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From oil to hydrogen:

The Middle East's next global advantage

100 Years in the Middle East


H2
HYDROGEN

Introduction

Abundant and proven, hydrogen has many advantages over other potential energy solutions in the race to decarbonize. To date, however, relatively few hydrogen proposals have achieved a positive final investment decision (FID). That is about to change, and the Middle East, in the form of the Gulf Cooperation Council (GCC), now has an opportunity to establish itself as a global hub for both the production and consumption of hydrogen as an industrial fuel.

The region has many of the requisite qualities, particularly in terms of strategic location on trade routes, and availability of renewable resources and favourable climate conditions, to scale the production of hydrogen. Critically, there is also the national will and ambition across several governments to diversify their economies beyond the production of carbon-based fuels and to play a leading role in the energy transition.

The global challenge for hydrogen

Rising demand, investments, and strong policy support from governments around the world – not to mention consumer and activist pressure – mean that the hydrogen opportunity is expanding significantly. In fact, there were around USD$116bn in FDI commitments to green hydrogen projects in 2024 alone (see INFO 1) and the sector is forecasted to grow annually by 37% to 2034 (see fig 1).[1]

Blue hydrogen (see INFO 1) meanwhile is also gaining momentum with CAGR forecast to increase by 17% over the next 10 years, fueled by early investments, industrial use cases and a growing appreciation of its potential as a pragmatic near-term decarbonization solution (see fig 2).[2] For example, Wood Mackenzie estimates >1.5 mtpa of blue hydrogen (≥3 projects) in the USA could reach FID in the near term, subject to offtake and policy support; meanwhile, ExxonMobil's ~1 mtpa ammonia project is advancing with US incentives.[3]

Green hydrogen sector is forecasted to grow annually to 2034 by

37%

Blue hydrogen is also gaining momentum with CAGR forecast to increase over the next 10 years by

17%

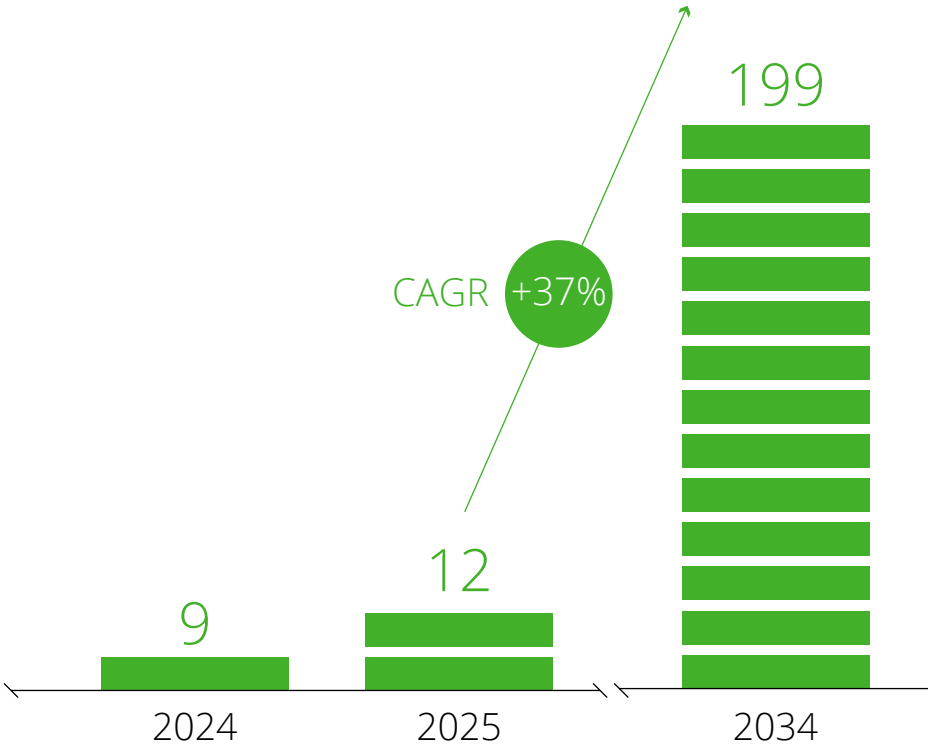


Figure 1: Global green hydrogen market size in USD Bn (2024-34)[1]

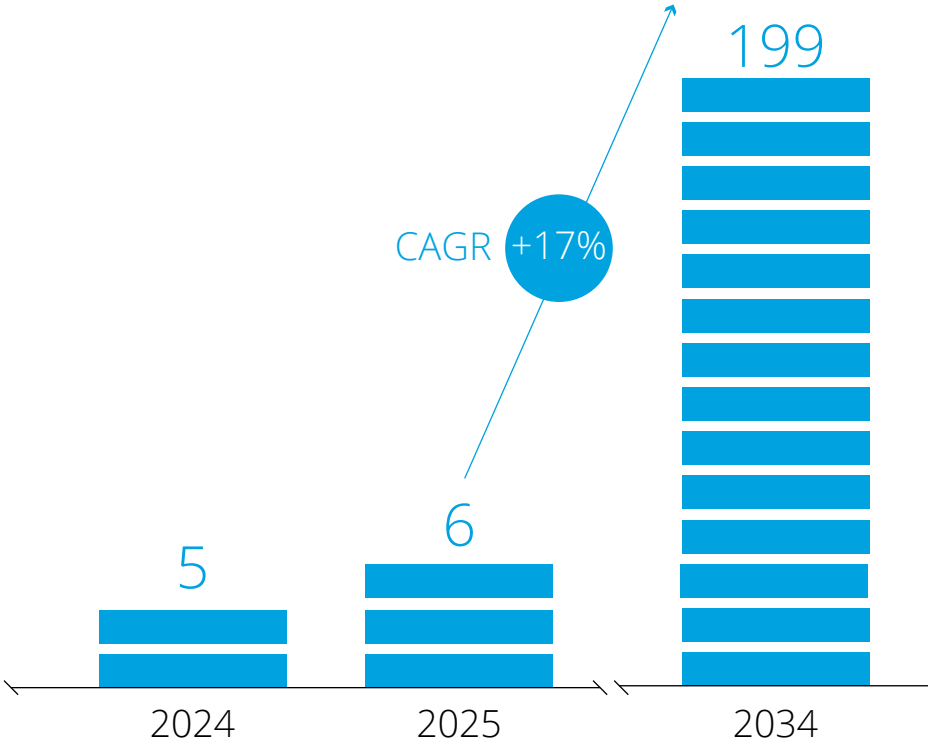


Figure 2: Global blue hydrogen market size in USD Bn (2024-34)[2]

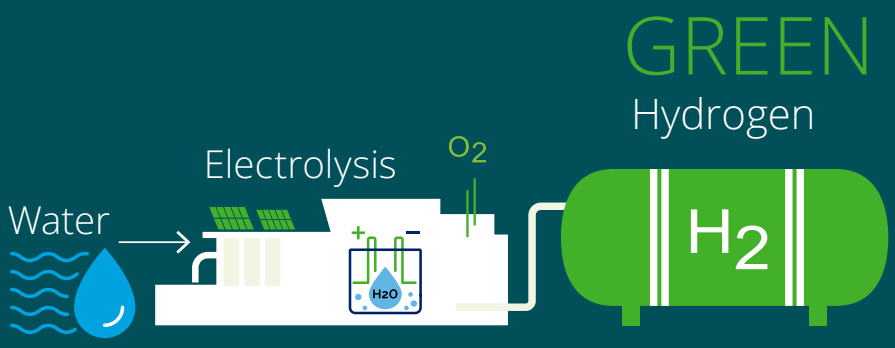
INFO 1

Hydrogen: the basics

Hydrogen, a highly reactive elemental gas, has huge potential as a clean source of energy with applications across a wide range of industries. It can be produced, i.e. separated or isolated, in a number of ways including, but not limited to:

- from natural gas in a process called steam reforming. The resulting '**blue hydrogen**' can be captured, though the process also produces carbon dioxide, which must be captured and stored in order to mitigate emissions.

- from water using a process called electrolysis that 'splits' water into its constituent elements, with the oxygen being safely released into the atmosphere and the '**green hydrogen**' captured for use as a clean-burning, highly potent source of energy.



Owing to its extreme combustibility and its small molecular size and diffusivity, storing and transporting hydrogen can be challenging – it leaks very easily. One solution is to tether the hydrogen to nitrogen to create ammonia, which can be safely transported and then 'cracked' at the point of use.

However, of the USD$320bn hydrogen projects announced to date, just 10% have reached FID stage, including those that are already operational or under construction.[4]

Despite its obvious advantages, potential new users have been slow to adopt hydrogen as an energy source: less than 1% of global demand comes from applications, including heavy industry. At the same time, the trade in hydrogen is still at an embryonic stage, totaling just USD$237m, and is primarily focused on small-scale transport of hydrogen derivatives, such as ammonia, between neighboring countries.[5]

What is suppressing demand? The answer is cost. Producing renewable hydrogen today is generally one-and-a-half to six times more costly than unabated fossil-based production due to high cost of renewables, transportation/conversion losses, etc. At the same time, there are few commercial incentives for consumers to choose green hydrogen or products made with it such as green steel over other alternatives. On top of this, new pipeline infrastructure is up to 50% more expensive than for natural gas, owing to hydrogen's diffusivity, though some savings can be achieved by repurposing existing pipelines.

None of these issues, however, is insurmountable, and momentum is undoubtedly building as pressure to decarbonize intensifies.

As things stand, Europe, which has USD$199bn announced investments in hydrogen – 36% of the global total (see fig 3) – is the clear leader in hydrogen. However, the Middle East, with announced hydrogen investments of USD$74bn (~10%), is well-placed to secure an important place in the market, though it will have to act quickly to capitalize on the opportunity. Other nations have recently signaled their support for hydrogen. For example, Japan has launched CfD auctions backed by a ~USD$20bn fund to secure low-carbon hydrogen supply, while South Korea has boosted subsidies, including reducing fuel costs by ~22% for hydrogen-powered buses. China, meanwhile already dominates electrolyser manufacturing, the critical technology for green hydrogen production, with 60% of global capacity.

The Middle East is well-placed to secure an important position in the hydrogen market — provided it acts quickly to capitalize on the opportunity

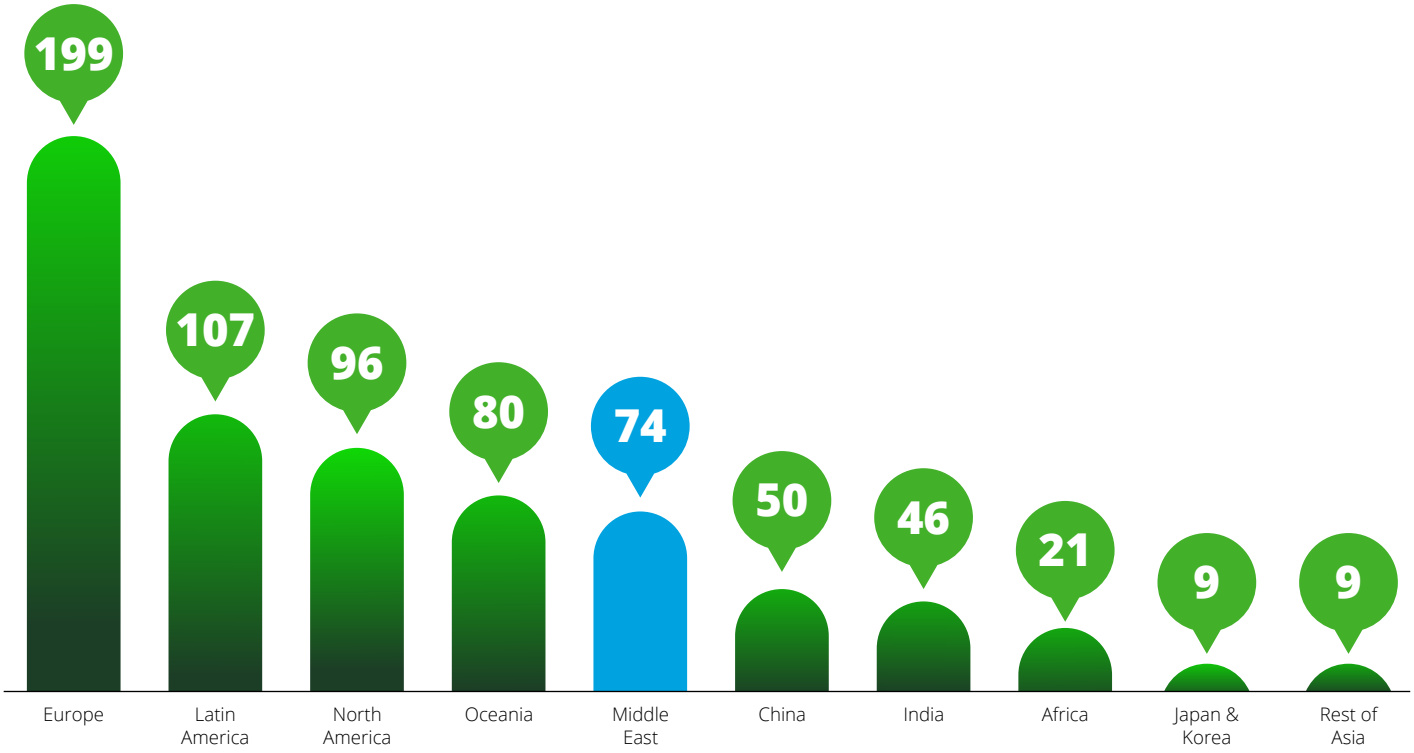


Figure 3: Global announced hydrogen investments across the hydrogen value chain by 2030 (billion USD, 2024)[6]

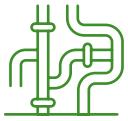
The Middle East's advantage

While there are undoubtedly challenges in scaling the production of hydrogen, the Middle East enjoys a number of advantages over other regions that put it in a very strong position to become a leader in the field.

Climate and geography

The abundance of renewable energy sources – essential for the production of hydrogen by electrolysis – means that the GCC has the joint-lowest levelized cost of hydrogen (LCOH) in the world alongside Australia, with UAE and KSA having achieved record low LCOEs at USD$10.4/MWh. Green hydrogen production costs are projected to fall below USD$2/kg by 2030.

- High RE potential: Middle East solar irradiance is among the highest in the world at more than 2,000kWh/m^2/year
- Abundant land resources: the Middle East has vast expanses of available land for the siting of renewable energy facilities – both solar and wind – as well as extensive coastlines providing access to water and modern port facilities.



Existing infrastructure

The region boasts well-established export and pipeline infrastructure that can be repurposed for efficient hydrogen distribution and export. This includes gulf ports, such as Duqm, Salalah and Yanbu, that are already equipped for ammonia export – reducing the need for new investments.[7]

Strong governmental support

Governments in the region are well-positioned and highly motivated to act quickly and decisively in planning and resource allocation to support decarbonizing strategies. KSA, Oman and UAE have already made major commitments to decarbonization and climate resilience through subsidies, incentives, and regulatory frameworks that encourage hydrogen projects.

- KSA's Vision 2030 aims at sourcing 50% of the country's energy from renewables by 2030 and reducing CO2 emissions by 287 MT per annum (mtpa), with a key focus on green hydrogen.
- Oman Vision 2040 aims for net zero by 2050, and the country has invested in clean energy, aiming to produce over 1 mtpa of green hydrogen by 2030, and potentially 8 million tons by 2050.
- UAE is targeting green hydrogen production capacity of 1.4 mtpa by 2031 as part of its strategy to become a global leader in climate resilience. The first net-zero building is being built with UAE produced green steel.

Location

Sitting at the crossroads between Europe and Asia – both rapidly expanding markets for hydrogen – the GCC enjoys shorter maritime routes and established trade corridors to provide faster, lower-cost hydrogen delivery.

Ambitious national visions and decisive government action are accelerating the Middle East's transition into a global green hydrogen leader

Opportunities to lead the world

With these home advantages, the Middle East, or more specifically the GCC, has two distinct but connected opportunities to establish itself as a global force in green hydrogen: the first by becoming a major exporter of hydrogen, primarily in the form of ammonia, and the second by becoming a leading exporter of green products – such as green steel – manufactured locally using hydrogen as an energy source [see fig 4].

The GCC has two powerful, interconnected opportunities to establish itself as a global force in green hydrogen

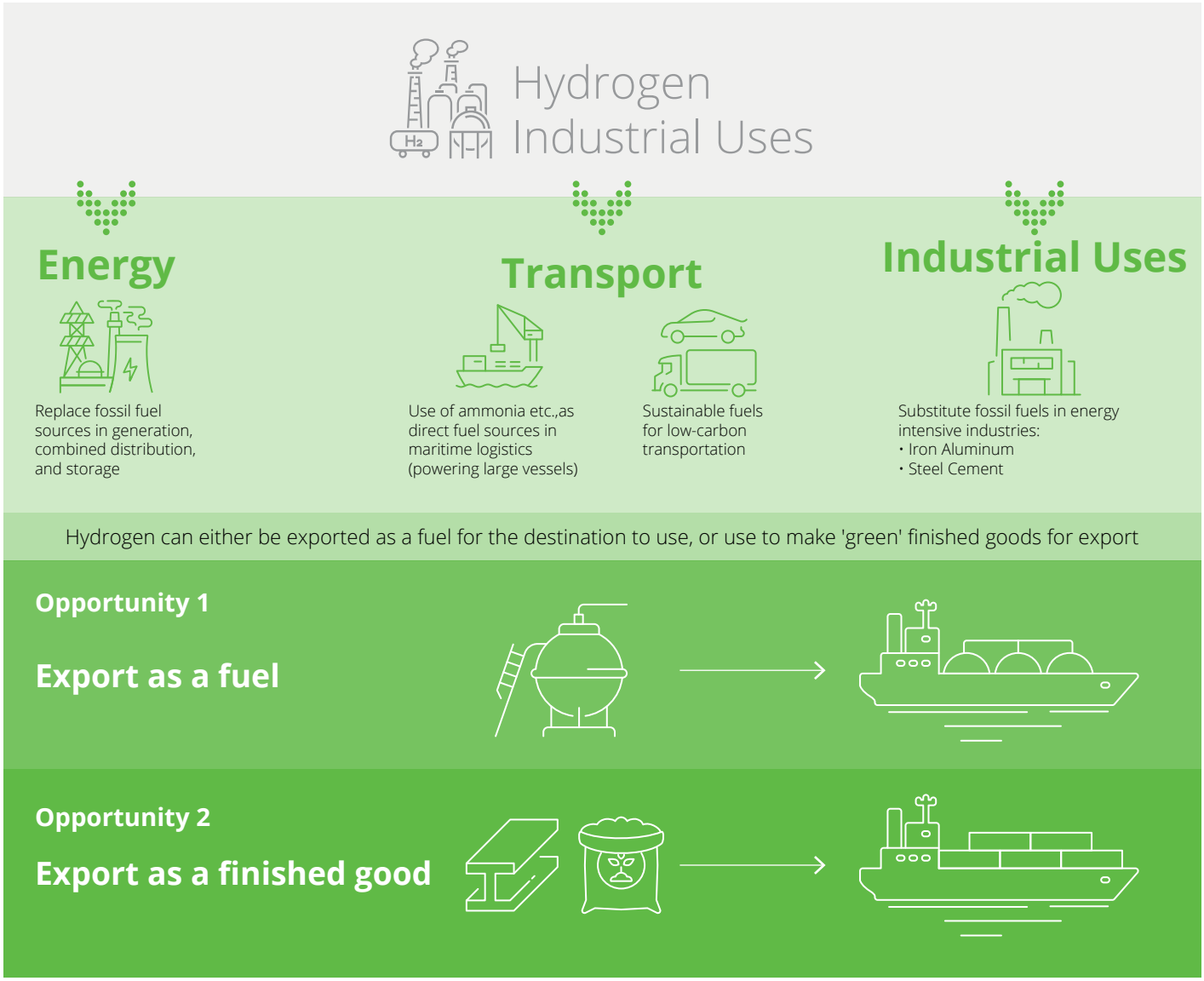


Figure 4: Hydrogen industrial uses

Opportunity 1:
Manufacturing and exporting hydrogen as a fuel

With CAGR for the trade in ammonia – the stable format in which hydrogen is transported is predicted to be around 10% [see fig 5], rising from 18MT in 2018 to 320MT in 2050, the growth potential of the hydrogen market cannot be underestimated.[8] GCC, with its world-leading low LCOH, driven by abundant and readily accessible renewable energy sources, strategic location and policy support is primed to capitalize on this market opportunity.

Major projects have already been announced between KSA and Germany to supply 200,000 tons of green hydrogen via ammonia by 2030, and between a UAE-based ammonia producer and Korean and Japanese energy companies to bring a 1mtpa facility online by 2030.

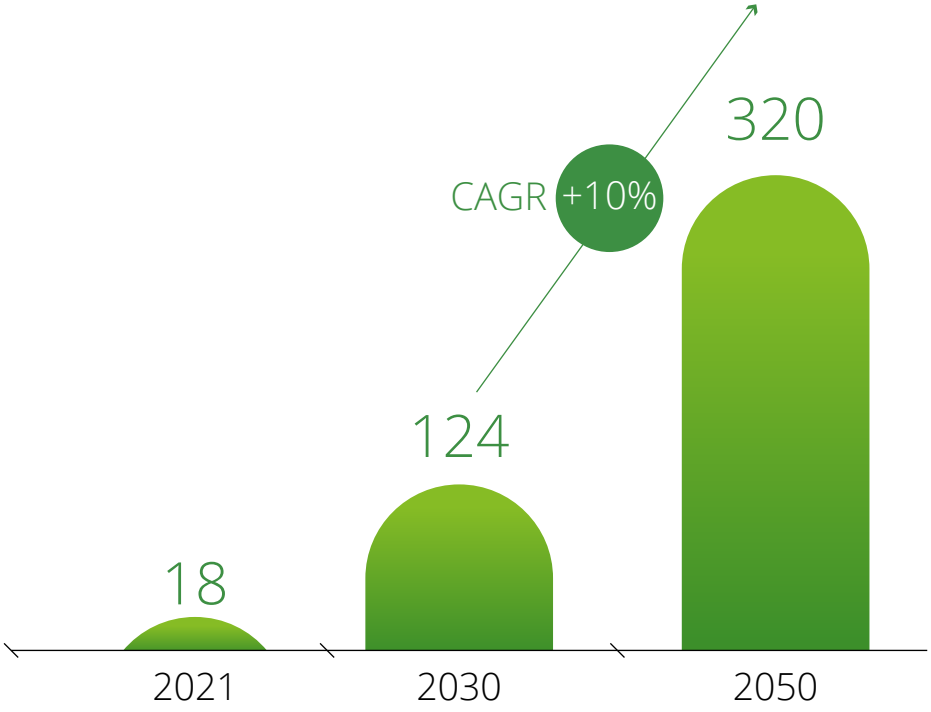


Figure 5: Global ammonia trade in volume in million tons (2030-50)[8]

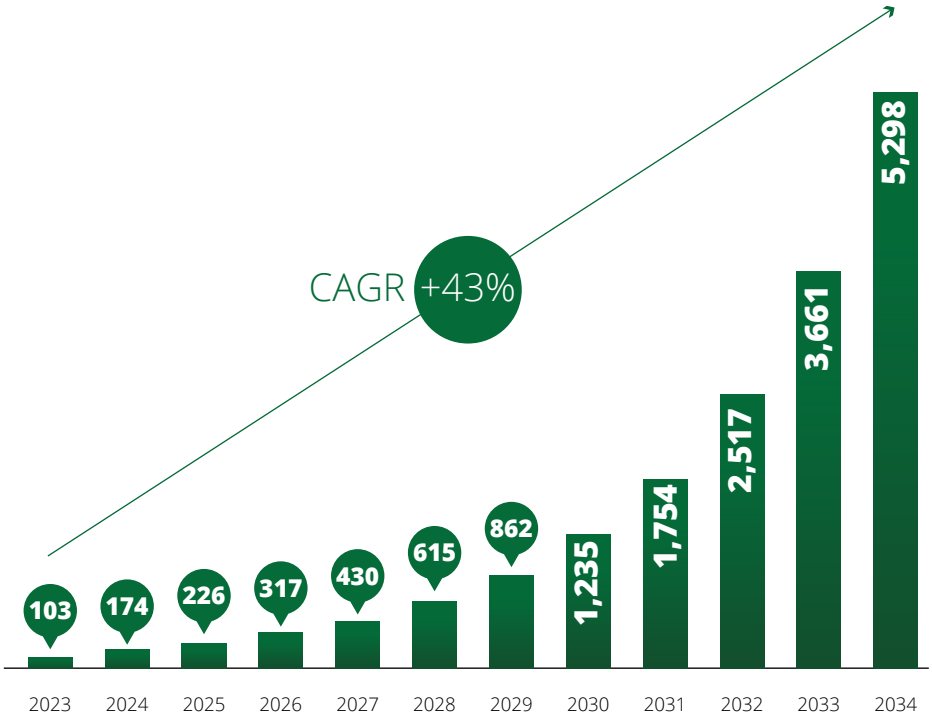


Figure 6: Green steel market size (million USD 2023 - 2034)[9]

Opportunity 2:
Green production and exports

The Middle East has the chance to amplify its hydrogen advantage beyond production and export by using hydrogen to fuel industrial growth and diversification in its own backyard. The market for green products is growing exponentially as corporates increasingly seek to strip carbon emissions out of their value chains. The region can take advantage of this spiraling demand to develop local industries and establish itself as a leader in green exports.

Green steel provides an ideal example of an industrial product that could take root in the Middle East, capitalizing on the growth of relatively low-cost domestic hydrogen production. The market for green steel, while still nascent, is expected to grow significantly over the next 10 years with CAGR at 43% [see fig 6] as more and more countries adopt and enforce or reward green policies such as the Carbon Border Adjustment Mechanism (CBAM) in the UK and EU.

As with the production and distribution of hydrogen, the Middle East enjoys a number of advantages that can be leveraged to help it become a major green steel producer.

Cost-effective renewable energy

The potential for green hydrogen outlined above is the key to this opportunity. Few other regions have the solar irradiance, the available land to support hydrogen production at scale or the infrastructure to distribute it. These factors alone mean that the cost of green hydrogen is already as low as USD$3.20/kg and projected to fall as low as USD$1/kg by 2050.

Access to high-quality iron ore

DR-grade iron ore is increasingly available, with regional mega-hubs emerging such as Vale's facility in Sohar, Oman. In parallel, Saudi Arabia and the UAE are developing integrated steel ecosystems—through players such as Hadeed (now under PIF) and EmSteel—supporting co-located DRI production and strengthening the region's green steel value chain.

Iron-production infrastructure ready to switch:

The MENA region already produces 46% of the world's DRI and the industry can easily incorporate green hydrogen in its fuel mix. The leading manufacturers of DRI- production technology confirm that Midrex units can use up to 30% hydrogen without any modification, while Energiron units can run on up to 80% hydrogen without major retrofit.

Strategic location

The region is the crossroads of global trade, close to the Suez Canal and major shipping lanes, with well-developed port infrastructure to support the rapid scaling of steel and goods manufacture and distribution.

Political and financial support

Governments in the region are actively backing green steel with policy support, advocacy and investment. KSA's public investment fund launched a dedicated USD$10bn 'Energy Solutions' company in 2024 to fund green hydrogen production for low-carbon industrial projects such as green steel.

In fact, at every stage of the green steel production value chain, countries in the GCC enjoy significant advantages that reduce costs relative to, for example, the EU.

The GCC can access low-cost, high-grade iron ore with shorter journey times, while the EU is dependent on imports from distant suppliers and has only limited local reserves in Sweden. In the region, specific initiatives already leverage the hydrogen potential. For example, Vale partnered with Jinnan Steel & Iron Group to develop an iron ore concentration plant in Oman (initial investment exceeding USD 600 million). In terms of the energy, one of the largest costs in steel production, the GCC's renewable energy costs are among the lowest in the world and, in turn, its hydrogen production costs are substantially lower than the EU's.

While the EU has been slow to scale its transition to DRI production, the GCC's DRI production technology is world-leading, with state-backed industrial policy and financing. Steel production in the EU is hampered by aging infrastructure and expensive labor, energy and environmental compliance. By contrast, the GCC has efficient, modern plants, lower labor and energy costs, and the capacity to build infrastructure quickly. Finally, while the EU enjoys very strong advantages for export and use within its home markets, global exports are more challenging. Meanwhile the GCC boasts modern port facilities, free-zones and trade agreements, and proximity to European, African and Asian markets.

While this explores the green steel opportunity, it is important to note that other hard-to-abate sectors, such as fertilizer, cement and glass manufacturing, and oil refining enjoy many of the same advantages and could all follow similar trajectories.

In fact, at every stage of the green steel production value chain, countries in the GCC enjoy significant advantages that reduce costs relative to, for example, the EU

Capturing the hydrogen potential

The development of a hydrogen economy will drive further investment, create employment and support the region's diversification away from oil and gas. It will take a concerted effort across governments, investors and industry for the GCC to become a global leader in hydrogen, but the potential gains are enormous.

The solution lies in public-private partnerships, concessional finance, green bonds – for which the market is also growing rapidly – and other financial innovations such as R&D funding, demonstration co-financing and Contracts for Difference (CfDs) that help to mitigate hydrogen price volatility.

Australia, the other rising force in hydrogen, is already showing the way in addressing the financing of hydrogen and the GCC can follow suit.

Australia's government is offering a refundable tax offset of USD$2/kg for 10 years for hydrogen producers, while government special investment vehicles provide debt and equity financing through concessional loans to investors. At the same time, it has made AUSD$300m available to fund research projects and pilot programs. Similar incentives and financial instruments can be deployed in GCC, both to de-risk investment and to accelerate project timelines, expanding access to global finance and improving the overall bankability of the hydrogen vision.

Partnerships will help to spread the risk, provide confidence to investors and encourage more players into the space. As projects mature and come on stream, these effects will compound, giving the GCC leadership in experience, knowledge and workforce that can snowball, further strengthening the region's hydrogen advantage.

The development of a hydrogen economy will drive investment, create jobs, and position the GCC as a global leader in clean energy

Conclusion

The urgent need for green energy solutions and the undeniable potential of hydrogen mean that it is no longer a question whether hydrogen is the answer but of where that answer is going to be realized. Climate, geography, political will and agility, all suggest that at least one of the answers to that question is the GCC.

Glossary/useful terms

- **Blue hydrogen:** hydrogen produced from fossil fuels, primarily natural gas with the associated carbon emissions captured and stored
- **DRI:** direct reduced iron is iron ore in the form of lumps, fines or pellets that have had the oxygen removed by using hydrogen and carbon monoxide.
- **Green hydrogen:** hydrogen produced through alkaline electrolysis – the 'splitting' of sea water – powered by renewable energy
- **Green steel:** steel manufactured using low-emissions production techniques
- **LCOE:** levelized cost of electricity, a metric used to compare the total costs of different electricity generation sources over their lifetime.
- **LCOH:** levelized cost of hydrogen, a metric used to calculate the average cost of producing hydrogen over a project's lifetime
- **mtpa:** million tons per annum

Endnotes

[1]Precedence Research, 2025
[2]Precedence Research, 2025
[3]S&P Global, 2021
[4]Hydrogen Council
[5]International Renewable Energy Agency
[6]Hydrogen Council
[7]IEA
[8]Statista
[9]BIS Research

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