

Strategic Investment in Low-Carbon Hydrogen Offtake: *A Toolkit for Senior Leaders*



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Why low-carbon hydrogen offtake *needs senior leadership*

1 Low-carbon hydrogen is an opportunity to seize: This is a commercial opportunity for companies to grow their business, foster new partnerships, and develop low-carbon products that attract end-use customers. If your company has a climate target then low-carbon hydrogen is important and relevant to your future business. This is particularly the case for sectors that directly use significant volumes of fossil gas but also where fossil gas forms a material part of supply chain emissions.

2 Finding value takes leadership: There is value in identifying and assessing low-carbon hydrogen adoption as a decarbonization solution in your business or supply chain. But this will take leadership. Senior leaders can empower teams across the organization to build the strategic, commercial, and operational capacity to support low-carbon hydrogen adoption.

3 This is a pre-commercial product: Channeling new investment in clean technologies, like low-carbon hydrogen and its derivatives, requires corporate strategic assessments and operational decision-making to understand the nature of pre-commercial products. To support growth of this sector, senior leaders need to engage with a risk profile that is different to day-to-day procurement.

4 There are balanced solutions available: Low-carbon hydrogen solutions can be taken forward without creating material business risks.



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01. Introduction

Why is low-carbon hydrogen important for your business?

Net-zero emission scenarios widely acknowledge that low-carbon hydrogen plays a critical role in decarbonizing industry. Currently, there is a strong appetite to invest in low-carbon hydrogen supply. Based on announced projects, the IEA estimates that annual production of low-carbon hydrogen could reach more than 20 Mt in 2030.¹

Corporates can take bolder action to meaningful progress towards decarbonization ambitions, including net-zero commitments under the Science Based Targets initiative (SBTi). Increasingly, we see businesses harnessing the leadership opportunity and strategically deploying low-carbon hydrogen as a necessary decarbonization solution that has the potential to give them a competitive advantage as regulations tighten and net-zero markets emerge.

In order to meet our climate ambitions, there is an urgent need to switch existing hydrogen use, produced from unabated fossil fuels to low-carbon hydrogen. Beyond traditional uses in chemicals and refining, hydrogen demand must grow in new applications across heavy industry and long-distance transport. This is not just hard-to-abate sectors. Any sector that uses fossil gas directly or within its supply chain has an interest in the transition of low-carbon hydrogen from a nascent to mature sector. There are many scenarios where electrification of industrial processes is not appropriate, with low-carbon hydrogen or its derivatives forming the recognized alternative.²

How can senior leaders address the current challenges?

C-Suite and board leadership can define a workable risk profile in recognition that this pre-commercial product is required to make concrete progress towards decarbonization targets. We are seeing low-carbon hydrogen projects proceed across diverse regions and sectors, often involving an anchor company as an investor and/or offtaker. However, projects are not proceeding at the scale and speed required to drive deep industrial decarbonization. For example, only 10% of the clean hydrogen capacity planned by 2030 has identified a buyer.³ This is often driven by a misalignment between the long-term demand signal required by the supplier and the relatively short-term framework offtakers use when procuring key commodities. Greater leadership engagement is needed to:

1. Find the right opportunities that best fit a corporate buyer's business operations and model; and
2. Take those forward in a way that recognizes the pre-commercial nature of this sector but protects the business

In both cases, senior management can provide the leadership to address these actions, ensuring that opportunities are actively pursued and business unit decisions reflect the nature of the sector.

How can this Toolkit help you strategically frame a low-carbon hydrogen investment?

Throughout 2023 and 2024, WBCSD and Baker McKenzie held extensive interviews and workshops with hydrogen suppliers and offtakers in heavy industry: steel, heavy-duty transport, chemicals, as well as low-carbon fertilizer producers, food and agriculture companies. This Toolkit outlines practical actions that can be taken by senior leaders to accelerate low-carbon hydrogen adoption, noting the need to shift from "demand signals" to "demand action" by which projects can move forward. Our recommendations are based on in-depth discussions with companies on:

- Steps to identify and action opportunities;
- Closed-loop offtake to accelerate action;
- Harnessing purchasing power to enable projects across the value chain;
- Approaching a project as a partnership;
- Finding the right risk allocation balance as offtake agreements are negotiated.

WBCSD and Baker McKenzie recognize nascent market risks are significant. But with strategic planning and the right business case, companies can seize this opportunity to transition towards a net-zero future.

02. Action

Steps to identify and action opportunities

The deployment of low-carbon hydrogen could come with a potential strategic competitive advantage. As the need to decarbonize quickly has never been more acute, WBCSD calls upon senior leaders to seize this decarbonization opportunity and make internal investments to support the adoption of low-carbon hydrogen. The decision-making wheel (see Figure 1) shows how senior leaders can navigate this nascent market to accelerate the adoption of low-carbon hydrogen and drive deep decarbonization. We expand on these elements in the following sections:

- 1 **Navigating transformation:** Harness senior leadership's ability to inform policymaking and reduce internal blockages to develop a low-carbon hydrogen investment that aligns with the company's overall decarbonization ambitions.
- 2 **Seizing opportunities:** Identify business locations and segments where low-carbon hydrogen can reduce both direct emissions and carbon hotspots in value chains. This involves technical and commercial analysis to understand where low-carbon hydrogen can replace fossil-fuel use and how to engage with supply-chain partners, particularly as environmental policies like the EU Carbon Border Adjustment Mechanism develop.
- 3 **Closed-loop offtake:** Consider whether closed-loop offtake is a viable pathway to develop technological, business and operational learnings. This involves allocating capital against transition plans and developing pilot projects within the business group.
- 4 **Unlocking the value chain:** Embrace unprecedented collaboration with different stakeholders across the value chain, acknowledging the increasing demand for low-carbon products from end-consumer sectors.

Figure 1: Strategic decision-making wheel for low-carbon hydrogen offtake





Low-carbon hydrogen is a pre-commercial product that comes with an innovation cost. Currently, the misaligned cost-benefit equation means that low-carbon hydrogen investments are not being signed at the scale and speed required to drive industrial decarbonization. Early projects are likely to come at a higher cost than the counter-factual fossil-fuel use and will involve technology risk. Senior leaders can take practical actions to understand why supporting a pre-commercial product is different.

The four key recommendations on the right, discuss how senior leaders can position the business in this sectoral transformation, to balance risk profiles with strategic opportunities and innovation.

Based on our extensive interviews and workshops, we have seen various ways companies translate strategic decision-making into bankable projects. This Toolkit outlines two offtake routes that emerged as the most viable pathways given the significant market challenges. The first option details closed-loop offtake; sometimes called vertical integration, and the second option shows how corporates can harness their purchasing power to foster value chain collaboration. Senior leaders should consider both offtake routes to understand whether they can drive decarbonization in their own business group or whether a joint approach is required to better engage a complex value chain.

Strategically framing the low-carbon hydrogen investment

- 1 Engage with a different risk profile:** Companies often approach projects with the aim of minimizing differences between a new solution and a 'business as usual' use case. This approach should be re-framed. Senior leaders can employ a different but not excessive risk profile when engaging with pre-commercial pilot projects to broaden the pool of reliable and cost-effective solutions available to companies, whilst potentially gaining first-mover advantages as the world transitions to a low-carbon economy. This re-framing can be assessed in terms of:

 - what certainty is needed by an owner or investor to underpin the development of a pilot project? and
 - if the business will accept more risk to support a pre-commercial product, what are the broad limits to that?
- 2 Build the right team expertise:** Developing the above approach to pre-commercial product risk requires senior leaders to realign certain processes, people and technologies to support deep decarbonization. This requires cross-organizational collaboration, as well as leveraging internal competencies and skills across the organization.

In some instances, a group company will act as lead and take on such risks. Senior leaders can remove internal blockages to support a bespoke risk allocation to effectively identify and action decarbonization opportunities.
- 3 Empower procurement:** It is crucial to provide a benefit weighting towards low-carbon production so that purchasing decisions uphold publicly announced SBTi targets. Senior leaders can empower procurement to re-baseline their pricing scenarios to translate high-level company goals into internal policies and purchasing guidelines.

For example, senior leaders can foster engagement with sales, marketing, procurement and sustainability teams so that green products can be re-valued and re-priced as low-carbon markets emerge. This cross-organizational collaboration can help to better quantify upside value.
- 4 Inform evolving policies and work closely with policymakers:** Senior leaders are in a powerful position to advocate and advise policymakers on the enabling policy environment required to unlock low-carbon hydrogen projects. This includes supply-side support, demand stimulation and critical enablers like standards and certifications.



02. Closed-loop offtake to accelerate action

One mechanism to drive decarbonization in this nascent market is closed-loop offtake. Here, first-movers develop projects for their own internal supply chain use to support their carbon neutrality targets. In essence, they become both the supplier and offtaker, rather than negotiating a hydrogen purchase agreement with an external supplier.

Opportunities

A key benefit of this offtake model is the greater commercial flexibility and risk appetite that can be achieved within a business group. A hydrogen production facility owned and financed by third parties will require clearly defined and negotiated risk allocation. Whereas, a corporate group can achieve strategic alignment within different parts of the group to bolster the economic viability of the business case and take a holistic view of the risks associated with a pre-commercial pilot. This approach does not negate the use of third-party contractors to access appropriate technical skills.

Challenges

This mechanism is limited to corporates with a group model that can draw on synergies between different parts of the business, such as the energy production arm and the heavy industry arm of the group. In this sense, this approach is best suited to corporates with existing production capacity.

Case study

JSW recognizes the leadership opportunity and adopts an internal carbon price

JSW Steel have already initiated a pilot project with a 25MW electrolyser capacity at their Vijayanagar plant, which is capable of generating 3,600 tons of hydrogen per annum. This green steel production demonstrates the strength of closed-loop offtake, as JSW Group is well-positioned to develop technological, business and operational learnings as both the producer— JSW Energy — and offtaker — JSW Steel.

JSW Steel have also adopted an Internal Carbon Price to make their operations future ready as tighter climate regulations emerge globally. This tool also supports decision-making when evaluating the financial viability of new CapEx projects, whilst accounting for the cost of carbon emissions.

“JSW Group is uniquely placed to lead on green hydrogen topic as we have significant interests in steel, cement, and renewable energy. This is a leadership opportunity.”

Prabodha Acharya
Chief Sustainability Officer
JSW Group



Senior leaders can foster cross-value chain collaboration and leverage their company's buying power to support deployment of low-carbon hydrogen. Scaling this pre-commercial product and decreasing the green premium is highly complex – radical collaboration is required to unlock demand. By radical collaboration, WBCSD means joining forces with suppliers and different nodes of the value chain from raw materials to retailers. This requires a recognition that no company can move this nascent clean technology to commercialization alone.

We recommend engaging with end-consumer markets as closely as possible, to allow credible, low-carbon products to be re-valued and re-priced to absorb the true costs. There is some demand for low-carbon hydrogen and low-carbon ammonia coming from consumer goods companies with emissions-reduction targets and a willingness to differentiate their products within the market i.e., low-carbon wheat, beer, and barley to name a few. Importantly, upstream cost increases can have a very modest impact on end-consumers, for example low-carbon chemicals can lead to a cost increase of 1-3% across end-user products.⁴ The challenge is that not all sectors benefit from end-consumers with a higher willingness to pay for a credible, low-carbon product.

Proactive and pioneering companies in the automotive industry have demonstrated their buying power; Mercedes-Benz, Volvo Group and Porsche AG all signed offtake agreements with H2 Green Steel to drive demand for green steel.⁵ These companies recognized that establishing a sustainable steel supply chain supports the automotive sector's transition towards a net-zero future.

Opportunities

By unlocking the value chain, one or more active end-users enable the decarbonization project to proceed by sending a robust price signal without directly using low-carbon hydrogen in their own operations. Benefits of this collaborative approach include:

- A manageable green premium downstream in a supply chain could be sufficient to enable upstream projects;
- With the right structuring, cross-value chain collaboration enables Scope 3 emission reduction claims;
- Leaves technology risk within the control of the product producer;
- Greater ability for end-user peers to work together to support supply chain changes.

Challenges

It is a common misconception that collaboration to decarbonize value chains gives rise to anti-competitive and antitrust behaviors. This can be unfounded, with various regulators globally seeking to provide comfort that collaboration across a sector for decarbonization goals is both legitimate and encouraged within appropriate guardrails.





Case study

Yara's collaborative approach to develop the world's first clean ammonia-powered container ship

With global shipping accounting for approximately 2% of global energy-related CO₂ emissions in 2022⁶, it is imperative that we cooperate across value chains to reach the 1.5°C goal by 2030.

- Yara Clean Ammonia, North Sea Container Line, and Yara International join forces to realize the world's first container ship that will use clean ammonia as fuel. Named Yara Eyde, the vessel will be the first to sail emission-free sea route between Norway and Germany.
- Yara Clean Ammonia AS and North Sea Container Line AS are establishing a joint venture to realize Yara Eyde, while the ship will be operated by NCL Oslofjord AS.
- "We see an increasing demand from cargo owners to reduce emissions. Yara Eyde offers competitive and emission-free logistics to cargo owners," says Bente Hetland of North Sea Container Line.
- From 2026, Norwegian companies can trade their products emissions-free in and out of Norway. Yara International is participating as cargo-owner. The fertilizer produced in Norway will be shipped emission-free to Germany, cutting scope 3 emissions with 11,000 tons of CO₂ per year.

"Yara Eyde will be the world's first container ship running on clean ammonia and is a cross-sector collaboration enabling large-scale emission reductions ahead of the critical 2030 climate targets"

Svein Tore Holsether
President and CEO
Yara International

Source: Yara (2023). The World's First Clean Ammonia-Powered Container Ship. Retrieved from: <https://www.yara.com/corporate-releases/the-worlds-first-clean-ammonia-powered-container-ship/>



Approaching a project as a partnership

In developing this Toolkit, interviews highlighted the importance of an investor-offtaker, as both parties have objectives and expectations that are more closely aligned. The anchor offtaker creates significant value for the project's investment case by engaging with the risk allocation required to support a pre-commercial product. In the right circumstances, it is justifiable that the anchor offtaker has access to upside where the project succeeds, relative to their liability exposure. This approach enhances the offtaker's visibility of all the factors influencing the project development.

However, potential conflicts of interest can arise when the offtaker also has an equity stake in a project. Different investors may have different approaches to risk and target returns. Whilst these issues can be managed, it is also important to note that partnering need not solely be via an equity structure. The actual approach will depend on the circumstances of a given deal. There are other approaches, from open book arrangements to contractual joint ventures.

Finding the risk allocation balance

For the right pilot or decarbonization intervention, senior leaders can take certain risks to support this pre-commercial sector. That approach to risk can be informed by the requirements of a developer (including its funders, such as banks or equity investors). But it can and should also be informed by evidence of fair solutions that have been found for other projects involving an anchor corporate offtaker. This is important for companies that are not as familiar with long-term offtake structures designed to underpin project investment (for example, where the company is used to short-term procurement of commodities). Based on our extensive workshops and discussions, Table 1 highlights some key areas under low-carbon offtake contracts where balanced positions can address both investor and offtaker needs.



**Table 1:** Offtake agreements – finding workable contracting solutions

<i>Considerations</i>		<i>Workable solutions</i>
Offtaker “Take or Pay” (ToP) Obligations	<ul style="list-style-type: none"> → Suppliers require a minimum demand profile (the take or pay obligation) to underpin project sizing and investment decision → For an offtaker, a long-term take or pay liability can cause a material concern for competitiveness 	<ul style="list-style-type: none"> → Offtaker flexibility in underlying asset can be provided through lower minimum ToP thresholds with incentive structures for achieving target annual quantities → Sharing risk, such as capping ToP breach liability at a level which compensates supplier for most but not all losses
Producer “Supply or Pay” Obligations	<ul style="list-style-type: none"> → Provides offtakers with certainty of low-carbon hydrogen supply with liability for a supplier breaching obligations → Suppliers’ ability to deliver is influenced by power purchase agreement (“PPA”) solution, the role of storage, and regulatory requirements 	<ul style="list-style-type: none"> → “Send or pay” sized at or similar to ToP level → Tolerance for supplying a certain level of low-carbon hydrogen that doesn’t meet the ‘green’ product specifications
Role of storage	<ul style="list-style-type: none"> → For an offtaker, storage can assist if supplier has short term outage and offtaker requires buffer to switch to alternative fuel → For a supplier, storage can be important tool to support production of ‘green’ hydrogen in the most economically efficient manner to manage 	<ul style="list-style-type: none"> → Shared storage solution developed early to ensure appropriate pricing → PPA strategy designed to align with agreed storage capacity and how that capacity will be used to manage each parties needs
Termination risk and liability	<ul style="list-style-type: none"> → Offtakers often require flexibility to reduce volume or terminate due to strategic business decisions (e.g., shutting down a facility) → Suppliers have a limited ability to mitigate losses due to the nascent market and large capital investment required to switch offtakers 	<ul style="list-style-type: none"> → Start discussions on termination risk early with offtakers – it is as important to consider as price and volume → Plan for and price mitigation solutions that could reduce liability in the event of sit closure → Engage with policy makers to address how subsidy support can mitigate risk of loss of significant offtaker
Change-in law mechanisms	<ul style="list-style-type: none"> → Regulatory uncertainty is a key challenge for suppliers 	<ul style="list-style-type: none"> → Provide potential for discussion and dispute resolution without explicitly shifting risk from one party to the other

03. The transition from “demand signals” to “demand action”



Without credible, clear and targeted demand, industrial transformation will not occur at the speed and scale necessary. The need to switch existing hydrogen use to low-carbon hydrogen is urgent, and we call on senior leaders to act now.

By virtue of this Toolkit, C-Suite and board leadership can manage complex decision-making and take informed action to accelerate the adoption of low-carbon hydrogen. We recommend senior leaders to:

- 1 **Navigating transformation:** Harness the ability to inform policymaking and reduce internal blockages to develop a low-carbon hydrogen investment that aligns with the company's overall decarbonization ambitions.
- 2 **Seize opportunities:** Identify business locations and segments where low-carbon hydrogen can reduce both direct emissions and carbon hotspots in value chains.
- 3 **Consider closed-loop offtake:** Explore whether closed-loop offtake is a viable pathway to develop technological, business and operational learnings.
- 4 **Unlock the value chain:** Embrace unprecedented collaboration with different stakeholders across the value chain, acknowledging the increasing demand for low-carbon products from end-consumer sectors.

With only 4% of announced projects having reached final investment decision, we believe that senior leadership can take bolder action to help boost low-carbon hydrogen demand.⁷

This Toolkit is a part of WBCSD's broader efforts to accelerate clean demand and drive deep industrial decarbonization. Launched in 2024, WBCSD's new Center for Decarbonization Demand Acceleration (CDDA), is a unique 2-year initiative bringing focus on developing the practical solutions necessary to stimulate and deliver on demand signals. It exemplifies our recognition of the need to balance supply with demand. The CDDA develops the tools and the policy, and financial environment needed, for companies to move from a demand “signal” to demand “action” for low and zero carbon materials in both light and heavy industries.

Endnotes

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Disclaimer

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The World Business Council for Sustainable Development (WBCSD) is a global community of over 225 of the world's leading businesses driving systems transformation for a better world in which 9+ billion people can live well, within planetary boundaries, by mid-century. Together, we transform the systems we work in to limit the impact of the climate crisis, restore nature and tackle inequality. We accelerate value chain transformation across key sectors and reshape the financial system to reward sustainable leadership and action through a lower cost of capital. Through the exchange of best practices, improving performance, accessing education, forming partnerships, and shaping the policy agenda, we drive progress in businesses and sharpen the accountability of their performance.

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