

The hydrogen sector in Europe is at a critical crossroads, with stakeholders navigating varying levels of readiness. Transportation stakeholders, for example, benefit from a relatively structured regulatory environment, enabling them to push forward. By contrast, other key players, such as offtakers, operate within uncertain conditions that hinder the development of the sector as a whole. This uneven playing field highlights an urgent need for alignment across the supply chain, particularly as Europe pushes toward its ambitious decarbonisation goals.

Regulatory clarity: uneven ground for stakeholders

Regulations play an essential role in shaping the low-emission molecule and hydrogen market. While the European Union has made significant progress in establishing directives, such as those governing 'green' hydrogen and Renewable Fuels of Non-Biological Origin (RFNBO), many Member States lag in transposing these directives into national legislation. This delay creates an uneven environment for stakeholders.

Kimberly Sari, ILF Consulting Engineers, highlights the necessary changes and alignment to push Europe's hydrogen sector past its tipping point.

HYDROGEN'S TIPPING POINT



Transportation stakeholders benefit from clearer regulatory structures, such as those guiding the repurposing of natural gas pipelines for hydrogen transport and storage. This regulatory certainty allows them to make informed decisions and implement long-term plans. However, developers and offtakers face greater uncertainty. For developers, ambiguity in standards, particularly around the classification of 'low-carbon' hydrogen, complicates project planning and investment decisions. For offtakers, the lack of a consistent framework for hydrogen use across sectors, such as maritime and heavy industry, reduces confidence in committing to long-term agreements.

The EU's 'Fit for 55' package offers a roadmap for cutting greenhouse gas emissions by 55% by 2030. However, achieving these targets requires more than ambitious legislation. It demands coordinated efforts among stakeholders across the value chain, from policymakers and financiers to developers and offtakers. Without a clear regulatory environment for all stakeholders, these efforts remain fragmented, slowing the pace of development.

Financing: a misalignment of needs and risks

Financing remains one of the most significant bottlenecks in Europe's low-emission molecule and hydrogen market. The financial sector is well-established and ready to invest in low-emission molecule projects, but its traditional risk management tools are often incompatible with the unique challenges of these projects. Developers struggle to demonstrate bankability due to high upfront costs,

extended project timelines, and a lack of long-term offtake agreements that would secure revenue streams.

This misalignment leaves even the most promising projects at a standstill. Public financial institutions like the European Hydrogen Bank and initiatives like H2Global are working to mitigate these early-stage risks by providing auctions and guarantees that attract private investment. While these mechanisms are helpful, they are not sufficient to meet the sector's growing needs.

Risk-sharing remains a key issue. The short- to medium-term planning preferences of offtakers clash with the long-term financial commitments required by developers and financiers. This mismatch creates a vicious cycle: offtakers are hesitant to commit without established infrastructure and stable pricing, while developers cannot secure financing or proceed with projects without those commitments. Breaking this cycle requires innovative solutions, including government-backed guarantees, new financing tools, and stronger collaboration between stakeholders.

Developers: leading the charge despite hurdles

Among all stakeholder groups, developers have made the most progress in preparing for a low-emission molecule and hydrogen-driven future. They are actively working on large-scale production and import projects to meet Europe's ambitious targets. However, their efforts are frequently stymied by two major obstacles: difficulties in obtaining financing and the absence of long-term agreements with offtakers.

Securing a final investment decision (FID) for capital-intensive hydrogen projects requires careful planning in both engineering and financing. Developers must navigate tight deadlines, evolving regulatory requirements, and high levels of financial risk. These challenges are further compounded by the absence of long-term commitments from offtakers, who often prefer flexible, short-term arrangements that allow them to adapt to energy price volatility.

Despite these challenges, developers remain optimistic about the future. High-level political support, substantial engineering solutions, and the potential to repurpose existing natural gas infrastructure provide a foundation for growth. However, to accelerate progress, developers need stronger commitments from other stakeholders, particularly financial institutions and offtakers.

Infrastructure bottlenecks: meeting the demand for growth

The transportation and storage of hydrogen present another set of challenges. Europe's existing infrastructure is insufficient to support the intercontinental transportation of low-emission molecules and hydrogen and its domestic distribution within the continent. Key investments are needed to expand ports, pipelines, and storage facilities.

Repurposing existing natural gas infrastructure offers a practical solution for some of these challenges. For

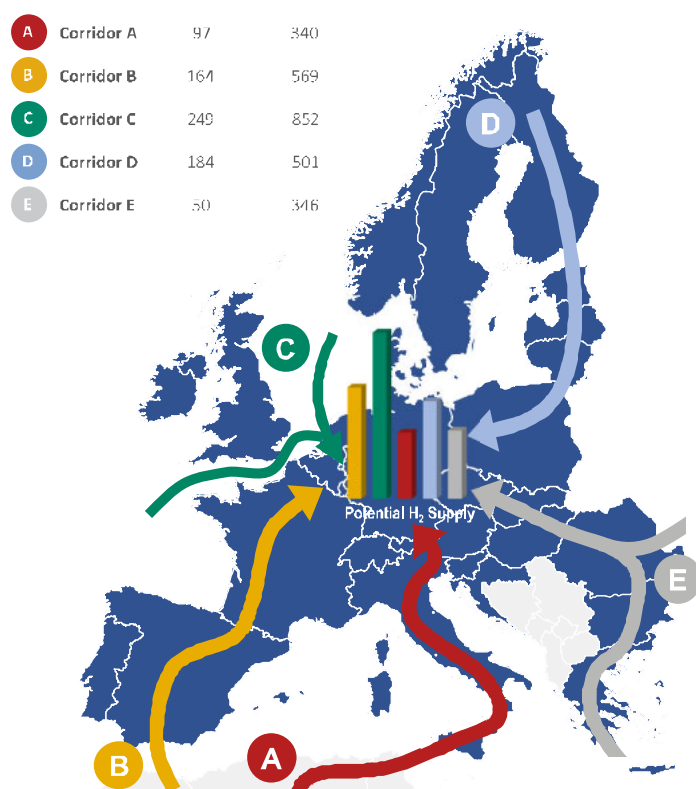


Figure 1. Potential future hydrogen supply corridors for Europe in 2030.

instance, converting natural gas pipelines into hydrogen pipelines could reduce costs and accelerate deployment. Cavern storage also holds significant potential for stabilising supply, particularly as hydrogen production scales up.

The main hurdle in infrastructure development is timing. The rapid growth of hydrogen demand requires infrastructure to expand at a similar pace. This necessitates close coordination among transmission system operators, government agencies, developers, and offtakers. Without proactive investment and planning, infrastructure bottlenecks could stall the market's development.

Offtakers: the key to unlocking the market

Offtakers hold the key to unlocking the full potential of Europe's low-emission molecule and hydrogen market. Their willingness to enter into long-term purchase agreements provides the revenue certainty developers need to secure financing and move projects forward. However, many offtakers remain hesitant due to regulatory uncertainty and the lack of a clear business case for hydrogen adoption.

To address this hesitancy, policymakers must establish clearer regulations and quotas for hydrogen use across industries. These measures will provide the market signals offtakers need to commit to long-term agreements. Additionally, pricing models that reflect the green premium of low-emission hydrogen should be standardised to support early adopters.

Financial tools and policy mechanisms can also play a role in reducing 'first-mover' risk for offtakers. By providing guarantees or subsidies, governments can encourage companies to take the initial steps toward hydrogen

adoption. These commitments will, in turn, create a ripple effect, enabling developers to secure financing and accelerating the overall market cycle.

Breaking the stalemate

The low-emission molecule and hydrogen market is stuck in a classic "chicken-and-egg" dilemma. Developers need offtakers to commit before they can secure financing, while offtakers need a reliable supply and clear market conditions before they can commit. This cycle of hesitation slows progress and jeopardises Europe's decarbonisation goals.

Breaking this cycle requires coordinated action across the stakeholder value chain. Governments must step in to provide early-stage support through subsidies, guarantees, and public-private partnerships. Developers and offtakers must work together to establish long-term agreements that align with the needs of both parties. Financial institutions, in turn, must adapt their risk management tools to better align with the realities of low-emission molecule and hydrogen projects.

A path forward

The recently published white paper, Low-Emission Molecules: Insights into an Emerging Sector, offers valuable insights into these challenges. Based on interviews with 31 industry managers, the paper highlights the barriers and opportunities within the low-emission molecule and hydrogen market and provides actionable recommendations for accelerating progress.

Key strategies include decoupling production from offtake, fostering vertical cooperation among stakeholders, regulating the transport of low-emission molecules, establishing strategic hydrogen reserves, protecting first movers, and adopting business case hedging. These recommendations provide a roadmap for stakeholders to overcome current challenges and create a more integrated, efficient hydrogen market.

A call to action

As Europe races to meet its decarbonisation targets, the hydrogen market must accelerate its development. This requires stronger collaboration, clearer regulations, and innovative financing solutions. By addressing the current misalignments and breaking the cycle of hesitation, stakeholders can unlock the full potential of low-emission molecules and hydrogen as a key driver of the energy transition.

The findings of the white paper serve as a vital resource for policymakers, developers, financiers, and offtakers. With coordinated efforts and a shared commitment to progress, the hydrogen market can overcome its current challenges and drive the clean energy future in Europe. 

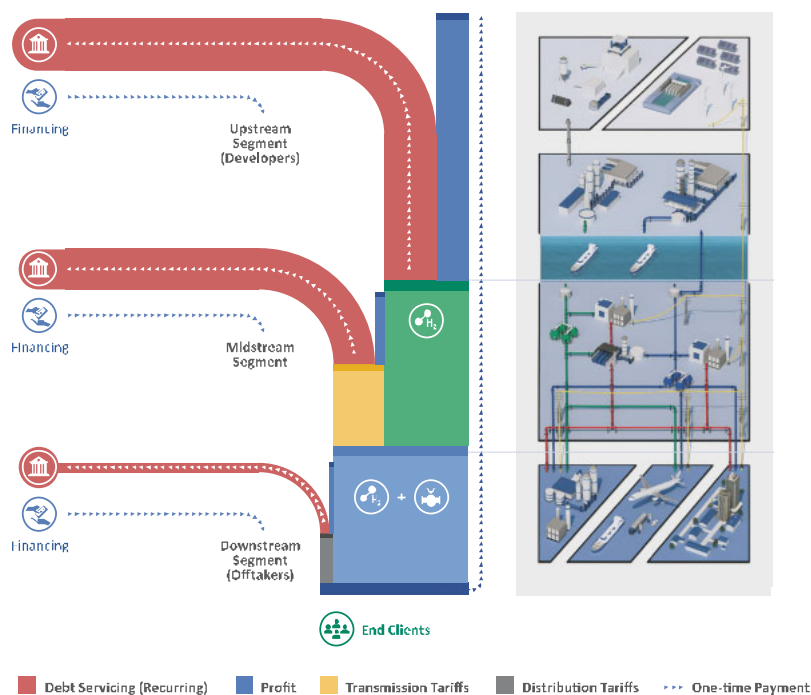


Figure 2. Cash flow dynamics across various segments within the emerging low-emission molecule sector.