



Global Infrastructure
Investor Association

Hydrogen: How to crowd in private investment

Summary

This paper looks at the future of the hydrogen market and makes a series of recommendations to governments on steps that would help to overcome the investment challenges facing the industry. It further addresses the need for supportive regulatory frameworks, clear government policy and financial support mechanisms to help de-risk related infrastructure investments.

Introduction

The growth of the hydrogen market and its derivatives hinges on sustained commitments and collaboration among financial institutions, industry players and government entities. However, this emerging market faces significant challenges, particularly for infrastructure investors. The high perceived risk and underdeveloped state of hydrogen projects discourage mobilisation of long-term, patient capital which is crucial for the market's development.

Securing the necessary capital requires substantial funding from diverse sources. However, the current lack of equity funding or debt financing available for infrastructure within the hydrogen value chain is a major obstacle to market growth. The capital-intensive nature of hydrogen projects requires financing structures that are typical in project finance, requiring significant debt and equity investment. Yet debt investors remain cautious, primarily due to technological uncertainties and the absence of committed offtakers.

Added to this is a lack of operational projects, which raises concerns further. This absence makes it difficult for investors to assess risk, forecast revenues and returns, and accurately value hydrogen projects.

To catalyse investment in hydrogen infrastructure and realise the transformative potential of hydrogen and its derivatives, these issues must be addressed. As a technology with substantial upfront costs, overcoming these barriers is critical to achieving global decarbonisation efforts and fostering a more secure and resilient energy system.

This paper seeks to address these and other challenges that investors face when exploring investment opportunities in hydrogen infrastructure. It draws together the views of GIIA's membership collected over several months and presents the areas where additional focus is needed to support investment cases, in line with five core recommendations.

Summary of recommendations to governments

1. **Offer robust support for long-term offtake agreements** to ensure stable revenue streams for hydrogen infrastructure projects, thereby reducing investment risks and enhancing financial predictability.
2. **Develop a pragmatic strategy for hydrogen infrastructure development** that leverages the unique national advantages and resources of countries, promoting efficient and tailored growth in the hydrogen sector.
3. **Encourage the establishment and growth of hydrogen clusters and industrial zones** to increase project visibility and operational transparency, creating synergies and reducing costs through shared infrastructure and knowledge.
4. **Ensure clear and consistent policy and regulatory frameworks** to provide certainty for investors, facilitating smoother project planning, approval processes, and long-term investments in hydrogen infrastructure.
5. **Extend comprehensive financial support mechanisms**, including grants, loans, and tax incentives, to lower the capital expenditure barriers and make hydrogen infrastructure projects more attractive to private investors.

Market development recommendations

Recommendation 1: Offer robust support for long-term offtake agreements

Long-term offtake agreements provide stability and certainty for investors. By supporting offtake agreements for hydrogen projects, governments can significantly reduce demand-side risks associated with hydrogen infrastructure investments.

Furthermore, support for long-term offtake agreements provide a powerful market signal, spurring investments in sectors like renewable energy for electrolysis and hydrogen transport and storage infrastructure. These agreements establish a stable demand for hydrogen, motivating the expansion of renewable energy projects essential for green hydrogen production as well as green molecules and hydrogen derivatives.

This fosters a cycle of investment and development throughout the hydrogen value chain, from production to end use, leading to cost reductions through economies of scale and technological advancements. Additionally, these policy measures can promote job creation in new and emerging industries, aid in economic diversification, and significantly contribute to national and international carbon reduction targets.

Addressing renewable hydrogen challenges

The scarcity of long-term offtake agreements poses key risks to the development of green hydrogen, given additional pricing risks associated with its production. A lack of targeted support for this type of hydrogen undermines the speed of its potential development in parallel with low-carbon alternatives.

In this case support for long-term offtake agreements can help to bridge the price gap compared to fossil-fuel derived hydrogen where they may not be receiving similar commitments. When in place, such agreements can create a catalyst for investment in infrastructure associated with the production of renewable hydrogen, as well as further

accelerate the deployment of hydrogen projects, green molecules, hydrogen derivatives and the creation of a more resilient hydrogen market.

By aligning government, investor and market interests, long-term offtake agreements offer a pragmatic pathway to scaling up the hydrogen economy, whilst ensuring low-carbon and renewable hydrogen plays a valuable role in the transition to a global net-zero economy.

	Type	Budget	Subsidy (\$/kg)
US	Production tax credit	Uncapped	0.60 - 3.00
EU	Production tax credit	~\$865m (€800m)	≤ 4.85 (€4.50)

Whilst there are several ways to support the uptake of long-term contracts, incentives such as guaranteed pricing or subsidies for hydrogen purchasers over a 10-to-15-year horizon will ensure that risks associated with the long-term capital repayment of high-risk greenfield projects are mitigated to the extent needed to reach a final investment decision on hydrogen-related infrastructure. This approach would further provide signals to investors that policy levers and regulatory hurdles will be overcome to de-risk governments' own share of risk.

Other examples of how governments may support the uptake of offtake agreements include support for utilisation of central buyer platforms or steps to help mitigate offtaker credit risk. Governments may also opt to become an offtaker of last resort in cases of offtaker default.

To create a fully functioning hydrogen market policy makers will need to consider multiply these and other potential solutions to ensure hydrogen's the scaling up and stability of the market and its long-term viability and market stability.

The ability to scale the hydrogen market at pace will require the availability of different forms of funding and financing, particularly debt. Without the support for offtakers and a market of operational facilities, the hydrogen industry will be unable to attract debt or equity investors and will continue to rely on public sector finance to de-risk the sector.

Recommendation 2: Develop a pragmatic strategy for hydrogen infrastructure development

Investors prefer the uptake of twin-track policies by governments, which provide equitable support for the development of low-carbon hydrogen alongside renewable electrolytic hydrogen and hydrogen derivatives. This approach recognises the reality and potential of existing infrastructure to play an important role in the energy transition through scaling of low-carbon hydrogen technologies, including utilisation of carbon capture and storage infrastructure, whilst electrolytic technology continues to develop and governments address price risks.

Governments must also take a pragmatic approach when considering the development of their national hydrogen strategies. A hydrogen strategy must account for natural resource advantages and the current distribution of a country's national energy system.

This approach would be sensitive to the national infrastructure profiles of each country, allowing governments the flexibility within policymaking to develop strategies that capitalise on their natural assets - e.g. wind or solar exposure, gas reserves, nuclear power - whilst allowing comparative advantages, energy security and emission reductions to be achieved.

Strategic advantage can be gained early and lost quickly, based on the signals that policymakers send to the market at the nascent state of hydrogen development. Whilst green hydrogen is the pinnacle of decarbonisation, it should not be the goal of each nation to achieve it.

Natural advantages will play a key role. Nations with an abundance of resources such as wind, sun and have a well-developed and distributed renewable energy system that is needed for the development of a green hydrogen economy at a cost that is sustainable. Nations with resources such as natural gas or nuclear will also have an early advantage in the creation of blue or pink hydrogen. A direction which focuses on natural advantage will attract investors who have more appetite to approach these kinds of projects, thereby creating a global market that caters to investors across all aspects of hydrogen development.

Maintaining a technology-neutral approach in the development of hydrogen infrastructure is not only a pragmatic strategy but also a crucial investment catalyst. By endorsing twin-track policies, governments will signal to investors a commitment to both immediate and long-term sustainable energy solutions, thus fostering a conducive environment for investment across the hydrogen value chain.

Geography	Strategy
US	National Clean Hydrogen Strategy
EU	Hydrogen Strategy REPowerEU Hydrogen Accelerator
China	Hydrogen Industry Development Plan
Japan	Hydrogen Society
India	National Green Hydrogen Mission
Australia	National Hydrogen Strategy Hydrogen Headstart

This approach would ensure that investments are not prematurely locked into specific technologies that may later become obsolete or less efficient compared to emerging innovations. Instead, it encourages a competitive and adaptive market, where the most efficient, cost-effective and sustainable hydrogen production methods can thrive. Incorrect correlation would harm the hydrogen economy, and it would be incredibly costly for governments to continue subsidising the wrong type of technology to satisfy a price gap between buyers and sellers.

Ultimately, technology neutrality in policymaking provides the certainty and flexibility infrastructure investors require, ensuring that their contributions effectively support the transition to a cleaner, more resilient and diverse energy system. This balanced and forward-looking stance acknowledges the complexities of the energy transition, ensuring that all viable paths towards decarbonisation are explored and supported.

Recommendation 3: Encourage the establishment and growth of hydrogen clusters and industrial zones

The energy transition is poised to reshape the global economy, ushering in a new era of industrial and economic development. Emerging technologies and the formation of industrial clusters will serve as catalysts, creating new economic hubs in nations that foster an environment conducive to innovation and growth.

Industrial clusters play a pivotal role in redefining hydrogen's role in the energy landscape in two significant ways. Firstly, hard-to-abate industrial sectors account for 30% of global greenhouse gas emissions. These existing clusters offer unique advantages, including risk sharing and demand aggregation, which are essential for the deployment and advancement of new energy systems. Already, these clusters host much of the necessary infrastructure for hydrogen development, positioning them as key hubs for kickstarting hydrogen initiatives.

By incentivising the development of hydrogen within these industrial clusters, policymakers can unlock a double benefit: not only would it create a thriving hydrogen market quickly (provide offtakers, access to energy etc), but it would also facilitate the decarbonisation of hard-to-abate sectors. This strategic approach leverages existing industrial capabilities and infrastructure, accelerating the transition to a low carbon economy.

Secondly, governments should promote and facilitate the development of bespoke hydrogen hubs and clusters that bring together production, storage and demand centres in close proximity. By supporting infrastructure development in strategic locations, governments can create concentrated ecosystems of hydrogen supply and demand. This approach not only reduces transportation and distribution costs but also increases the visibility and reliability of hydrogen offtake agreements within the cluster.

Policy measures can include providing grants or low-interest loans for the development of such hubs, easing regulatory approvals, and encouraging collaboration between different sectors (e.g. transport, industrial manufacturing and power generation) to secure a diversified demand base within the hub. This approach can significantly enhance the attractiveness of investments in hydrogen infrastructure by demonstrating a clear, integrated pathway for hydrogen utilisation.

Recommendation 4: Ensure clear and consistent policy and regulatory frameworks

Policy and regulations will determine how the hydrogen ecosystem develops.

To foster a robust investment landscape in the hydrogen sector, it is crucial for national and international policymakers and regulators to provide definitive guidance on hydrogen types, and on what constitutes renewable and low-carbon hydrogen. Policymakers and regulators need to provide clarity on the types of models that will be used to regulate

hydrogen, such as RAB, CfD or subsidies. This needs to be developed for all variants of hydrogen, along with clarity on the scale of networks that will be needed to utilise them.

Further consideration should be given to adapting regulatory frameworks to meet demand-side needs that can help drive infrastructure development. The European Union's work in this space is welcome, including changes introduced through the Fitfor55 package and EU Hydrogen Strategy. Additionally, the UK's unique model for managing risk between co-dependent infrastructure projects, such as with CO₂ transport and storage networks, offers a model which can support the development of necessary infrastructure in liberalised markets

Such approaches to developing a policy framework can be further strengthened by individual countries adopting of national hydrogen strategies, where they do not already exist.

Within this due consideration must be given to promote investment security when designing national hydrogen strategies and standards. This includes provision of full grandfathering of existing projects and those at an advanced stage to ensure long term marketability of the hydrogen produced. For longer term promotion of the international hydrogen market, international consensus on standards must be reached and this could be achieved by creating an internationally recognised certification regime.

Given the lengthy investment timelines characteristic of the hydrogen sector, it is essential to avoid imposing arbitrary deadlines and strict regulations regarding hydrogen types. This approach will ensure that the regulatory environment remains adaptive and flexible, accommodating advancements in hydrogen technologies and thereby securing the confidence of infrastructure investors.

Hydrogen development hinges on a streamlined permitting process and prompt access to the grid. Permitting stands as a significant bottleneck for renewable energy projects worldwide. Often, the approval process for large-scale renewable energy projects exceeds the time required for their actual construction. Governments must establish clear and efficient timelines for hydrogen-related permitting applications. Streamlining procedures, especially for smaller-scale projects meeting specific criteria, can expedite approvals on a no-objection basis.

Energy grids will necessitate substantial upgrades to accommodate the growing reliance on variable energy sources. Delays in grid access will impede the integration of hydrogen into the energy system. Priority should be given to streamlining interconnections and cross-border grids to foster a widespread renewable energy network. Such initiatives will facilitate the sharing of surplus renewable energy among nations, enabling the production of green hydrogen.

Measures can also be introduced to support the production and integration of green hydrogen into existing energy networks, ensuring parity with blue hydrogen projects. This could involve establishing preferential tariffs, carbon pricing mechanisms or renewable energy quotas, to incentivise green hydrogen production. Through this regulatory support, green hydrogen projects can be made more commercially viable, thereby supporting the investment case.

Recommendation 5: Extend comprehensive financial support mechanisms

As the global energy landscape shifts, hydrogen holds the potential to be a cornerstone of the transition to a sustainable energy system. However recent economic challenges and shifts in the energy market have made it clear, that without robust and comprehensive financial support mechanisms, the adoption and scaling of hydrogen technologies may falter.

The competitive position of renewable fuels like green hydrogen and its derivatives (green ammonia, eMethanol, and eSAF) has worsened compared to fossil fuels like natural gas and oil. Since 2021 oil and gas prices have significantly decreased, while the cost of EU CO2 certificates has also fallen. At the same time, the cost of renewable wind power has increased substantially due to inflation, rising interest rates, quality issues and supply chain problems. The production costs for hydrogen and its derivatives are rising because of their complex and new production processes, leading to higher contractor costs and difficulties in securing financing for projects. Efficient and easily accessible support frameworks are crucial to ensure sufficient progress in hydrogen projects reaching final investment decisions (FIDs).

To effectively mobilise private capital for hydrogen infrastructure projects, it is imperative to establish a broad spectrum of financial support mechanisms. The capital-intensive nature of hydrogen projects necessitates significant upfront investment, which often poses a barrier to private investors who are concerned with unproven technologies and uncertain returns.

One approach that governments can take is to provide grants and subsidies. Governments can offer grants to cover initial research, development and pilot phases of hydrogen projects (e.g. EU Hydrogen Bank), thereby reducing the financial risk for early-stage investors. Subsidies can also be structured to support ongoing operational costs, making projects more financially viable over the long term. For instance, production tax credits that offer financial benefits based on the volume of hydrogen produced can help offset costs and make investments more attractive.

Low-interest loans and loan guarantees can also play a critical role in de-risking hydrogen projects. By providing access to capital on favourable terms, financial instruments can lower the cost of borrowing and enhance the financial viability of large-scale hydrogen infrastructure developments. Guarantees, in particular, can encourage banks and other financial institutions to extend credit to hydrogen projects by mitigating the risk of default, addressing the lack of debt availability for hydrogen projects.

Tax incentives are another vital tool for attracting private capital. Tax credits, deductions and exemptions can significantly reduce the financial burden on investors, making hydrogen projects more appealing. For example, accelerated depreciation for hydrogen-related assets can allow investors to recoup their capital expenditures more quickly, improving the overall investment return profile.

Governments can also establish dedicated hydrogen funds or green bonds to pool resources from both public and private sectors. These funds can be used to finance a portfolio of hydrogen projects, spreading the risk and making it easier for individual investors to participate. Green bonds, which are debt instruments specifically earmarked for environmental projects, can provide a steady stream of capital for hydrogen

infrastructure, attracting institutional investors looking for sustainable investment opportunities.

To further support the scaling of hydrogen infrastructure, it is essential to create mechanisms that enhance market liquidity and reduce investment risk. This includes developing insurance products tailored to hydrogen projects, covering risks such as technology performance, operational disruptions, and market fluctuations. Such products can provide additional security to investors, making them more willing to commit capital to hydrogen ventures.

About the Global Infrastructure Investor Association

The Global Infrastructure Investor Association (GIIA) brings together the world's leading institutional investors in infrastructure and advisers to the sector. GIIA members have more than \$2 trillion (€1.8 trillion, £1.57 trillion) of assets across six continents in a wide range of infrastructure, from roads, railways and airports to power generation, utilities, broadband, schools and hospitals - all helping communities and nations to thrive. As leading public pension funds, insurers, sovereign wealth funds and other investors in the sector, many of our members invest the retirement savings of teachers, firefighters, and public and private sector employees in many other industries.

Our members' long-standing expertise in investing in and managing infrastructure, coupled with more than \$300 billion of funds available for further investments, including in sustainable transport and energy infrastructure, makes the GIIA a valuable partner for EU institutions and Member States.

Our mission is to improve understanding of the role played by private investors in building and operating efficient and effective infrastructure. In pursuit of this goal, we advocate for supportive, stable regulatory environments and increased pipelines of well-developed projects that can leverage private investment and expertise.