highly capital intensive.

Lastly, project scale is a key differentiator. The NEOM Green Hydrogen Company (NGHC) exceeds the size of most regional projects at financial close, supported by state-backed

developers with significant execution capacity. Saudi Arabia's Red Sea location also provides a geographic advantage for European-bound exports by avoiding transit through the Strait of Hormuz.

Structural Disadvantages

Saudi Arabia's primary constraints are institutional and market-based. Compared with the UAE, its hydrogen strategy is less supported by formal regulatory frameworks; compared with Oman, it has a thinner pipeline of distributed private-sector projects.

Renewable deployment below national targets also constrains expansion beyond flagship projects. Certification, buyer confidence, and the ability to translate state-backed ambition into a broader commercial market remain important uncertainties.

Expected Premium / Discount Drivers

For buyers, Saudi Arabia's pricing position reflects both structural advantages and potential premiums. Low-cost gas and strong renewable resources can reduce production

costs; project scale can lower unit costs; Red Sea routing can reduce some transit exposure for European-bound cargoes; and existing export infrastructure can limit new logistics investment. At the same time, third-party certification, less formal policy architecture, and limited downstream offtake may add risk or cost. Financing terms will also depend on whether future projects retain the level of sovereign or state-linked support available to NGHCC. Overall, Saudi Arabia is positioned as a low-cost, large-scale supplier, but delivered competitiveness will depend on the full system cost: renewable generation, construction, financing, conversion, certification, shipping, and infrastructure at the receiving end.

The Project Pipeline by Stage

Saudi Arabia's hydrogen project pipeline is concentrated and capital-intensive rather than broad. The largest developments are state-backed and relatively advanced, while the pipeline of smaller commercial projects remains thinner than Oman's auction-led model or the UAE's industrial clusters.

	Scale & Investment	Product	Location
Operational			
Aramco Hawiyah CCUS	800,000 tCO ₂ /yr captured; EOR injection; operational since 2015 [3]	Blue H ₂ enablement	Eastern Province
SABIC Jubail Carbon Capture	500,000 tCO ₂ /yr captured for chemicals use; operational [3]	Blue H ₂ enablement	Jubail
Jazan IGCC (Aramco)	USD 12B; H ₂ , steam, electricity for Jazan refinery complex [20]	Gray H ₂ (base for blue conversion)	Jazan
First Blue Ammonia Shipment	25,000 t blue ammonia to South Korea (2022); world's first commercial blue ammonia export [29]	Blue ammonia export	Jubail
Construction			
NEOM Green Hydrogen Company	USD 8.4B; 4 GW renewables; 600 tpd H ₂ ; 1.2 Mtpa ammonia; financial close May 2023; 90% complete; commissioning 2027 [1], [2]	Green ammonia export	NEOM/ Tabuk
Planning			
Jubail CCS Hub (Aramco/Linde/SLB)	9 MtCO ₂ /yr geological storage; target 2027; underpins Jafurah blue H ₂ [3]	Blue H ₂ enablement	Jubail

Jafurah Blue Ammonia Plant	USD 10B+; 1.2 MtPA blue ammonia; Aramco; no start date confirmed [3]	Blue ammonia	Eastern Province
SABIC Blue Ammonia — Jubail	1.2 MtPA; gas allocation secured; cost and timeline not public [3]	Blue ammonia	Jubail
BHIG Blue H ₂ Pipeline (Aramco/APQ)	Blue H ₂ via pipeline to Jubail industrial customers; Aramco 50% stake [3]	Blue H ₂ — industrial	Jubail
Yanbu Green H ₂ Facility	400,000 t/yr green H ₂ by 2030; government announced; no financial close [9]	Green H ₂	Yanbu
PIF Energy Solutions Company	USD 10B+ PIF vehicle for green H ₂ production; announcement pending as of 2024 [3]	Green H ₂ / derivatives	National

Table 2. Saudi hydrogen project pipeline by stage (sample projects selected for this table).

Trade Position & Infrastructure

The Geographic Advantage

Saudi Arabia occupies a strategically advantageous position for hydrogen export, located between its primary target markets in Europe and Asia. Its Red Sea coast provides access toward Europe through the Suez corridor, while Gulf ports connect to long-standing Asian energy trade routes.

Existing ports, including Jeddah, Yanbu, Jubail, and Ras Tanura, already handle large volumes of hydrocarbons and petrochemicals, providing a foundation for hydrogen derivatives. The Red Sea and Bab-el-Mandeb corridor also creates potential demand for future ammonia and methanol bunkering [27], [30].

Export Infrastructure: What Exists and What is Needed

Saudi Arabia can build on established chemical and energy export infrastructure at Jubail, Yanbu, and other major ports. Early hydrogen-derivative volumes may use adapted facilities, but larger trade flows will require dedicated terminals and expanded handling capacity.

This existing logistics base is an important advantage over new exporters that must build port, storage, and industrial infrastructure from scratch. However, Infrastructure requirements do not end at the Saudi port, as receiving-market infrastructure are an important constraint on trade growth. Dr. Al-Shaal points to import-terminal development in Japan and South Korea, while Berraho identifies ammonia handling, storage, cracking, and hydrogen delivery infrastructure in Europe as a major bottleneck.

This changes how Saudi Arabia's export advantage should be interpreted. The Kingdom can develop production and export infrastructure more quickly than destination markets necessarily develop the capacity to receive, convert, and distribute equivalent volumes. Commercial scale-up therefore requires coordination across both sides of the trade corridor.

Saudi Arabia's extensive desalination capacity reduces the water challenge associated with large-scale hydrogen production, but does not eliminate it. Dedicated water infrastructure remains part of project design, cost, and local resource planning.

Trade Relationships: Where Things Actually Stand

Saudi Arabia has signed MoUs and framework agreements with Germany (through the Saudi-German Hydrogen Partnership and PtX Hub), Japan (IEA-endorsed bilateral agreements; Aramco-METI collaboration), South Korea (Aramco/SABIC-KNOC; blue ammonia shipments), India, and others. Japan and South Korea have received actual commercial blue ammonia shipments [29], [31], [32].

The critical distinction is between project-level offtake and broader downstream market depth. NGHC's 30-year agreement with Air Products covers project production, while TotalEnergies and Yara provide additional channels for placing that output in European markets. The commercial question has therefore shifted from whether NGHC itself has an offtaker to whether downstream markets can absorb large volumes at commercially viable prices and whether that model can be replicated for subsequent Saudi projects.

Buyer requirements also differ by destination. Dr. Al-Shaal notes that European buyers place particular emphasis on renewable-origin traceability and RFNBO alignment, while Japan and South Korea have historically focused more heavily on verified lifecycle carbon intensity. Receiving infrastructure, including ammonia terminals and downstream conversion capacity, adds another layer to buyer readiness.

European mechanisms such as H2Global could provide another route to market by helping bridge the price gap for imported hydrogen derivatives. Saudi producers have not yet secured an H2Global award, but participation would provide a significant commercial signal for exports beyond NGHC.

Domestic Price Policies, Tariffs, and Competitiveness of Low-Carbon Hydrogen

Domestic hydrogen competitiveness is shaped as much by energy pricing and policy as by technology. Low domestic gas prices, the absence of carbon pricing, and localization policies can favor conventional hydrogen even as they support industrial investment.

The Energy Subsidy Structure: Gray Hydrogen's Structural Advantage

Saudi Arabia has long maintained administered domestic energy prices below many international market levels. Industrial natural gas prices rose to USD 2.15/MMBtu in 2025 after earlier increases, which is still a fraction of international spot prices and well below the USD 4–12/MMBtu range in most competing markets. At USD 2.15/MMBtu, Saudi SMR-based gray hydrogen can be produced at a cost of roughly USD 0.5–0.8/kg [14]. That cost base is a major advantage for existing refining and petrochemical users, but it also makes lower-emissions substitutes harder to justify on purely commercial grounds.

Under current assumptions, low-carbon hydrogen remains more expensive than conventional hydrogen produced from natural gas. Adding 90% carbon capture raises production costs, while renewable hydrogen remains several times more expensive.

Because Saudi industrial users also benefit from relatively low domestic natural gas prices, conventional hydrogen retains a strong cost advantage in refining and petrochemicals. Unless buyers are willing to pay a premium for lower-emissions hydrogen, or policy changes those economics, conventional hydrogen is

likely to remain the default for many domestic uses.

The IMF reports that fuel subsidies have declined as a share of GDP but remain significant, reinforcing this cost advantage for conventional energy [33]. Further price reforms could gradually narrow the gap, although the pace of reform must also account for industrial competitiveness, household energy costs, and broader economic priorities.

Import Tariffs on Hydrogen and Related Equipment

Saudi Arabia applies customs duties via the GCC Common External Tariff (CET), which sets a baseline rate of 5% on most industrial goods.

Hydrogen itself (HS code 2804.10) is subject to the standard 5% import duty when imported from non-GCC countries [34], [35]. Within the GCC — encompassing the UAE, Oman, Qatar, Kuwait, and Bahrain — goods trade is effectively duty-free under the GCC free trade arrangement, which means that if any Gulf neighbor were to develop surplus hydrogen production, intra-GCC trade would face no tariff barrier. For non-GCC imports, the 5% duty creates a modest but non-trivial cost layer on any imported green or blue hydrogen derivatives, though this is unlikely to be the binding constraint on

market development at current price levels.

More consequential for the hydrogen industry's supply chain are the tariffs on electrolyzer equipment and renewable energy technology. In July 2024, Saudi Arabia raised customs duties on certain electrical and manufacturing equipment from 5% to 15% — a localization-driven measure to protect domestic manufacturers [36]. For hydrogen project developers importing electrolyzer stacks, power electronics, and balance-of-plant equipment from international suppliers, this represents a meaningful cost increase. NGHC and other large state-linked projects are likely protected through government agency exemption mechanisms—the Saudi customs framework

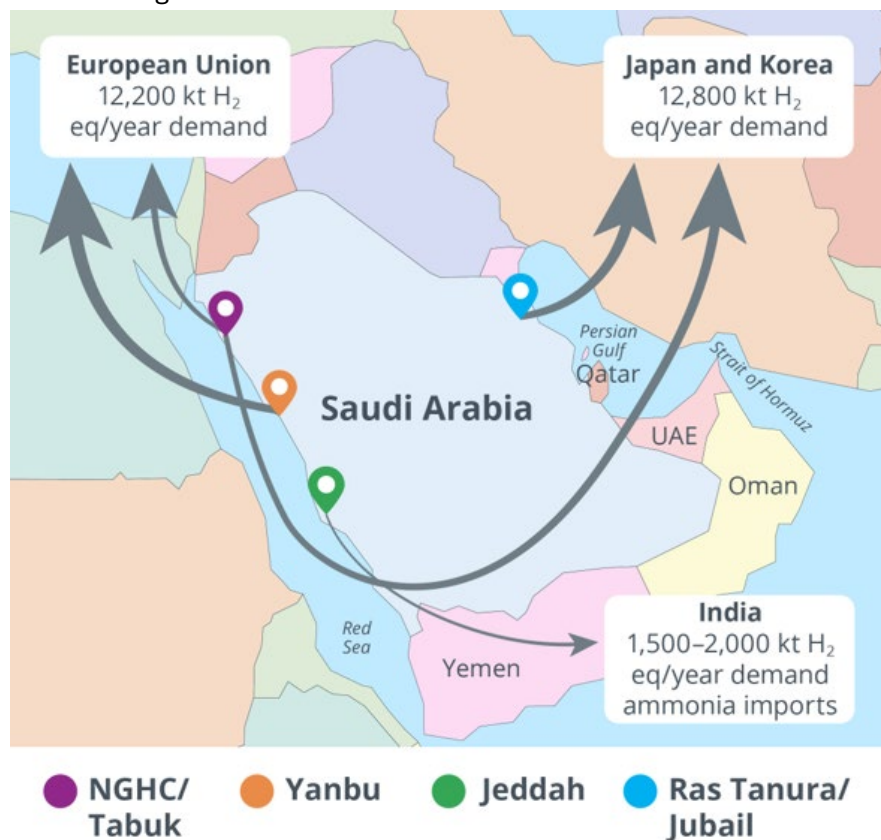


Figure 4. Potential export ports and associated export demand routes, based on port analyses results from the 2025 World Bank study “Winds, Waters, and Watts.” Demand estimates are based on a 2040 timeline.

provides duty exemptions for goods imported by government or semi-government entities and for raw materials destined for local manufacturing. Smaller private developers without state backing face the full tariff cost, which is a real barrier to the distributed, smaller-scale project development that Oman's private-sector model has demonstrated is achievable. VAT applies at 15% to most imported goods and services. Hydrogen and hydrogen equipment imports are subject to this standard rate; the zero-rated and exempt categories in the VAT regulations are a closed list, and none addresses clean energy or hydrogen technology. Exports of goods and services are zero-rated for VAT outside the GCC territory, which creates a clean incentive structure for the export side of the hydrogen equation — but does nothing to stimulate domestic demand [37].

No Carbon Price: The Missing Instrument

The single most consequential policy gap for domestic hydrogen competitiveness is the absence of any carbon pricing mechanism. Saudi Arabia has no domestic carbon tax, no emissions trading scheme, and no carbon levy on industrial emissions. Without a carbon price or comparable demand mandate, lower-emissions hydrogen must compete against conventional production largely through corporate strategy, export requirements, or other policy support. This is particularly important in refining and petrochemicals, where existing hydrogen is already integrated into facilities and priced against low-cost domestic gas.

Without a carbon price, the domestic economics of low-carbon hydrogen substitution in refining, petrochemicals, and steel depend entirely on Aramco and SABIC's internal transfer

pricing decisions and ESG commitments—both of which are subject to change across commodity and political cycles. The KAPSARC modeling confirms the consequence: under a carbon pricing scenario, domestic low-carbon hydrogen demand could reach approximately 3.2 Mt/year by 2034; without it, the trajectory is far more constrained [25]. Saudi Arabia's fiscal breakeven oil price of USD 85–95/barrel in 2026, well above current market prices, further compresses the political space for subsidy reform and carbon pricing in the near term, as the government faces pressure to preserve non-oil revenue and industrial competitiveness simultaneously.

The Localization Imperative and Its Dual Effect

Vision 2030's localization agenda, which requires renewable energy projects to meet domestic content thresholds, and preferentially allocates industrial gas feedstocks to projects with local manufacturing commitments, creates an ambiguous incentive for the hydrogen industry. On one hand, it drives investment into domestic electrolyzer manufacturing capability, local CCUS supply chains, and Saudi engineering services — all of which lower the long-run cost of hydrogen project development in the Kingdom. ACWA Power, SABIC, and Aramco have all been directed to develop local supply chains for key hydrogen components. On the other hand, the July 2024 tariff increases on imported manufacturing equipment effectively tax project developers who have not yet established local supply chains, creating a chicken-and-egg problem: localization is required for competitive economics, but the tariffs make the transition period more expensive. This is a solvable policy design problem, where targeted exemptions for

green hydrogen-related equipment are the standard international response, but Saudi Arabia has not yet implemented such a carve-out [36].

Overall Implication

Saudi Arabia's export positioning is supported by strong geography, infrastructure, and capital capacity. However, domestic market development is constrained by pricing structures and the absence of policy-driven demand signals.

As a result, the near-term hydrogen pathway remains export-led, with long-term dependent on both international demand formation and the evolution of domestic policy frameworks.

Market Access Constraints The Barrier Stack

Saudi Arabia's main constraints are increasingly commercial and institutional rather than technical. The most important are downstream market depth and import readiness, renewable deployment beyond dedicated projects, and credible certification across both renewable and natural gas-based pathways. These constraints interact: buyers are less willing to commit without certification and receiving infrastructure, while infrastructure investors are less likely to move without confidence in future volumes.

The Credibility Question

Saudi Arabia's hydrogen ambitions face a constraint that is less technical than institutional: international climate credibility.

Why it matters		Severity
 Downstream offtake	Institution-led industrial hubs	High
 Renewable buildout	Projected buildout remains materially below target, constraining expansion of green hydrogen beyond flagship projects.	High
 Certification and methane verification	No EU RFNBO aligned framework; lack of publicly available, system-wide methane emissions data. 3rd-party certification needed, increasing cost and complexity.	High
 Policy and market credibility	Net zero target lacks formal legal backing and a detailed implementation pathway. Limited transparency increases due diligence requirements for buyers	Medium-high
 Domestic pricing, demand signals	Subsidized domestic energy prices support low-cost gray H ₂ , reducing incentives for substitution with low-carbon alternatives. Reform remains politically sensitive.	Medium
 Geopolitical risk exposure	Export strategy is dependent on international demand, with evolving buyer preferences and energy security considerations introducing moderate uncertainty	Medium-low

Figure 5. Market access constraints in Saudi Arabia's hydrogen market.

The country is positioning itself as a major exporter of low-carbon hydrogen while simultaneously expanding oil and gas production capacity and maintaining a climate framework that explicitly links emissions reductions to continued hydrocarbon export revenues. Climate Action Tracker continues to rate Saudi Arabia's policies as "Highly Insufficient," and the Kingdom has opposed stronger fossil fuel phase-out language in international climate negotiations [26], [38].

This has direct commercial implications for hydrogen exports. Buyers evaluating long-term ammonia or hydrogen supply agreements must assess not only project-level economics, but also the credibility of lifecycle emissions claims, methane monitoring systems, and CO₂ storage permanence. These considerations increase due diligence requirements relative to jurisdictions with more established climate governance and transparent emissions accounting frameworks.

Saudi Arabia has the financial and technical capacity to strengthen these systems through better methane data, auditable CCS performance, and more transparent emissions accounting. Doing so could improve buyer confidence and reduce the risk that otherwise competitive projects are discounted because of verification uncertainty.

Development Pathway & Strategic Role

Saudi Arabia's hydrogen trajectory breaks into three phases, but the structure is different from a domestic decarbonizer like Colombia. Saudi Arabia is building toward export dominance from the outset, not transitioning from domestic use to export. The questions are scale and credibility, not sequencing.

Phase 1 (2021–2028): Flagship Demonstration

The primary commercial test in Phase 1 is no longer whether NGHC can secure project-level offtake. That structure is already in place. The test is whether first production can be delivered on schedule, whether downstream placement through Air Products, TotalEnergies, and Yara proves commercially durable, and whether destination-market infrastructure develops quickly enough to receive growing volumes. Earlier blue ammonia shipments to Asian buyers provide a parallel demonstration of existing export infrastructure and trade relationships [29], [32]. The planned expansion of CCS capacity will also determine how credible the natural gas-based pathway is for markets that require verified low lifecycle emissions.

The risks in this phase are commercial: securing the additional two-thirds of NGHC's production into binding offtake agreements before commissioning, and demonstrating that Air Products can deliver buyers rather than accumulating unsold inventory.

Phase 2 (2028–2035): Scale-Up and Market Share Consolidation

Phase 2 would expand beyond flagship projects into a broader portfolio serving Asian and European buyers. The Jafurah and Jubail developments could anchor the natural gas-based pathway, while additional renewable projects would depend on power-sector buildout and new offtake agreements. Trade mechanisms in Europe and procurement programs in Japan and South Korea could become increasingly important demand anchors during this phase.

This is also the period in which Saudi Arabia's renewable deployment gap either narrows or becomes a lasting constraint. Firm contracts, import-market certification, and additional renewable capacity will determine how much the pipeline can grow beyond NGHC. If renewable capacity expands more slowly than planned, Saudi Arabia may retain a large hydrogen role but with a greater weighting toward natural gas-based pathways.

Phase 3 (2035–2050): Global Hydrogen Superpower (Conditional)

By 2035–2050, Saudi Arabia could become a major global supplier if international demand grows at the scale envisioned. The solar and wind potential are sufficient; the CCS geology is favorable; the export infrastructure is in place. The conditionality is twofold: first, the global hydrogen market must develop at a pace that creates demand at the scale Saudi Arabia is targeting; second, Saudi Arabia must resolve

the certification and credibility challenges that currently prevent it from being treated as a first-choice supplier by buyers who have alternatives.

Long-term competitiveness will therefore depend on institutional infrastructure as much as physical infrastructure (verified methane reporting, independent CCS auditing, domestic carbon pricing, transparent NDC pathways). Countries that establish credible certification, monitoring, and verification systems early will be better positioned to access higher-value hydrogen markets. Those that do not may be forced to compete primarily on cost, which provides a less durable competitive advantage over time.

Implications for Global Trade

Saudi Arabia's hydrogen development matters globally because it tests whether an established energy exporter can translate existing capital,

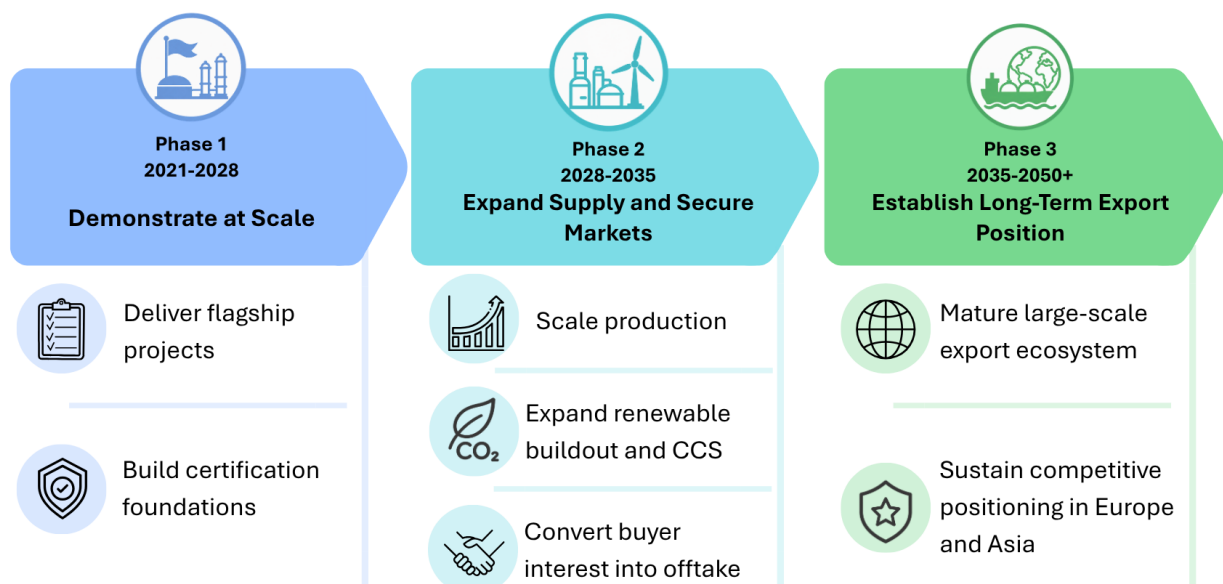


Figure 6. Saudi Arabia's phased hydrogen development pathway, from flagship project delivery and certification through production scale-up, market formation, and long-term positioning.

infrastructure, and trade relationships into a large-scale lower-emissions fuels business. It also tests whether those advantages can be extended across the full value chain, from renewable generation and gas supply through conversion, certification, shipping, import infrastructure, and final use. Its experience will be relevant well beyond the Gulf.

The Largest Single Supply Signal in the Global Hydrogen Market

NGHC is one of the clearest tests of vertically integrated hydrogen development at scale. Successful commissioning and downstream placement would provide an important reference point for project finance, production economics, ammonia logistics, and buyer confidence. It would also demonstrate whether very large projects can move from state-backed ambition to repeatable commercial deployment. If the model proves replicable, it could influence how other export-oriented countries structure integrated production and logistics projects.

The Test of Natural Gas + CCS in International Markets

Saudi Arabia's blue hydrogen program represents a critical test of the pathway's viability at scale. The key questions are operational: whether upstream methane emissions can be measured and maintained at levels consistent with international standards; whether captured CO₂ can be permanently stored and independently verified; and whether certified blue hydrogen can meet emerging requirements such as CBAM in the absence of domestic carbon pricing.

The outcomes in Saudi Arabia will shape how blue hydrogen is viewed in global markets. Demonstrated compliance would support its

role as a scalable export pathway for resource-rich economies. Failure to meet these standards would constrain its credibility and limit its contribution to international hydrogen trade.

The Credibility Externality

Saudi Arabia's position in international climate negotiations introduces an additional layer of complexity for its hydrogen export strategy. Long-term buyers, particularly in Europe, must weigh commercial agreements against broader policy and reputational considerations, including the alignment between supplier climate positions and their own regulatory and stakeholder expectations.

This dynamic does not preclude market participation, but it can influence the pace, structure, and risk allocation of offtake agreements. In practice, it represents a source of friction that may affect how quickly and under what terms large-scale hydrogen trade relationships are established.

Implications for Global Hydrogen Market Design

Saudi Arabia's trajectory will shape the global hydrogen market irrespective of how its climate commitments evolve. The country has the capital, geographic position, and institutional capacity to become a major exporter. The key question for Saudi's participation in the global market is under what conditions that trade contributes to measurable emissions reductions.

This places greater importance on market design and governance mechanisms. Certification standards, methane monitoring requirements, carbon border adjustments, and import support frameworks will determine how

hydrogen from Saudi Arabia is evaluated and integrated into global markets.

Saudi Arabia's strategic objectives and global decarbonization goals are not inherently misaligned. However, alignment depends on the development of robust policy and verification systems that ensure hydrogen trade reflects real emissions performance rather than nominal classification.

Strategic Conclusions & Outlook

Saudi Arabia has many of the fundamentals required to become a major hydrogen exporter: competitive resources, strong capital backing, large-scale industrial capabilities, and established global energy infrastructure. The remaining challenge is translating those advantages into a broader commercially viable market beyond flagship projects.

Near-term progress will depend on NGHC commissioning successfully, renewable capacity expanding beyond dedicated projects, and producers securing durable downstream demand. Over time, certification alignment (including methane measurement and CCS verification for natural gas-based pathways) will increasingly shape access to premium import markets.

Regionally, Saudi Arabia is unlikely to lead on regulatory architecture in the same way as the UAE or on distributed private-sector development in the same way as Oman. Its competitive position lies in scale, cost, sovereign capital, and export infrastructure.

More broadly, Saudi Arabia is a test case for whether a major hydrocarbon producer can use existing infrastructure, technical capability,

capital, and trade relationships as a platform for lower-emissions fuels. The natural gas-based pathway depends on credible methane measurement and a scalable CO₂ transport and storage backbone, while the renewable pathway depends on continued power-sector expansion, certification, competitive delivered cost, and destination-market infrastructure.



The lesson for other energy producers is less about picking green or blue, and more about using existing infrastructure and capital as a bridge.

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& Minerals, Saudi Arabia

Saudi Arabia's trajectory is therefore fundamentally an integration challenge. Its advantage lies less in choosing between renewable and natural gas-based hydrogen than in connecting existing industrial assets with new renewable generation, CCS, export logistics, certification systems, and international buyers. Dr. Al-Shaal summarized the lesson succinctly: "For the Kingdom of Saudi Arabia, integration is the magical word."

The next phase of the market will show whether Saudi Arabia can turn NGHC's successful financing and construction model into a repeatable commercial system across multiple projects and buyer markets.

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