

Anchoring UK hydrogen supply chains: setting out an industry vision

An industry-led supply chain strategy

Written By Hydrogen UK on behalf of industry



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Forewords



Clare Jackson, CEO Hydrogen UK

“The UK is at a critical juncture in the evolution of the UK’s hydrogen supply chain development. Navigated correctly, we have the unparalleled opportunity to not only reap significant economic benefits, but also achieve our Net Zero objectives, and bolster domestic energy security. What’s apparent from this industry-led supply chain report is the UK’s innovation and manufacturing base is well placed to capitalise on the global hydrogen opportunity. Our extensive work with industry has shown achieving a UK voluntary local target ambition is achievable if the strategic pillars and fundamentals identified in this report are enacted.

We must, however, recognise that hydrogen is still a relatively nascent industry, and as such necessitates a high degree of collaboration between government and industry to accelerate its growth and adaptation. Together, we have a collective responsibility to channel investment into our supply chains, thereby cementing the UK’s stature as a global frontrunner in hydrogen production and its diverse end-use applications. Hydrogen UK is committed to sustaining the positive momentum garnered through this report and looks forward to working with industry and government to make this vision a reality.”



Jane Toogood, Chair of the Hydrogen Delivery Council

“The UK has a unique set of capabilities and skills that are critical enablers for meeting our future net zero target. The opportunity for the hydrogen economy to deliver 20,000 new jobs and generate £26bn in cumulative GVA by 2030 represents an attractive prize for both industry and government. In the Hydrogen Champion Report published earlier this year, I recommended that industry should set voluntary commitments to deliver UK content that’s underpinned by a wider supply chain strategy. Therefore, I’m delighted to see that Hydrogen UK has worked with industry to define a strategy that will accelerate the development of a vibrant, local supply chain.

This initial report focuses on the types of activities needed to build a UK supply chain, identifying the strategic pillars and foundational elements necessary for industry to achieve an ambition of 50% UK content. To build on this report and sustain the focus on hydrogen supply chains, a more detailed report will be published early next year, identifying the UK focus areas across the hydrogen value chain. The evidence gathered as part of this analysis will be an important input to ensure the much-welcomed Green Industries Growth Accelerator and other government interventions deliver the greatest impact. I look forward to this strategy evolving into a shared action plan which will support future job creation and economic growth across the UK hydrogen supply chain.”

The rationale for a study and the need for competitive supply chains

The strategic importance of hydrogen has gained significant recognition as nations across the world have committed to achieving net zero. Here in the UK, there's a widespread consensus that hydrogen is critical to achieving our net zero target. This commitment culminated in the launch of the UK's first Hydrogen Strategy and has been reaffirmed by Chris Skidmore's Independent Review of Net Zero. Both these documents highlight hydrogen's importance not only to net zero but growing the UK industrial base¹. Analysis by Hydrogen UK estimates up to 20,000 jobs could be created by 2030, contributing £26bn in cumulative GVA². These economic benefits flow from all areas of the value chain ranging from production, storage, network development and off-taker markets. However, with large scale projects still to take final investment decisions, current volumes of low-carbon hydrogen produced and consumed fall well below the government's 2030 ambitions.

Encouragingly the UK has a positive track record of deploying low carbon technologies. The combination of the UK's world leading policies and incentive schemes, alongside our vibrant RD&I and engineering environment, has enabled rapid deployment of technologies like offshore wind and electric vehicles. Yet despite being world leaders in deployment, early opportunities for regional supply chain growth and job creation were not fully realised and taken advantage of from inception. The hydrogen sector is therefore at a tipping point. To capitalise on the economic opportunity hydrogen offers, the UK must learn from prior technology deployments and build a strong domestic hydrogen supply chain in parallel to championing deployment.

This report delivers on a recommendation from the Hydrogen Champion Report which encouraged industry to create an industry led supply chain strategy³. With Hydrogen UK steering the work on behalf of the UK hydrogen industry, this study focusses on identifying the actions needed to mature a local supply chain that can support the initial deployment of hydrogen technologies across the value chain. The report is segmented into two sections. The first section outlines a voluntary ambition for local content from industry alongside the potential intervention mechanisms needed to achieve the ambition. The second section explores the challenges companies across the hydrogen value chain face in maximising UK supply chain opportunities.

The extensive evidence base Hydrogen UK used to support this summary report can be seen in **Figure 1**. What's emerged from the evidence is that for the UK to achieve any industry-led, voluntary local content target, a series of strategic pillars and foundational elements must be in place. These serve as the basis for growing UK supply chains and must be worked on in parallel. This report provides an overview of the findings and offers a vision for how the UK can nurture its hydrogen supply chain base.

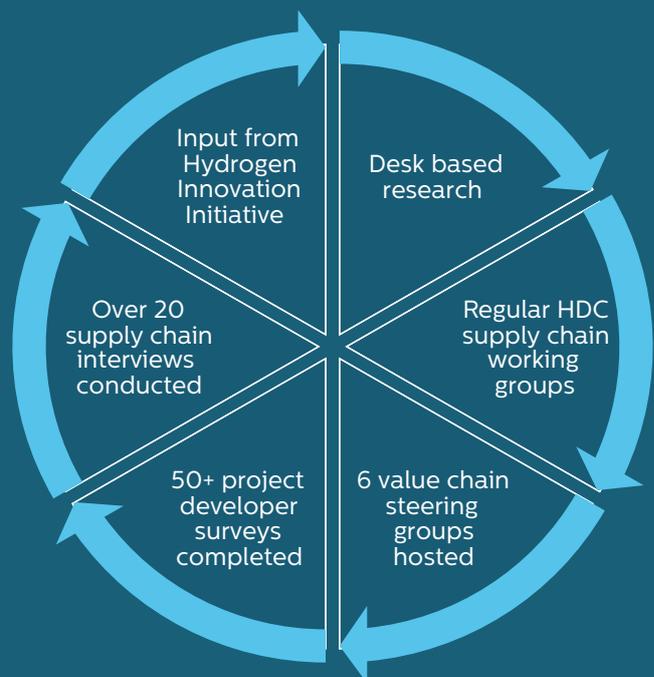


Figure 1: Supply chain study research process

¹ Chris Skidmore, 2023. [Mission Zero: Independent Review of Net Zero](#).

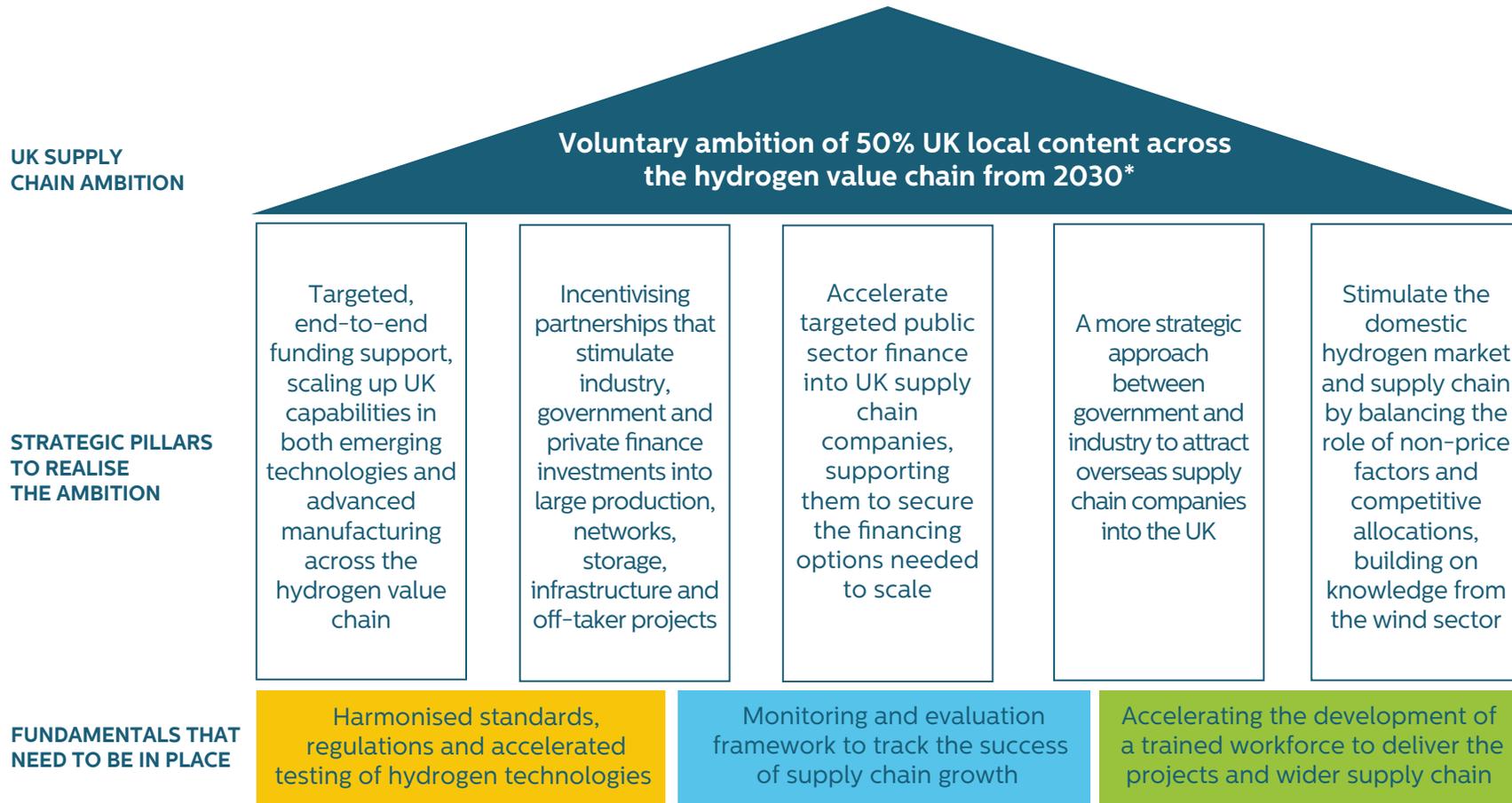
² Forthcoming Hydrogen UK economic impact assessment

³ Jane Toogood, 2023. [Hydrogen Champion Report](#).

An industry-led supply chain ambition

The global hydrogen industry is still in its infancy with the UK firmly in the race to build a vibrant hydrogen supply chain. But to achieve this, an ambitious coalition between government, industry, private finance, and academia is needed to kick-start large projects and off takers. **Figure 2** sets out the UK ambition from industry and a series of strategic pillars and market fundamentals that need to be in place to achieve this ambition.

UK Hydrogen Strategy Vision: Seizing the opportunity for hydrogen to contribute towards the UK's net zero target, energy security and economic growth



*The 50% local content target is consistent with the North Sea Transition Deal ambition for low carbon energy projects and the CCSA's localisation target for CCUS projects

Figure 2: Proposed UK supply chain ambition, strategic pillars and foundational elements

Voluntary ambition of 50% UK local content across the hydrogen value chain from 2030

The ambition outlined in this document represents a bold vision of what industry feel could be achievable. What's essential to meet this ambition is that **all the strategic pillars and fundamentals are acted on simultaneously**. The voluntary 50% UK local content ambition is aligned with the North Sea Transition Deal's goal for low carbon energy projects⁴ as well as the recent CCSA's localisation target. The structure and composition of these industries are similar with the supply chains heavily overlapping. Therefore, it was felt aligning the targets provides a level of consistency for the energy industry. The scope of the ambition includes manufacturing, construction, engineering, and hardware elements across the value chain and is applied to deployments that begin construction / installation in 2030. It's expected that the voluntary ambition extends beyond the 2030 timeframe and industry will be striving for greater increases in content in later years. Considering this, a monitoring and evaluation framework will provide an evidence base for the industry to regularly review the ambition, strategic pillars and fundamentals.

Targeted, end-to-end funding support, scaling up UK capabilities in both emerging technologies and advanced manufacturing across the hydrogen value chain

Both capital support and innovation support is required to help foster innovative technology and accelerate the UK's manufacturing capabilities across key components. A hydrogen support ecosystem should recognise the role for supporting low-to-mid Technology Readiness Levels (TRL) technology companies on their commercialisation journey. However, there are many established UK manufacturers who would immediately benefit from both advanced RD&I and manufacturing support to transition or accelerate their capabilities to support the hydrogen economy. Without this dual focus, there is a significant risk the UK becomes a leader in cutting edge hydrogen RD&I but lacks the manufacturing fundamentals to industrialise this capability.

It's also recognised that many funding pots for hydrogen exist, but these are perceived to be disjointed and tend to focus on one element of the value chain. For example, established funding organisations like the Aerospace Technology Institute or Advanced Propulsion Centre are actively funding hydrogen projects but just in a narrow area of transport. Moreover, while Department for Energy Security and Net Zero (DESNZ) and UKRI fund multiple areas of the hydrogen economy, there is room for these funding organisations to develop a more coherent strategic vision. Therefore, investigating the viability of a central hydrogen co-ordination body that complements and co-ordinates the capital and RD&I investment of existing funding organisations is needed. This funding mechanism should also look to build UK capabilities across value chain areas and vertically up and down the tiered supply chain to work towards the 50% voluntary ambition.

Incentivising partnerships that stimulate industry, government and private finance investments into large production, networks, storage, infrastructure and off-taker projects

Industry, government and private financiers must be encouraged to co-invest across the UK hydrogen value chain. This incorporates both industry investment into capital and RD&I as well as directing financial instruments such as private equity and pensions into the hydrogen sector. Ideally these co-investments should be large, ambitious projects that incorporate multiple partners across the value chain to share risk and increase the likelihood of success. All survey respondents thought more favourable tax treatment for "green" infrastructure investments would be effective or somewhat effective at incentivising capital investments. It's encouraging that the recent Autumn Statement extended tax relief on capital expenditure which should increase spending across UK supply chains. Industry should now work with government to ensure investments in green capital expenditure, such as hydrogen, are further incentivised.

⁴ BEIS. 2021. [North Sea Transition Deal](#)

Many Engineering, Procurement and Construction (EPC) contractors also highlighted that financiers often require a Lump-sum Turnkey (LSTK) EPC bid. Given some of the issues executing large energy projects in the UK, a common position of EPCs is that this is not something that would be offered in today's market. It was strongly felt there needs to be a reasonable re-distribution of risk between financiers, owners, developers, EPCs and the associated supply chain. A LSTK EPC model essentially assigns most of the project risk to the EPC contractor which generates a degree of inertia in the supply chain.

To overcome this challenge, the hydrogen industry should adopt the approach of the offshore wind industry for larger projects. Multiple different options have emerged, but joint ventures or Memorandum of Understandings (MoUs) are common either between energy and technology providers or between energy providers. These partnerships are often reinforced by several international and domestic financial institutions such as international development banks, export credit agencies and pension funds. There is also a role for encouraging locally based financial institutions to invest in the hydrogen economy. Research suggests the UK has the second largest pensions market in the world. Yet overseas pension funds invest 16 times more in venture capital and private equity in the UK than domestic public and private pensions do⁵. Addressing this structural challenge will be vital in stimulating growth in both large-scale projects for hydrogen production and usage as well as the associated supply chain companies.

Accelerate targeted public sector finance into UK supply chain companies, supporting them to secure the financing options needed to scale

Many respondents praised the establishment of public sector finance initiatives like the UK Infrastructure Bank and British Business Bank – especially given their clear intentions on investing across the hydrogen value chain. However, the research has pointed to a disconnect between finance institutions and supply chain partners. On the one hand, many supply chain companies felt the current remit and ambition of UK government led finance mechanisms is limited. The main challenge that emerged was the supply chain companies believed public sector finance institutions possess the same risk appetite as mainstream financial institutions. While the supply chain companies understood the need for a balanced approach to risk, it was thought that public-sector led institutions could be bolder and enable more UK companies to build desperately needed UK energy infrastructure. On the other hand, private finance institutions often felt elements of the UK hydrogen supply chain were too nascent for certain investment mechanisms and that more support was needed to mature business propositions to trigger investments. This highlights a need to strengthen communications between the emerging hydrogen supply chain and public sector finance institutions. The recent Green Industries Growth Accelerator is a positive development and supported by industry. Moving forward, industry should work alongside government to ensure the scheme effectively crowds in private sector finance into companies aiming to manufacture at scale in the UK.

Another positive point raised during the stakeholder engagement was the role of UK Export Finance (UKEF). Supply chain companies claimed that the financial terms in UKEF are more favourable versus domestic facing financial mechanisms. In fact, evidence emerged that international organisations were exploring UKEF funding mechanisms which necessitated projects to use a UK supply chain. This is a positive development and helps UK supply chain actors become more visible and competitive on a global market. However, the downside is that it's created a perception within the supply chain that current UK finance mechanisms are set up to prioritise export overseas rather than support domestic projects. Therefore, an equalisation of financial support is required to help support both domestic and overseas opportunities.

⁴HM Government, 2023. [Offshore Wind Net Zero Investment Roadmap](#).

⁵Tony Blair Institute, 2023. [Investing in the Future: Boosting Savings and Prosperity for the UK](#)

A more strategic approach between government and industry to attract overseas supply chain companies into the UK

The UK has been astute at attracting foreign direct investment with many of the UK's largest manufacturing facilities being foreign owned. Many respondents noted the UK is home to a world leading engineering and science base, strong net zero and economic policies, home to one of the world's lowest carbon energy supplies with an established logistics infrastructure. These factors make the UK a competitive investment proposition for many international companies. A clear message from the surveys and interviews was that a country showing strong demand signals often results in a supply chain localising in a region. Many of the project developers and off takers in the UK are international companies with hydrogen activities in the US, Asia and further afield.

Therefore, the Department for Business and Trade and Office for Investment should work more strategically with hydrogen project developers and end users to immediately attract their overseas supply chains. The offshore wind and automotive industries were used as positive case studies in this. For example, expected demand for UK produced Electric Vehicles (EVs) were used to incentivise foreign direct investment into battery gigafactories and strong offshore wind uptake helped anchor investments into high voltage cabling and blade manufacturing in the North East.

Stimulate the domestic hydrogen market and supply chain by balancing the role of non-price factors and competitive allocations, building on knowledge from the wind sector

A consistent theme from the stakeholder engagement was trying to balance the two competing government requirements of cost effectiveness and maximising UK economic benefits. Many project developers and end users were nervous around stipulating minimum supply chain content and meeting cost effectiveness criteria. There was a feeling that anchoring multiple large projects would naturally lead to a supply chain forming in the UK and that should be the focus. Equally, many UK supply chain companies felt that a tendency towards cost effectiveness from UK government was neglecting that hydrogen is still nascent and there are strategic elements like building up a domestic supply chain that should be factored in. A strong focus on price, before a supply chain has developed, would likely push sourcing abroad before the UK has had time to build up capability and capacity. Therefore, exploring mechanisms that would potentially allow for a higher strike price for a period based on strategic economic factors was viewed as a potential remedy for this.

Finally, there was a strong consensus that moving the hydrogen production business models to price competitive auctions too early would be detrimental to the industry. Experience from the offshore wind sector shows that the technologies had already benefited from years of subsidies. This provided business case certainty and allowed early wind projects to trial the technologies, take on a higher risk and establish ~4000MW of operational offshore wind projects before competitive auctions were introduced⁶. The recent government announcements that Contracts for Difference (CFD) will evolve to include 'non-price' factors focusing on environmental and social impact is a welcomed move and should extend to the hydrogen sector and factor in supply chain development.

Harmonised standards, regulations and accelerated testing of hydrogen technologies

A foundational element identified by multiple stakeholders is creating or adapting relevant standards and regulations for the hydrogen industry. In certain areas such as hydrogen networks and geological storage, unclear industry standards and regulatory frameworks for hydrogen are proving barriers for investment. These can often relate to both materials level regulations and standards relating to hydrogen safety right through to component and site level considerations. Many companies also pointed to a lack of testing capability. This ranged from gas turbines, networks, compressor technology and validating the safety of storage systems. Moreover tests are often conducted in a limited number of test houses with facilities being booked well in advance. One solution to this could be closer collaboration between industry and shared innovation pots across mutual challenge areas. Initiatives like the Clean Hydrogen Innovation Programme could help derisk investment in testing facilities where collaboration would facilitate spillovers and accelerate development.

⁶RenewableUK, 2023. [Demystifying the Hydrogen Business Model for Electrolysis](#)

In addition, trying to source hydrogen in testing quantities is often expensive with many producers unable to supply in such small volumes. The impact is that project timelines are often delayed, and supply chain companies are unable to fulfil orders as testing takes too long. One potential way to address this is to explore the merits of government funded hydrogen production facilities that supply companies with hydrogen for RD&I and test purposes. This would reduce the bottleneck associated with testing and enable hydrogen producers to concentrate on securing larger off takers.

Monitoring and evaluation framework to track the success of supply chain growth

A monitoring and evaluation framework is essential to tracking the success of supply chain growth. This study has highlighted that building a domestic supply chain in an emerging industry is complex with multiple intervention points. To best evaluate and build upon the collaboration between industry and government, a practical framework is needed to regularly review the effectiveness of the strategic pillars and fundamentals. Hydrogen UK and the DESNZ will work closely with industry and organisations like CCSA, Hydrogen Innovation Initiative and HEA to develop an effective monitoring and evaluation framework. This monitoring and evaluation framework could act as a first step for industry to self-report on UK content as an interim measure prior to the voluntary UK content ambition.

Accelerating the development of a trained workforce to deliver the projects and wider supply chain

To deliver a diverse array of hydrogen projects, an appropriately trained workforce is a fundamental requirement. Much of the short-term skills bottleneck was envisaged to be in the construction, design, and engineering sectors. Operational roles, while important, were viewed as having longer lead times to reach critical mass. EPC providers consistently cited construction skills as the biggest problem but argued this isn't a hydrogen specific problem. In fact, many outlined that delayed hydrogen projects due to skills shortages will likely be a symptom of a challenge that is prevalent in the wider energy and public infrastructure sector.

A consensus between project developers, end users and the supply chain were gaps in intermediate skilled workers in areas such as fabrication, construction and design engineers. Many noted these skills gaps are not radically different to other energy sectors. The concern was there's a risk of competition between sectors if the transition is not managed appropriately. The quality of the UK skills base wasn't cited as a major issue, more the sheer increase in the number of roles required to meet the stated ambitions. Some of the skills from adjacent sectors in gas networks, storage and wider oil and gas sectors were deemed transferable. However, it was noted that hydrogen has unique properties versus other industrial gases therefore dedicated training was needed on how to handle it in new environments. It was also discussed that having skilled and qualified regulators was an important enabler to accelerate development of standards, protocols, and testing. Work by the Hydrogen Skills Alliance is currently identifying the most critical roles alongside tangible actions to alleviate an impending skills shortage. This ongoing work is also being supported by the Green Jobs Delivery Group via it's Hydrogen and CCUS Task and Finish Group.

Opportunities and challenges across the UK hydrogen value chain

Through extensive industry engagement and desk-based research, several supply chain opportunities and challenges have emerged. The most valuable insights arose from surveys with project developers and interviews with the wider supply chain. Surveys focused on project developers' perceptions of the UK supply chain, current engagement with UK suppliers and intervention mechanisms to build a UK supplier base. For the interviews, both UK and international supply chain companies articulated their perceptions of the UK as a manufacturing location and experiences in supporting UK based projects. Both groups highlighted similar issues but there were specific challenges highlighted across the project life cycle which are explored further below (see **Figure 3 on page 10**). This project life cycle is an illustrative case study of challenges facing hydrogen infrastructure projects as well as for power and industry. While supply chain challenges are common for transport and domestic heat, it doesn't capture all the issues faced by these sectors.

Existing challenges in the hydrogen development cycle

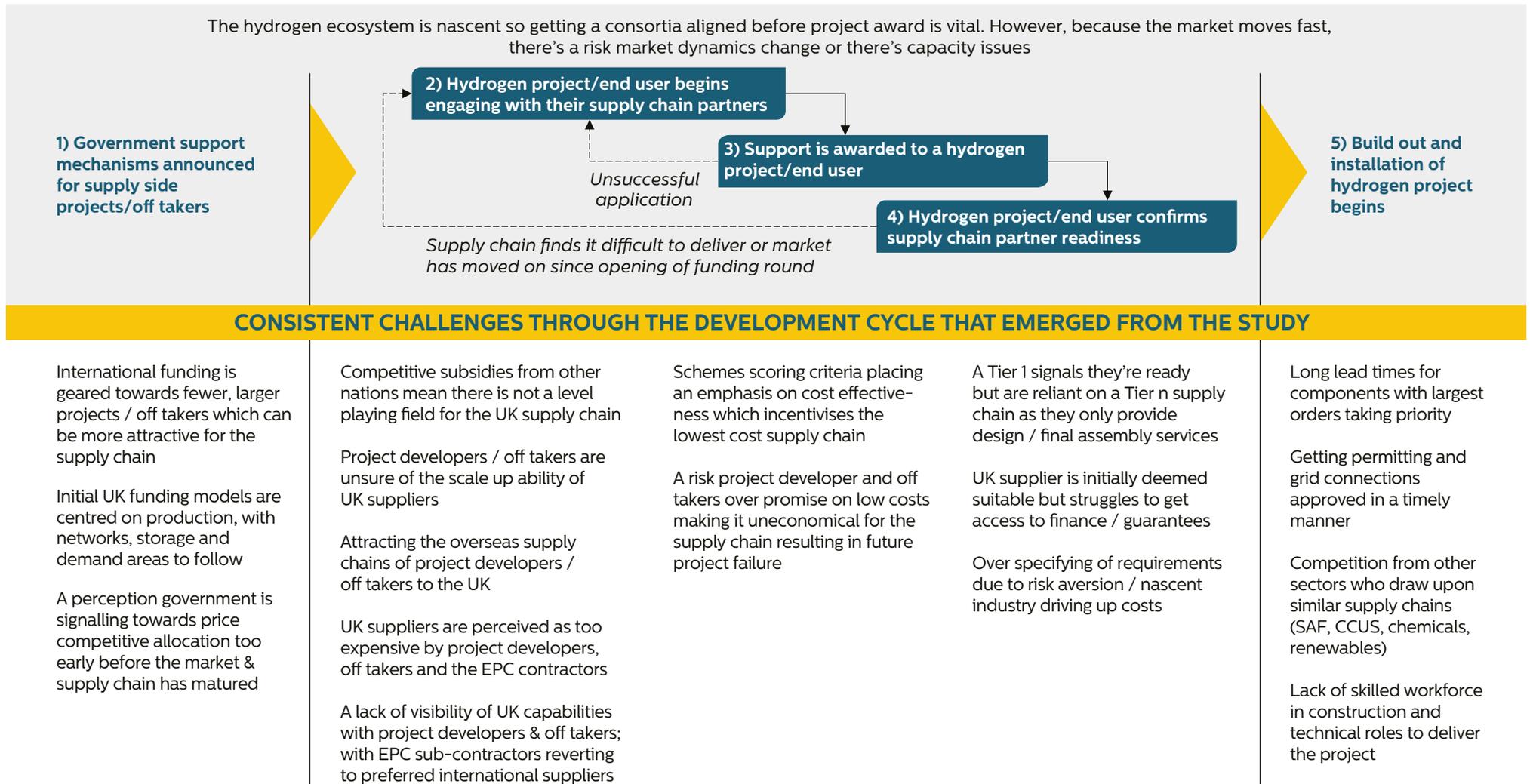


Figure 3: Existing challenges in the hydrogen development cycle

Government support mechanisms announced for supply side projects/off takers

As the hydrogen sector is still emerging, the UK Hydrogen Strategy acknowledges that government intervention is required to accelerate adoption. Three consistent themes arose with regards to government schemes. The first theme was that support mechanisms across the hydrogen value chain are at different levels of maturity. Many respondents commended the Hydrogen Production Business Model and subsequent Hydrogen Allocation Rounds. It was felt these initiatives have sent positive signals to the international supply chain on the level of UK demand. However, many respondents voiced concerns that business model and funding support for other areas like distribution, storage and end uses like power are not yet in place which is undermining investment and supply chain development. In fact, many companies across the hydrogen value chain hadn't engaged with a UK supply chain for this reason so couldn't provide a view on UK supply chain maturity. A consistent suggestion from industry to alleviate this issue would be setting the schedule for funding schemes 3-5 years in advance to help support early supply chain engagement.

The second theme was around the size of projects in the UK. There was a consensus felt by both project developers, end users and supply chain actors that the UK's competitor nations are geared towards supporting a fewer number of larger projects which is preferable for building a large supplier base. Many respondents argued a supply chain will tend to co-locate next to where they see the largest ambition for projects. It was raised several times by project developers and supply chain companies that this is already happening in electrolytic hydrogen. Respondents often cited the US, Germany and European Union as examples where ambitious schemes are attracting international suppliers. A related observation was that the ambition of the hydrogen industry is moving quickly. Since the publication of the UK Hydrogen Strategy in 2021, the size of "typical" projects across the hydrogen value chain had increased. There was a sense the UK government hadn't reflected these market developments when considering funding support. However, some respondents noted there needed to be a balance between supporting scale, which would often emanate from foreign direct investment, and nurturing smaller projects that could help grow UK companies. Some respondents articulated that the market could learn more initially from multiple, smaller project deployments which could better develop the UK technology base. Ultimately, there should be room to support both high volume developments alongside nurturing the UK supply chain via smaller developments.

The final observation was around the UK government's trajectory towards price competitive allocation for hydrogen. Many respondents highlighted the challenges price competitive allocations had caused the supply chain in more mature sectors such as wind. For a more nascent sector like hydrogen, there was a consensus moving too quickly towards price-based allocations before a supply chain had developed could be detrimental. Potential consequences of this could be a reduced number of applications (like AR5), or, project developers putting extensive burdens on their supply chains to meet an arbitrary cost. This would result in a higher likelihood of projects failing. In short, both project developers and the supply chain felt that until a more stable price for hydrogen is established, non-price factors (such as supply chain development) should be carefully balanced with valid concerns around value for money.

Hydrogen project / end user begins engaging with their supply chain partners

As the hydrogen ecosystem is still emerging, aligning a consortium in advance of a project award is crucial. Therefore, immediately after support mechanisms are announced and understood, companies will begin scoping the project and start forming partnerships with their supply chain. This is the first step where project developers and off takers consider UK supply chain partners, so it is necessary to understand potential barriers and opportunities.

The first theme that emerges is the lack of visibility of UK capabilities to project developers and their EPC partners. There were differences in opinion between project developers and supply chain partners on this point. Some supply chain companies in the UK felt that project developers / EPC partners often reverted to “safe” international suppliers where relationships had been formed in adjacent sectors. On the other hand, project developers and their EPC partners often remarked they had looked at a UK supply chain. Key themes emerging from the surveys were: the UK supply chain is non-existent in places; the UK supply chain’s ability to scale up and meet future demands; UK suppliers are too expensive. Some UK supply chain partners agreed it was hard to compete on cost globally but not with Western Europe or the US. Many argued that large subsidies like the Inflation Reduction Act and the Important Projects of Common European Interest schemes are distorting the market and resulting in the UK supply chain becoming uncompetitive.

Interestingly, evidence from the surveys would support both arguments (**Figure 4**). On the one hand, 42% of survey respondents had actively engaged or analysed the UK supply chain, with 10% actively selecting a UK supplier for projects moving forward. This is positive and shows there is some level of engagement in the UK supply chain. Nonetheless, 41% of respondents had not conducted a UK supply chain analysis with 17% also highlighting there was a lack or no suitable suppliers.

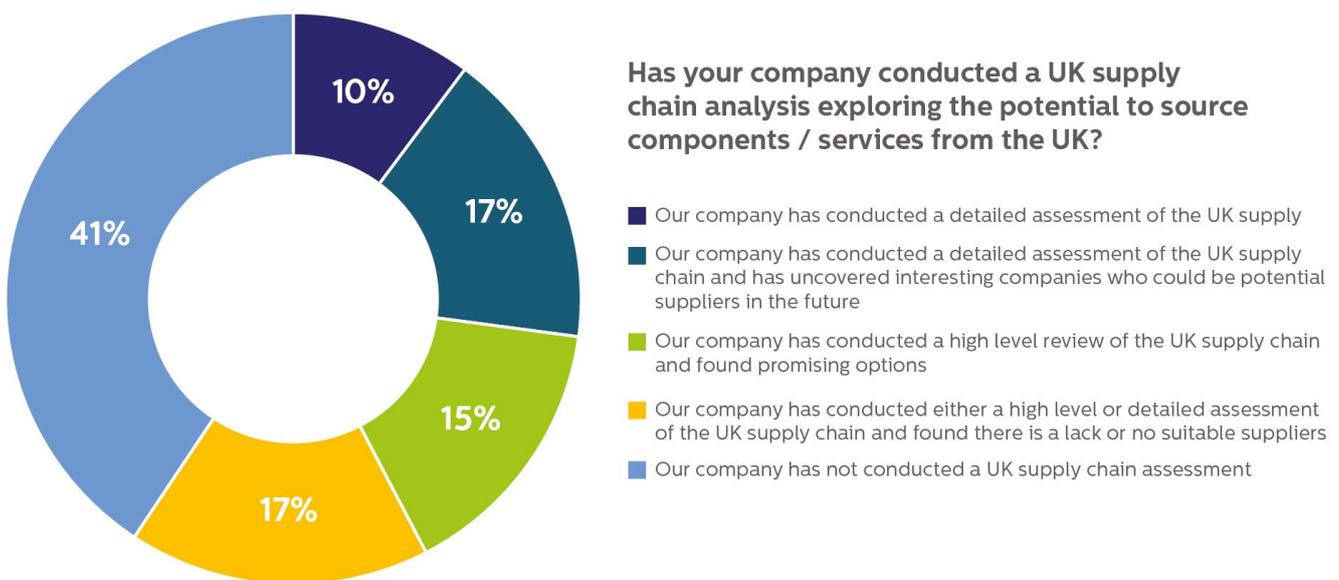


Figure 4: Has your company conducted a UK supply chain analysis exploring the potential to source components/services from the UK

This demonstrates there’s room for more communication and engagement between project developers, off takers and UK supply chain partners. Therefore, trying to open communication channels more clearly and explore options to overcome these challenges may result in greater levels of UK supply chain companies being considered. The Energy Pathfinder portal used by the North Sea Transition Authority was mentioned as a mechanism to increase visibility of projects and engage a UK supply chain.

One final point that was made was trying to attract overseas supply chain companies based on the demand signals. Many project developers and users of hydrogen are often foreign head quartered entities that use international supply chains. It was often felt more could be done jointly by industry and government to strategically target overseas supply chains and encourage them to anchor capabilities in the UK.

Support is awarded to a hydrogen project/end user

Once project developers and off takers align their supply chains and submit bids, projects will then be awarded funding from various support schemes. This could be the outcome of an allocation round or approval for grant funding. As these schemes are publicly funded, the guiding principle is to deliver value for money. While wider economic benefits are considered in the application process, many industry participants felt final negotiations tended to heavily centre on cost. This can incentivise the lowest cost supply chain which often originates outside of the UK. Furthermore, while industry was sympathetic with external pressures on project awards, minimising delays for future project awards would increase internal and private investor confidence in UK projects. A few survey respondents with global footprints stated that any future delays around funding announcements and awards would result in a loss of confidence in the UK as a hydrogen market. Award delays also impact the wider supply chain as competing interests may pull capacity away from supporting the project or end use if it is deemed higher risk. Another issue is also the short turnaround government expects for projects to sign contracts once awarded, especially in the context of rising supply chain costs and labour shortages.

Hydrogen project / end user confirms supply chain partner readiness

After projects have been awarded the project developer / end user begins detailed discussions with their supply chain on delivery timescales. A key issue highlighted by Tier-n supply chain companies is that while OEMs and Tier 1s may signal their capability to deliver, they are often reliant on a Tier-n supply chain that has capacity to deliver. The availability of facilities like fabrication yards to manufacture components like storage vessels and CCUS components is expected to be limited and could impact delivery timelines. Feedback from the broader supply chain highlighted this nuance was not factored in when considering projects across the hydrogen value chain. The implication is that a lack of capacity in the Tier-n supply chain could impact the UK's hydrogen deployment ambitions even if only a few hydrogen projects are awarded from the UK.

Another factor highlighted by UK supply chain actors was the difficulty in accessing private finance and guarantees to support local projects. Even if a UK supplier is selected as having the right product at an appropriate cost, the ability for smaller and medium sized companies to take on the risk or secure finance options to fulfil the order is limited. One narrative that emerged during interviews and surveys was that the support offered by UK Export Finance to export is more attractive than to supply into UK based projects. A perception has emerged where UK based suppliers feel more incentivised to export versus supporting domestic projects.

The final challenge that was highlighted centres on specifications. There was an impression in the wider supply chain that project developers and their EPC partners are over specifying products due to risk aversion or the industry being nascent. While it was appreciated that safety is paramount when transitioning to hydrogen, especially from existing gas assets, the supply chain companies interviewed often felt like some specifications were onerous and didn't understand their origins. It was felt that these specifications were being implemented due to uncertainty rather than collaboration with the hardware providers to understand what the best solution could be.

Many respondents also felt future certification schemes, like UKCA, were impacting current investment decisions. Many manufacturers across the value chain highlighted supply chains would prefer to prioritise larger, global markets versus investing in UK specific certification. In hydrogen storage, the requirement for transportable pressure equipment to be Rho marked (rather than Pi marked) was cited as a specific example.

Build out and installation of hydrogen project begins

The final part of the project development cycle is the construction and installation of a hydrogen project or end use application. Larger scale hydrogen projects are in the early stages of being implemented so the challenges highlighted below are what's anticipated. One of the most cross-cutting challenges identified through this study has been lead times for components. This applies to both hydrogen specific components and more generic components. Elements that were identified as having longer lead times at scale were electrolyser stacks, compressors, high voltage transformers, reformer packages, large storage vessels, metering equipment and industrial equipment such as boilers and burners. For items like compressors, high voltage transformers and storage vessels, despite being relatively established items, the ramp up in demand across different applications is creating a backlog. For elements such as reformer packages and electrolysers which are more bespoke, lead times are being influenced by difficulties in manufacturers scaling up and large orders booking out capacity well in advance. For certain elements of the supply chain like boilers and burners, it was felt while some products exist on the market, purchasing decisions could be held up by incumbent suppliers waiting to tailor their existing technology. Finally there were concerns raised regarding concentrated supply chains, especially in areas like reformer packages, air separation units and gas turbines where the industry is reliant on a handful of suppliers. Delayed build out by these suppliers would have profound impacts on meeting government and industry ambitions on roll out.

A contributing factor to long lead times for components is competition from other sectors who draw upon similar supply chains. One short term pain point highlighted by various stakeholders was in late 2024 early 2025 when projects for hydrogen allocation and Sustainable Aviation Fuels (SAF) plants are expected to be built in line with government ambitions. Another pain point was in the late 2020s when the industrial clusters begin ramping up their Carbon Capture Utilisation and Storage (CCUS) and hydrogen related activity in addition to further hydrogen production, storage and distribution projects coming online. There was a feeling both industry and government do not appreciate the scale of what the supply chain is expected to deliver across multiple sectors.

Many elements of the hydrogen industry such as production, networks, storage and demand sectors like industry and power can be substantial infrastructure projects. This has a significant demand for labour with many respondents highlighting a deficit in construction and technical roles. Survey responses from project developers highlighted there is a shortage of UK skilled engineers with some receiving large amounts of application from people overseas who have limited experience in meeting European design standards. This was reiterated by stakeholders across the hydrogen value chain and their supply chains. The impact of labour shortages is now being felt in two ways. The first is that project developers and off takers are nervous delivery time scales could be impacted as the ramp up required is challenging. The second impact is in the wider supply chain where roles in fabrication, design engineers and production staff are limited which is creating wage competition.

The final challenge mentioned from respondents across the hydrogen value chain is the time it takes to be granted planning permission and access to a grid connection. While this is not a hydrogen nor UK specific issue, it is hurting the roll out of a hydrogen economy and is expected to get increasingly worse as more of the hydrogen ecosystem such as networks, storage and industry projects start reaching critical mass.

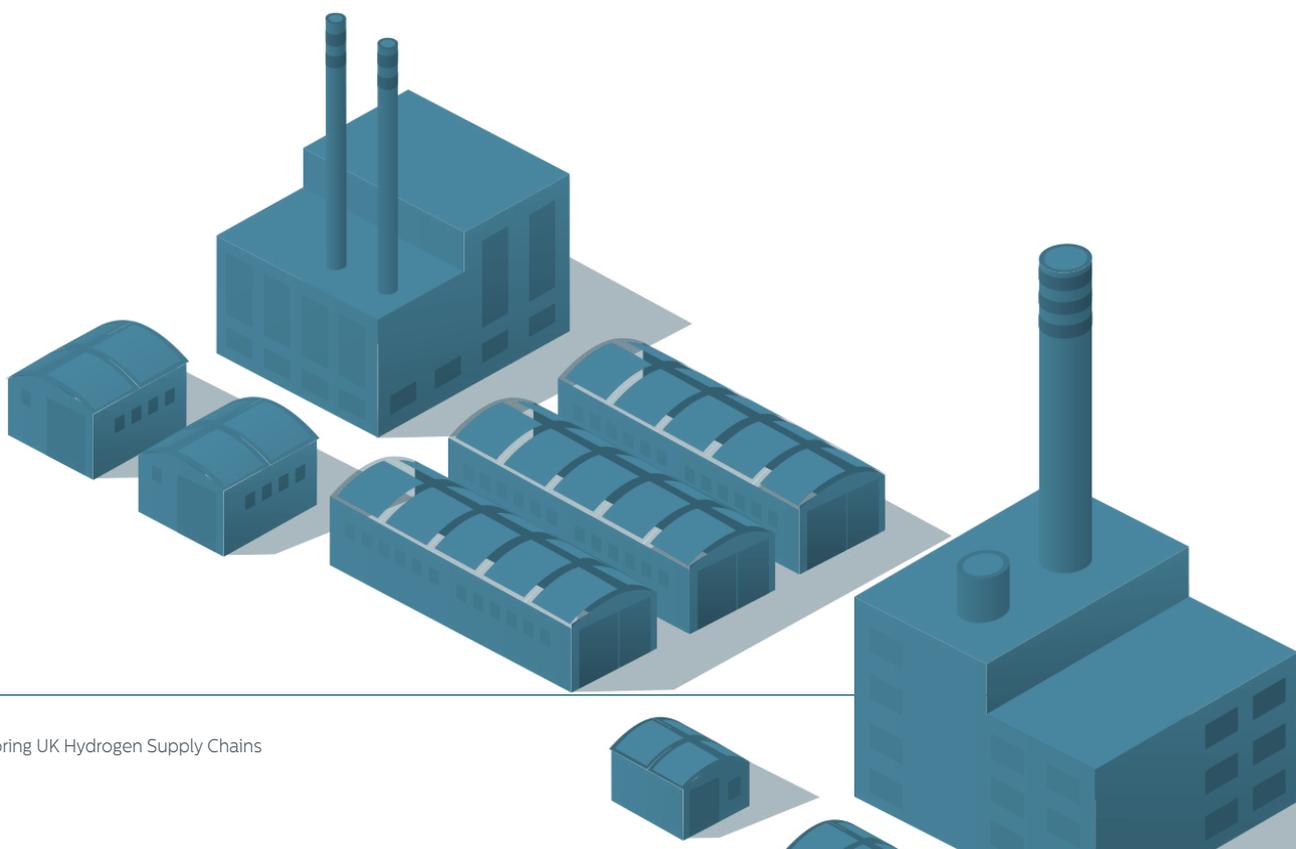
Next steps to deliver on the industry's supply chain ambition

This report has provided a thematic overview of the opportunities and challenges in building a hydrogen supply chain. However, this study only represents a snapshot of the UK hydrogen industry at a point in time. The intention is for the industry to continuously evolve the strategy in association with the Hydrogen Delivery Council and wider stakeholders. We also expect the industry ambition, strategic pillars and foundational elements identified in this report to be discussed at the next Hydrogen Investment Forum. Now scheduled to take place in Q1 2024, this provides industry, government departments, and investors a forum to openly discuss the challenges identified in this report and help steer future actions.

Following this summary, Hydrogen UK will release a more detailed report that explores more of the evidence base for these recommendations in Q1 2024. In this report, a selection of higher priority items will be identified in electrolytic hydrogen, CCUS enabled hydrogen, networks, storage, power and industry. These are the elements identified for Phase 1 of the analysis with Phase 2 work also expected to begin in 2024 which will include the remaining demand side areas. In addition, Hydrogen UK will also be working with DESNZ and industry to scope supporting pieces of work such as the monitoring and evaluation framework, in collaboration with organisations like HII. It's expected that the outputs of both the Phase 1 and Phase 2, could help inform the strategic priorities of the Green Industries Growth Accelerator as part of a wider consultation. With this in mind, industry should work closely with DESNZ to ensure the fund accelerates the growth of UK manufacturing and crowds in significant private sector investment.

Despite some of the challenges outlined in this report, it's important to note that the hydrogen sector is still emerging. What's been evident through the engagement process is that UK industry and government are passionate about collaborating to overcome these challenges and ensuring the UK is a world leader in hydrogen production and end-use applications.

Hydrogen UK understand that anchoring a strong manufacturing base is fundamental to capturing the full economic potential of hydrogen. If you'd like to get involved with any of the supply chain work, please get in touch to help us shape the industry's ongoing hydrogen supply chain strategy.





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