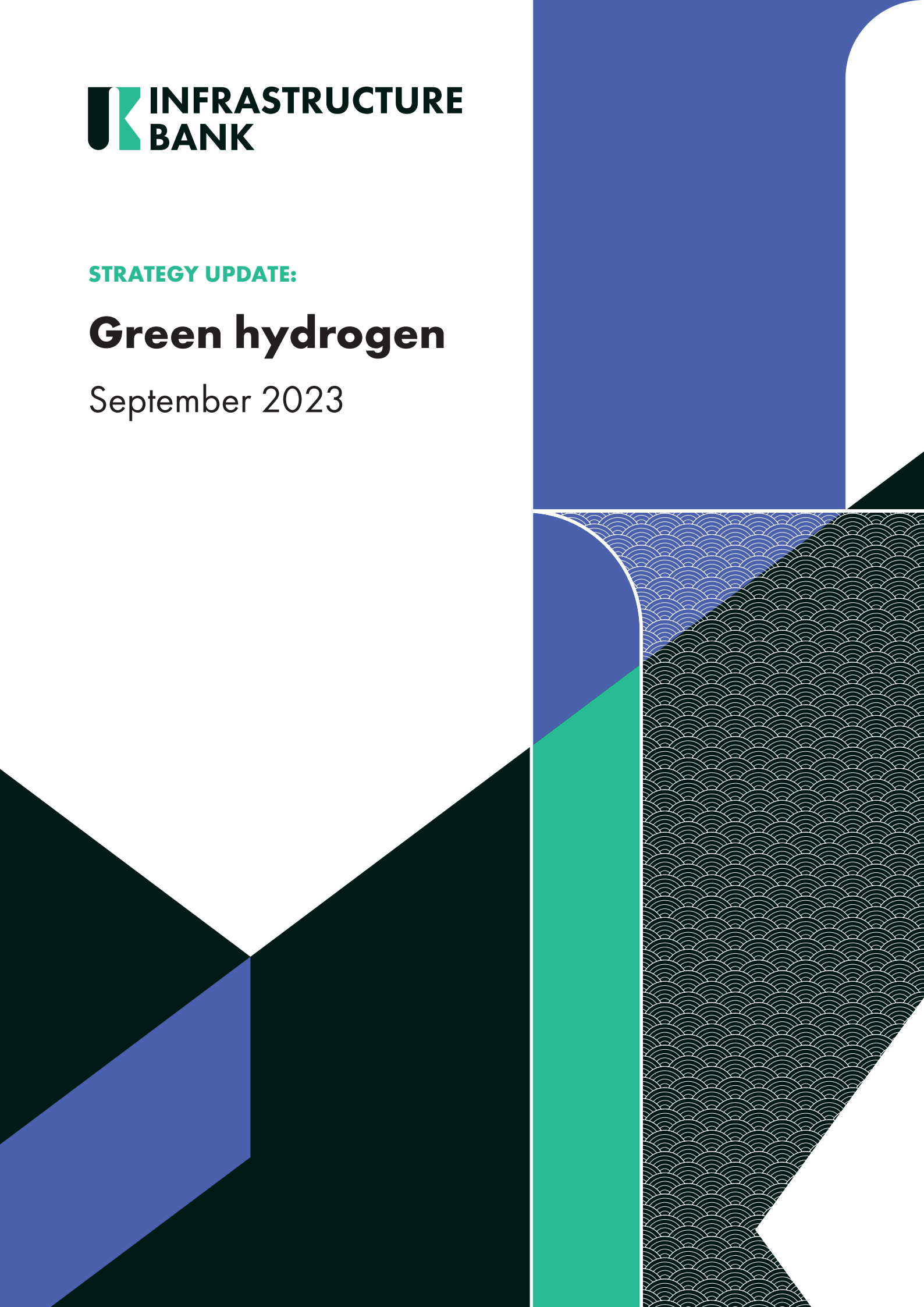




STRATEGY UPDATE:

Green hydrogen

September 2023



Sector summary: green hydrogen

Government ambition

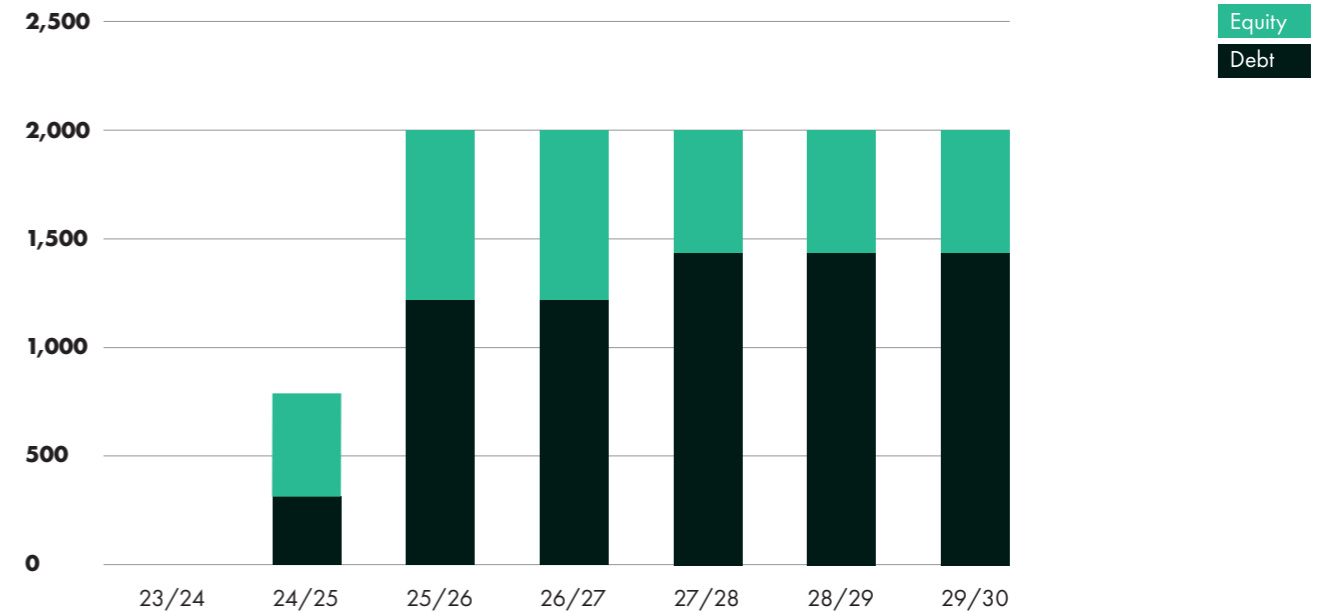
10GW of low carbon hydrogen (blue and green) by 2030, with at least half from electrolytic (green) hydrogen. On a pathway, government aims to:

- > By 2023, award hydrogen allocation round 1 (HAR1) contracts to deliver up to 250MW green hydrogen production capacity.
- > By 2025, award HAR2 contracts to deliver up to 750MW green hydrogen production capacity
- > By 2025, to have up to 1GW electrolytic (green) and 1GW CCUS enabled (blue) production in operation or in construction.
- > By 2025, hold annual allocation rounds.

Government funding

- > **£240 million Net Zero Hydrogen Fund** provides capital support to blue and green hydrogen projects.
- > **Hydrogen business model provides revenue support over 15 years**, initial £100 million allocated for first 250MW capacity.

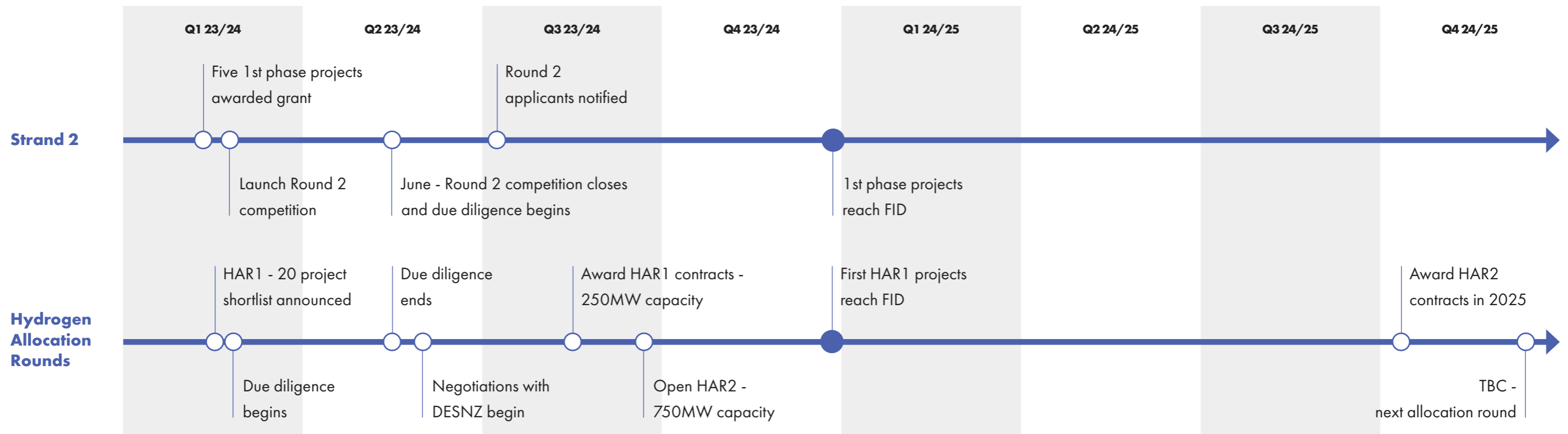
Estimated private financing need (£m)



Data note:

UKIB estimates based on the capital required to finance projects benefitting Net Zero Hydrogen Fund (NZHF) HAR1 over the initial years. From 2025/26, estimates, relate to the amount required to meet capacity targets alongside HAR2 and expected future annual allocation rounds.

Investment roadmap



Low carbon hydrogen will play a key role in meeting net zero, by reducing emissions in hard-to-electrify sectors, such as industrial heating and heavy transport, and providing flexibility to the power sector.

Government analysis for the 6th Carbon Budget suggests between 250-460TWh could be needed by 2050 to meet net zero, making up 20-35% of the UK's future energy consumption.

The UK currently produces around 27TWh of hydrogen per annum. However, this is almost solely produced by **grey hydrogen** – produced from natural gas without carbon capture. The majority is produced and used on-site. There is almost no low-carbon hydrogen production or tradeable hydrogen energy market in the UK.

There are two main forms of low carbon hydrogen production:

- > **Electrolysis (green hydrogen)** – produced from renewable electricity which is used to split water.
- > **CCUS enabled hydrogen (blue hydrogen)** – produced from fossil fuels, often natural gas, where CO₂ from the production process is captured.

Government ambition is to deliver up to 10GW of low carbon hydrogen production capacity by 2030, with at least half of this from electrolysis. By 2025, the aim is to have up to 1GW of electrolytic (green) hydrogen and up to 1GW of CCUS enabled (blue) hydrogen in operation or construction.

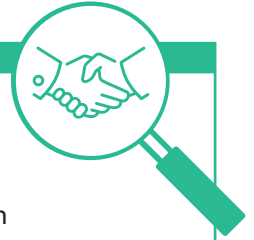
This document focuses on green hydrogen. Our role in blue hydrogen projects is covered in our [CCUS sector update](#).

Early demand for green hydrogen will be limited, although it is expected to develop at pace as production capacity ramps up and transport and storage infrastructure develops. The government's [2030 roadmap](#) sets out how supply, transport and demand will develop through the 2020s. The latest [hydrogen update to the market](#) highlights the steps being taken in pursuit of the government's 10GW ambition. We want to help lead the market in developing sustainable financing to help deliver this ambition.

Green hydrogen presents a significant opportunity to stimulate regional growth and could create up to 12,000 jobs by 2030, with a pipeline of over 250 projects across a range of production methods in development across the UK.¹

Government has recognised the importance of lowering production costs and stimulating demand. The industry's development will be heavily influenced by upcoming government policy decisions, in particular awarding the first Hydrogen Production Business Model contracts and action taken to stimulate transport and storage infrastructure and demand. We work closely with government on their policy development.

¹ [HM Government, 'Hydrogen Net Zero Investment Roadmap' \(2023\)](#)



Green Hydrogen – Government policy support

There are two main programmes that support investment in green and blue hydrogen production:

Net Zero Hydrogen Fund (NZHF), providing up to £240 million capital support for production facilities.

Hydrogen Production Business Model (HPBM), providing 15 year revenue support contracts to hydrogen producers.

Green hydrogen support is delivered through the Hydrogen Allocation Round (HAR).

- > **HAR1**, launched in July 2022 to support up to 250MW green hydrogen production capacity;
- > **HAR2**, expected to launch later this year and intending to award HPBM contracts in early 2025 to deliver up to 750MW green hydrogen production capacity, subject to affordability and value for money; and
- > aiming to hold annual allocation rounds from 2025.

Eligible projects must meet the Low Carbon Hydrogen Standard.

This is not the full extent of support available. For example, Renewable Transport Fuel Obligation revenue is available for production projects in the transport sector.

We estimate around £800 million of private investment will be needed in 2024/25 to deliver up to 250MW production capacity (HAR1). Much of this capital has already been committed, or will be committed, subject to government awarding contracts. We expect Government to award contracts by the end of 2023.

For HAR2, we estimate £1.5-2 billion of private investment will be required in 2025/26 to deliver up to 750MW capacity.

We will prioritise financing green hydrogen production over the next 12-18 months as we think this is the most effective way the bank can solve problems in this nascent market.

We will also consider support for demand, transport and storage infrastructure and supply chain projects. We will work closely with projects and government to crowd-in investment as the market develops and grows.

Problems we want to address: green hydrogen production

Demand risk

Early demand for green hydrogen is expected to be limited and production projects are expected to meet demand through both contracted and uncontracted revenues. This means projects can face relatively low levels of revenue certainty. This problem will decrease over time as demand for green hydrogen increases and investment and technology barriers are overcome.

While exposure to these problems is reduced by volume support provisions in the government's [Hydrogen Production Business Model](#), projects face residual risks that may reduce investor appetite to provide debt.

Delivery and initial performance risk

While green hydrogen production is scaling quickly, with 269GW capacity expected to be operational globally by 2030, operational capacity today totals 450MW.² There is limited reliability and performance data on green hydrogen projects.

Supply chains are constrained. Some projects are facing delays receiving equipment because critical components, such as electrolysers and compressors, are in global demand.

In their development phase, projects may face planning and consent issues. During construction, the lack of turnkey EPC contracts exposes investors to cost uncertainty. During operation, projects may face unexpected maintenance costs. There are limited warranty and insurance products available to address these risks.

These risks can be mitigated but may result in delays and increased costs.

Sponsor performance

The risk of counterparties being unable to meet their contractual obligations varies across projects and driven by factors such as a sponsor's track record. This could reduce investor appetite to provide debt as it may be difficult to price the risk on a project-by-project basis.

² [Aurora Energy Research \(April 2023\)](#)

Our solution

We want to help lead the market in tackling these problems and creating a sustainable platform for financing green hydrogen projects. By having a risk tolerance to address these problems, we can be a first-mover and help open up debt financing.

We will focus on larger scale projects selected by government in HAR1 and HAR2.

To deliver this, we will:

- > work with the projects to understand their exposure to the problems identified and other investment barriers faced;
- > accelerate transformative debt financing models to help deliver the quantum of private investment required to deliver government's hydrogen ambition;
- > partner with other lenders to support debt financing where possible. We will also consider being a sole lender on a case-by-case basis.

Although equity has flowed into early hydrogen projects, we will consider providing direct equity to help deliver HAR1 projects, if market capacity gaps emerge.

We will also consider direct equity in HAR2 projects, which are expected to be larger and more complex. We can participate as a minority equity investor where projects are able to demonstrate a pathway to profitability, subject to receiving government support.

Across all our private products, our indicative minimum ticket size is £25 million.

Moving forward: demand, transport and storage

There is currently a limited amount of hydrogen transport and storage infrastructure.

As the hydrogen economy develops during the 2020s, we expect markets to grow rapidly for this infrastructure, including: pipelines, storage, tube trailers, refuelling infrastructure and technologies to enable new uses of hydrogen.

Government is working to catalyse the UK's developing hydrogen economy, including providing the necessary conditions to incentivise investment in the wider value chain and supply chain. We anticipate policy development in the areas below will be particularly important to unlock projects we can support over the next three years:

- > **Transport and storage business models:** government is developing a revenue support model to incentivise the development of hydrogen transport and storage infrastructure. This business model is expected to be finalised by 2025.
- > **Demand side incentives:** government is assessing how it could encourage the use of green hydrogen. For example, capacity market reforms to more closely align the policy with net zero, which could unlock demand in the power sector.

The most prominent problem facing project developers which limits investment is currently **feedstock risk**, which is driven by a lack of firm green hydrogen supply.

We will work closely with project sponsors and the government to crowd-in investment as the market develops and grows.

Get in touch

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