

Importing one
million tons of
green hydrogen
via the port of
Amsterdam

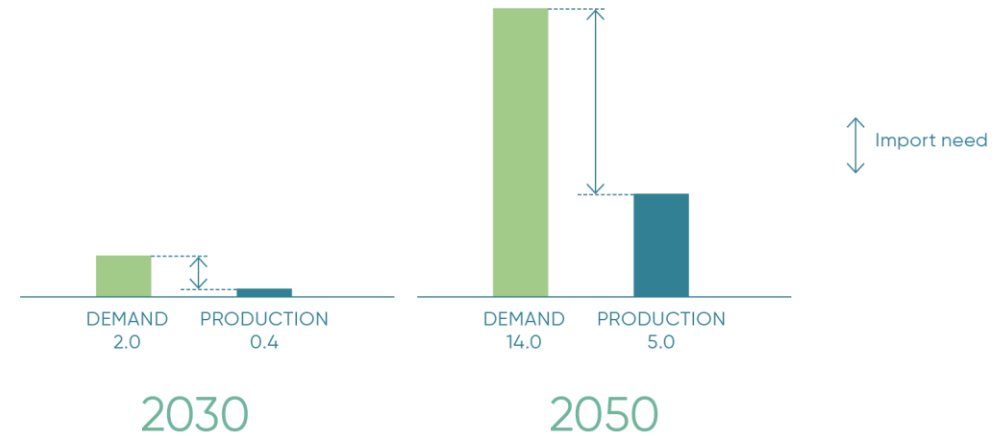


Delivering the benefits of green hydrogen

Our journey

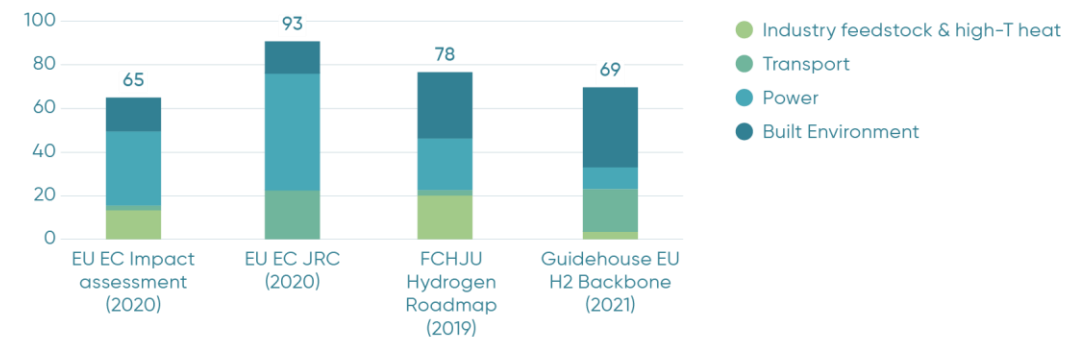
Europe is on an amazing journey towards becoming environmentally sustainable by 2050. The sights are set high: cut emissions by at least 55% by 2030 and reach climate neutrality by 2050. The time to take concrete action is now. We need workable solutions to make a real difference. Green hydrogen is such a gamechanger. It is essential to enable industry and heavy transport to decarbonise, while remaining viable and competitive. This is why demand for green hydrogen is expected to surge in the decades ahead. But the demand will soon outstrip the supply. The green electricity generation required for large-scale hydrogen production is too space and energy intensive in north-western Europe to meet future demand. That's why we need to import hydrogen within a sustainable import, transshipment and distribution network. >>

Green hydrogen deficit in the Netherlands in 2030 and 2050 (Mton/yr)



Source: Gasunie (2019), Gasunie & Tennet (2019), TKI Nieuw Gas (2018) & team analysis

Hydrogen demand in Europe in 2050 (Mton/yr)



This is where H2Gate comes in. We are a consortium of companies with complementary expertises that is dedicated to realising an international green hydrogen supply chain on a commercial scale. The goal: to import, tranship and distribute one million tons of green hydrogen annually via the port of Amsterdam. Thanks to its geographic location, existing infrastructure and entrepreneurial mindset, the port of Amsterdam is a major hub for energy products and as such is uniquely positioned to also play a leading role in the green hydrogen ecosystem. H2Gate has the vision, expertise and capabilities to make this happen. The consortium is working on several hydrogen carrier technologies with synergies across the entire import value chain. It is the fit-for-purpose solution for supplying the industrial, transport and power sectors with the carbon neutral raw materials and fuels they need to keep our economies thriving.

Potential synergies in shipping, storage and release are explored within the hydrogen import value chain



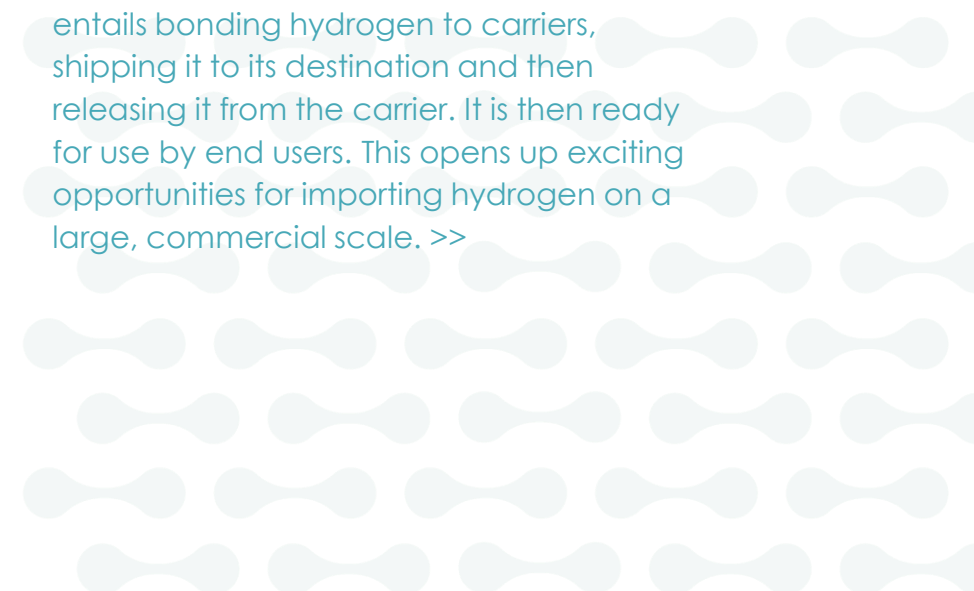


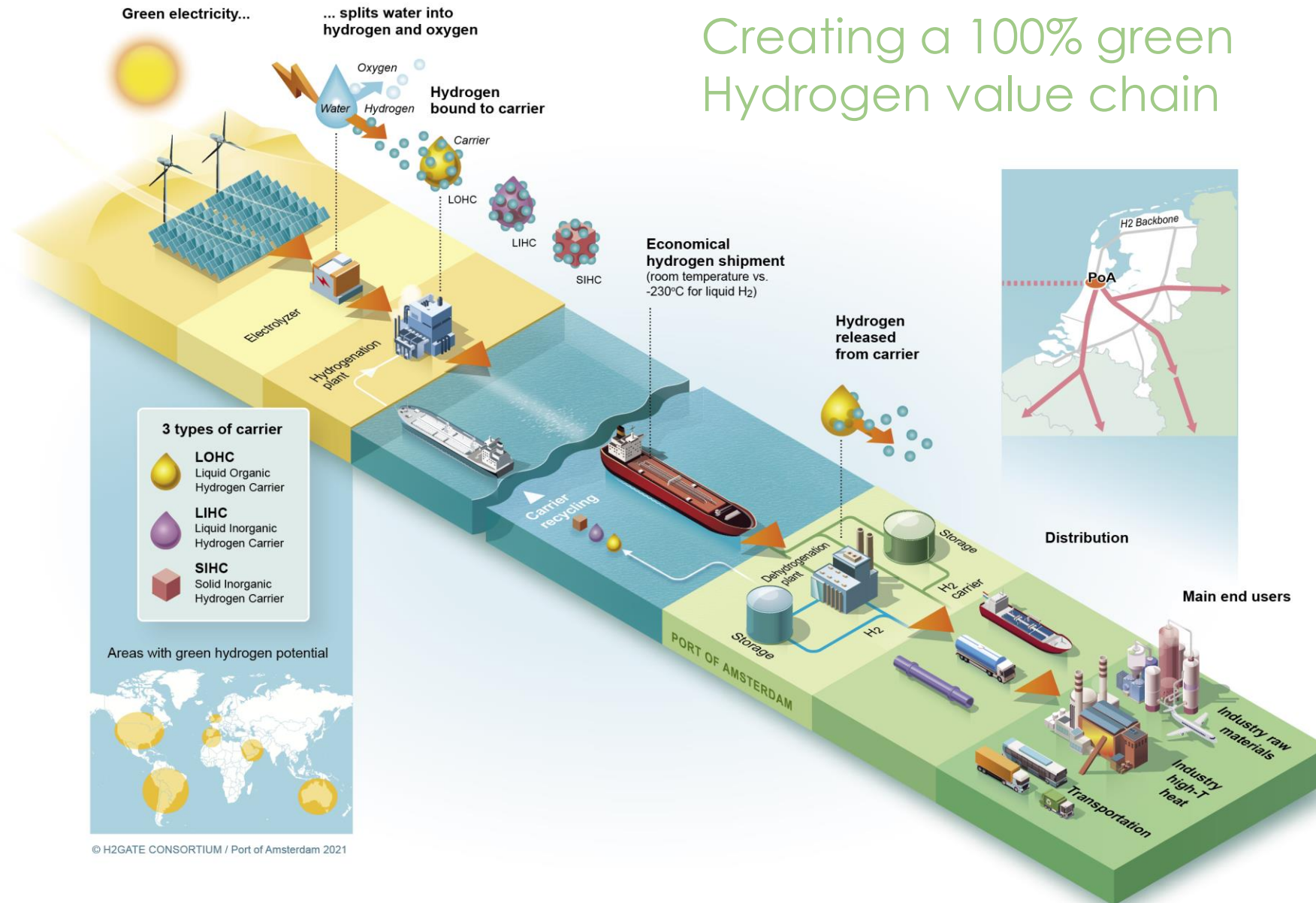
Bringing the net zero solution of the future

Hydrogen is a raw material for the industry and an energy carrier. Green hydrogen is produced via electrolysis using electricity generated in solar and wind farms. The surging demand for green hydrogen cannot be met only through local production – not even with an increased number of offshore wind farms. There simply isn't enough. This means hydrogen must be imported from regions outside north-western Europe that have abundant sunshine and/or wind, and space.

But getting the hydrogen here is not easy. Transporting gaseous hydrogen over long distances is prohibitively complex because there is no grid network to the source countries. So a lot of new infrastructure would be required.

That's why H2Gate is developing a way to import green hydrogen from areas where sufficient, inexpensive and sustainable electricity is generated. An efficient green hydrogen shipment and distribution system that uses new technologies to bond hydrogen to carriers. Hydrogen carriers offer a cost-effective, flexible and safe solution for transporting green hydrogen over long distances. This innovative process entails bonding hydrogen to carriers, shipping it to its destination and then releasing it from the carrier. It is then ready for use by end users. This opens up exciting opportunities for importing hydrogen on a large, commercial scale. >>





Joining forces to create value

H2Gate brings together the consortium partners Port of Amsterdam, Evos Amsterdam, Electriq Global, Hydrogenious and Hysilabs. We share a common vision, mission and aspiration. Together we offer a 100% green value chain covering shipping, storage, release and distribution. Pooling our resources and complementary areas of expertise let us create maximum value. H2Gate takes a multi-carrier approach. Different carrier technologies are being explored based on their unique product characteristics, energy efficiency and user applications.

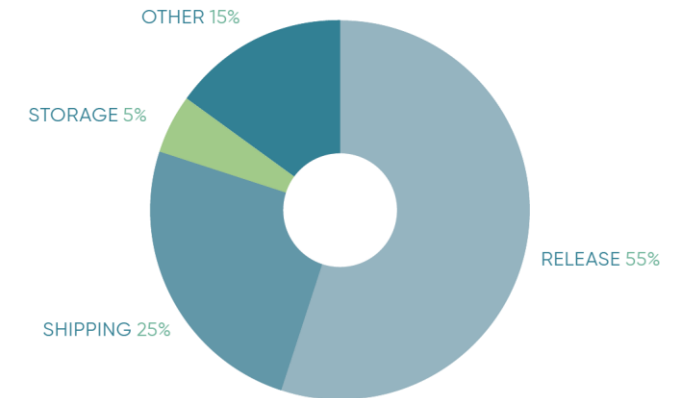
Combining parts of the value chain of these carriers, for example in common release sites and sharing of logistics infrastructure, results in cost savings of up to 15%.

The mass import of green hydrogen must be a concerted effort and that is why collaboration is at the heart of our consortium. H2Gate generates clear benefits: increased efficiency, improved value and economies of scope.

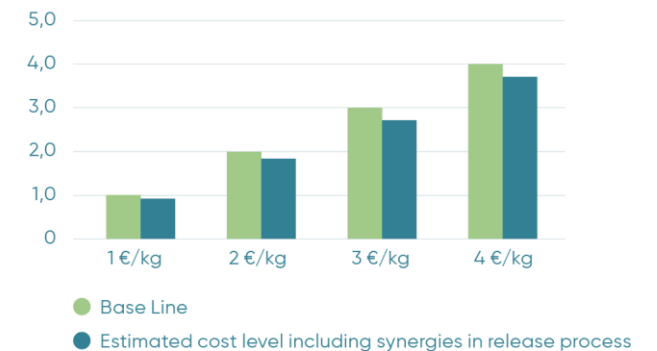
“H2Gate is unique because we combine different carrier technologies resulting in increased efficiency, improved value and economies of scope”



Relative contribution of various import-to-release stages in the levelized costs of hydrogen



Impact of cost synergies at the release site due to horizontal synergies



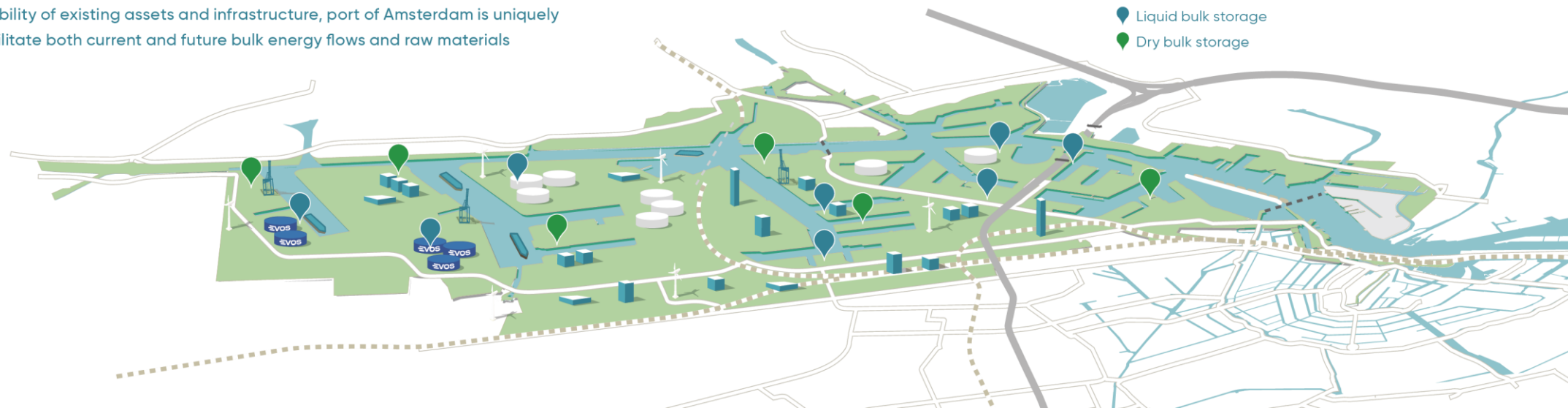
Amsterdam has it all

The port of Amsterdam gives H2Gate a perfect springboard for realising an international supply chain for green hydrogen on a commercial scale. As a core network port, Amsterdam has access to three of the nine European transport corridors. This makes it a vital port for supplying Europe. Amsterdam is a leading player in the liquid and dry bulk market. Recognised as one of the world's largest fuel ports, the port of Amsterdam has all the assets and

infrastructure in place to facilitate current and future bulk energy flows and raw materials. All the hydrogen carriers fit into the existing infrastructure and assets at port of Amsterdam. The present nautical infrastructure for carriers and ships, including quays and draught, can also be used for the transport of hydrogen. The storage capacity currently used for fossil fuels will also be utilised for the hydrogen carriers. The port also has suitable locations for releasing

hydrogen from carriers. This is a tremendous benefit for H2Gate: all the infrastructure and services are already present for the new supply chains. So we can get the hydrogen supply chain up and running faster and achieve significant cost and commercial advantages thanks to our multi-carrier approach. Building on the achievements of the past to accelerate our journey to a sustainable future.

Due to the availability of existing assets and infrastructure, port of Amsterdam is uniquely positioned to facilitate both current and future bulk energy flows and raw materials



Taking the lead towards a net zero future

Developing an international supply chain for green hydrogen is a golden opportunity to help shape a sustainable energy and industrial future. H2Gate is working on solutions that are technically, commercially and socially feasible. Society will benefit from this innovation across the board. This is because a secure supply of green hydrogen enables us to decarbonise our vital industries, including steel, aviation, inland shipping and utilities. These industries

are an essential source of employment, innovation and prosperity. By building a new sustainable supply chain for green hydrogen now, we can fulfil our ambition to achieve a carbon-neutral future. We've got the infrastructure, expertise and willpower to meet this challenge. Now is the time to take the lead in creating a green hydrogen ecosystem. Let's get going.

"Now is the time to take the lead in creating a green hydrogen ecosystem"

Scaling towards importing
one million tons

PHASE 3:
Commercially viable
import case

PHASE 2:
Proof of Concept

PHASE 1:
Blueprint & Roadmap

2020

2025

2030 AND
BEYOND



H2Gate is a collaboration of



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