

HYDROGEN BREAKFAST EVENT - ROTTERDAM 12 OCTOBER

Hydrogen deployment – From plans to practice



**Green
Giraffe
Advisory**

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2. Challenges to deployment
3. Getting to deployment



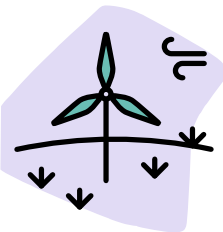
With our pioneering and independent advice, we help our clients accelerate the energy transition at scale



More than **EUR 36 bn** funding raised over **13 yrs** of specialised advisory



130+ professionals globally in 10 offices in 10 countries on 5 different continents



294 transactions or projects
>239 GW total capacity

A global and independent financial advisory firm launched in 2010

- Part of the Green Giraffe Group, providing finance solutions for capital intensive renewable projects and energy transition initiatives
- Pioneer from the early days and today the largest financial advisor specialised in the energy transition
- One integrated team - acting on a global scale

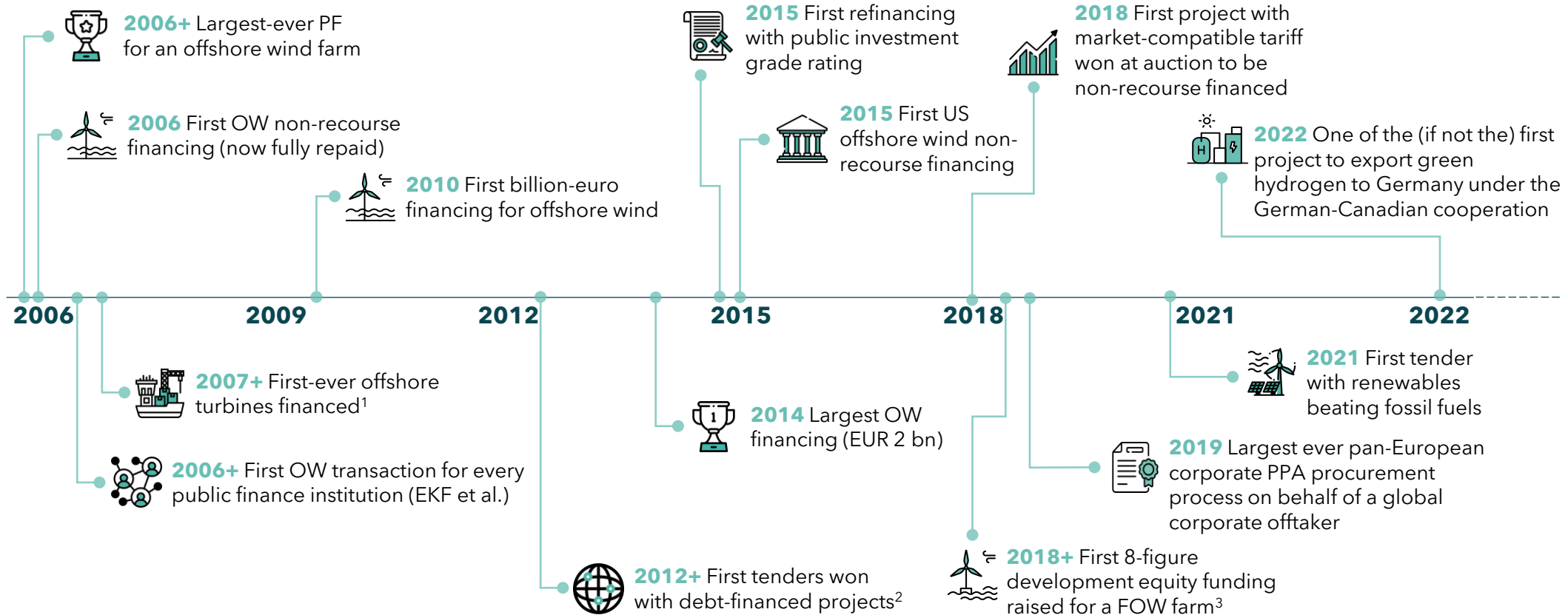
An ambition to provide high quality, specialised advice

- Proven track record in renewable and energy transition technologies
- High value-added from our specialised expertise on all our missions
- We build long-term relationships with our clients

Green Giraffe Advisory follows a simple strategy

- Provide a holistic and multi-disciplinary approach, coupling sector-specific tasks and traditional debt or M&A advisory services
- We are connected locally and globally to industry expertise, and we bring this pool of knowledge to you
- We are committed to the industry, we believe in the countries we are active in, and we have the skillset it takes to **get deals done**

Transaction “firsts” with Green Giraffe team members actively involved



¹ For wind turbines of 5, 6, 8 & 9.5 MW size

² Won in France, the Netherlands UK and Taiwan

³ First in the US / Asia / Europe

We are proud to be actively supporting various hydrogen and e-fuels projects over the world

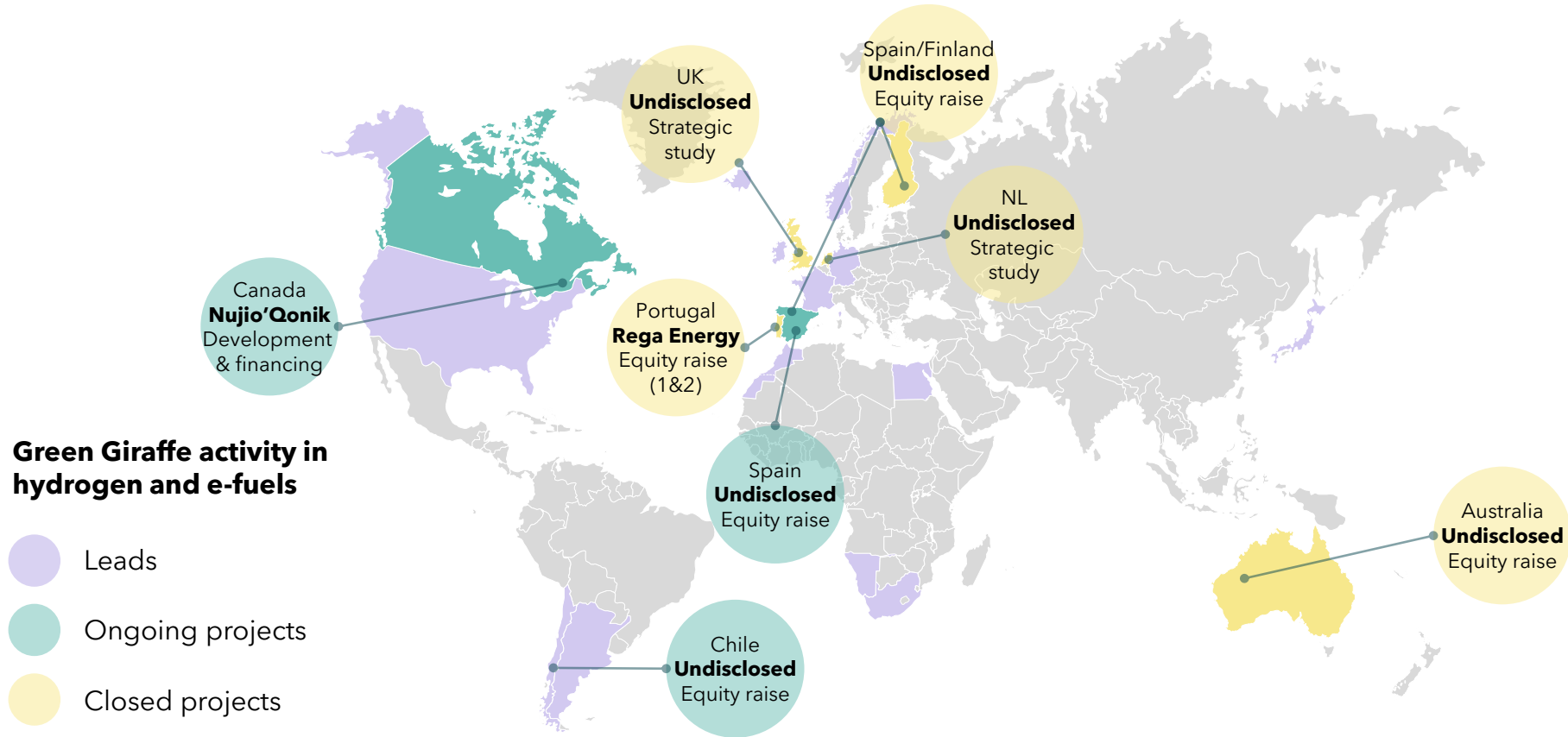
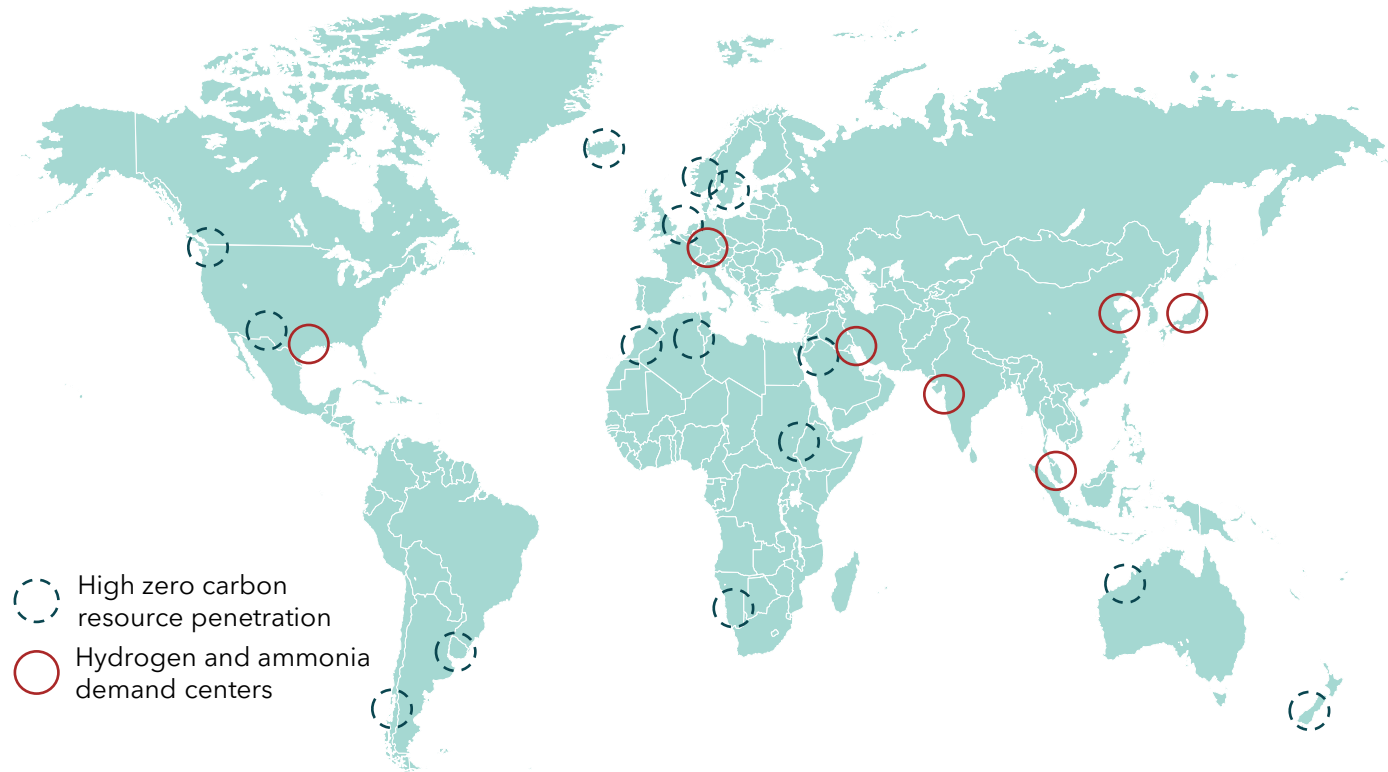


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Three business models angling for offtake opportunities concentrated in industrial centres



Source: Columbia Center on Global Energy Policy (2021)



Global production

- Utilize economies of scale
- Seek out world-class RE resources
- Shipping necessary - until certificates and physical delivery are decoupled



Local near factories

- Smaller plants co-located with demand
- Able to use pipeline to transport
- Avoid being traded as a commodity



Local near e-generation

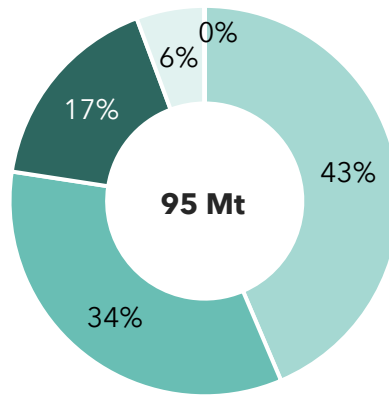
- Plants co-located with supply
- Combination of above - access to energy and less transport
- Ability to tap into existing infrastructure

Hydrogen demand already exists, yet visibility on green hydrogen long-term offtake lacking

Industrial feedstock

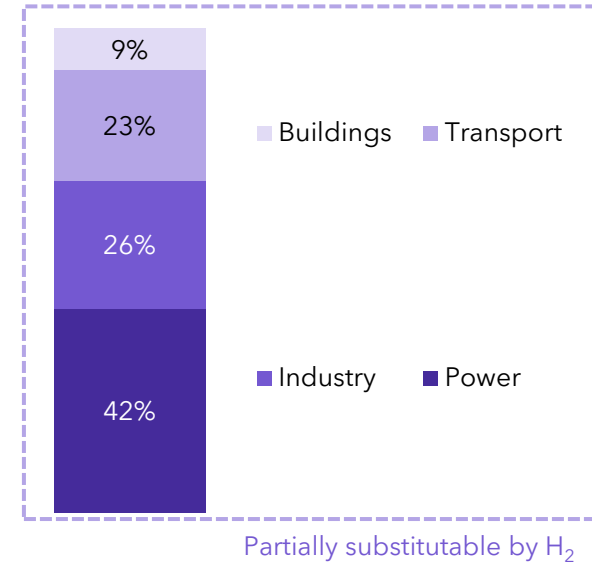
- Oil refining
- Chemicals (NH₃, methanol)
- Steel production
- Food industry

Hydrogen consumption 2022



- Oil refining
- Ammonia production
- Methanol production
- Iron and steel production
- Transport

GHG emissions 2022 by segment



0.7% of the total hydrogen produced today is produced low-emission

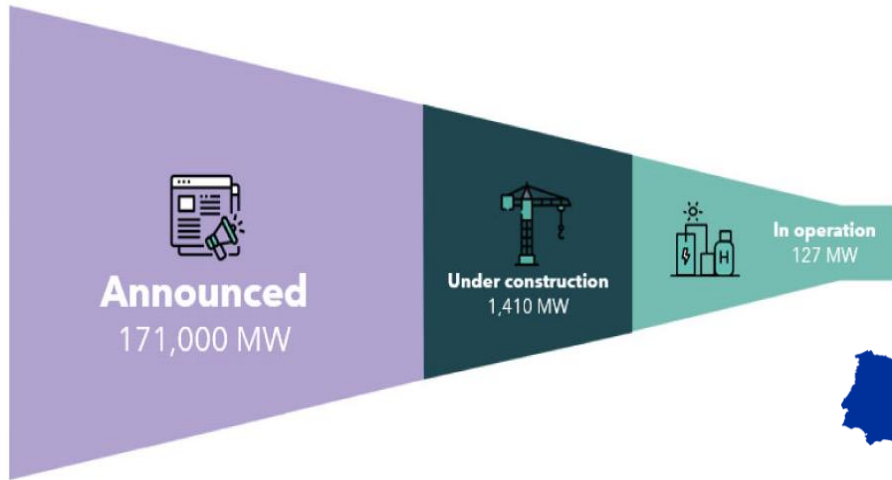
900Mt of global carbon emissions can be attributed to hydrogen production

Source: IEA Global Hydrogen review (2023), IEA Global CO₂ emissions per sector, 2019-2022 (2023)

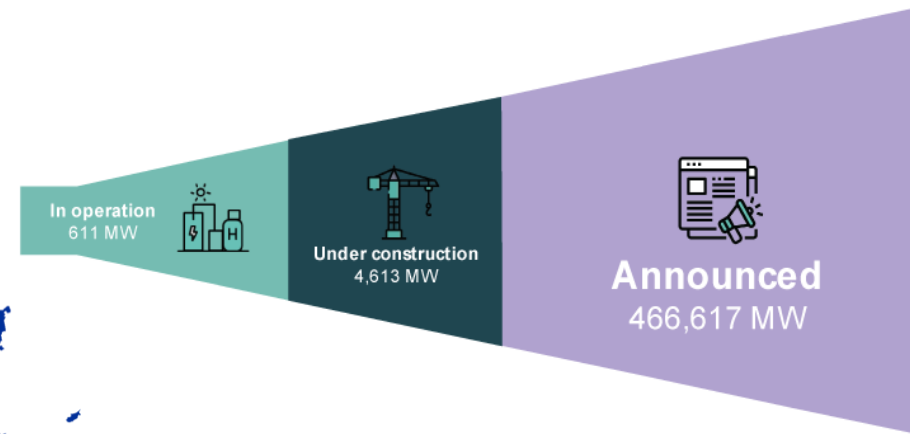
Current hydrogen uses offer insights into future abatement potential, but not enough to take FID at current prices

Supply for Europe - plenty of plans to build out H2 projects but only 4% of has taken FID

Green hydrogen capacity in EU announced



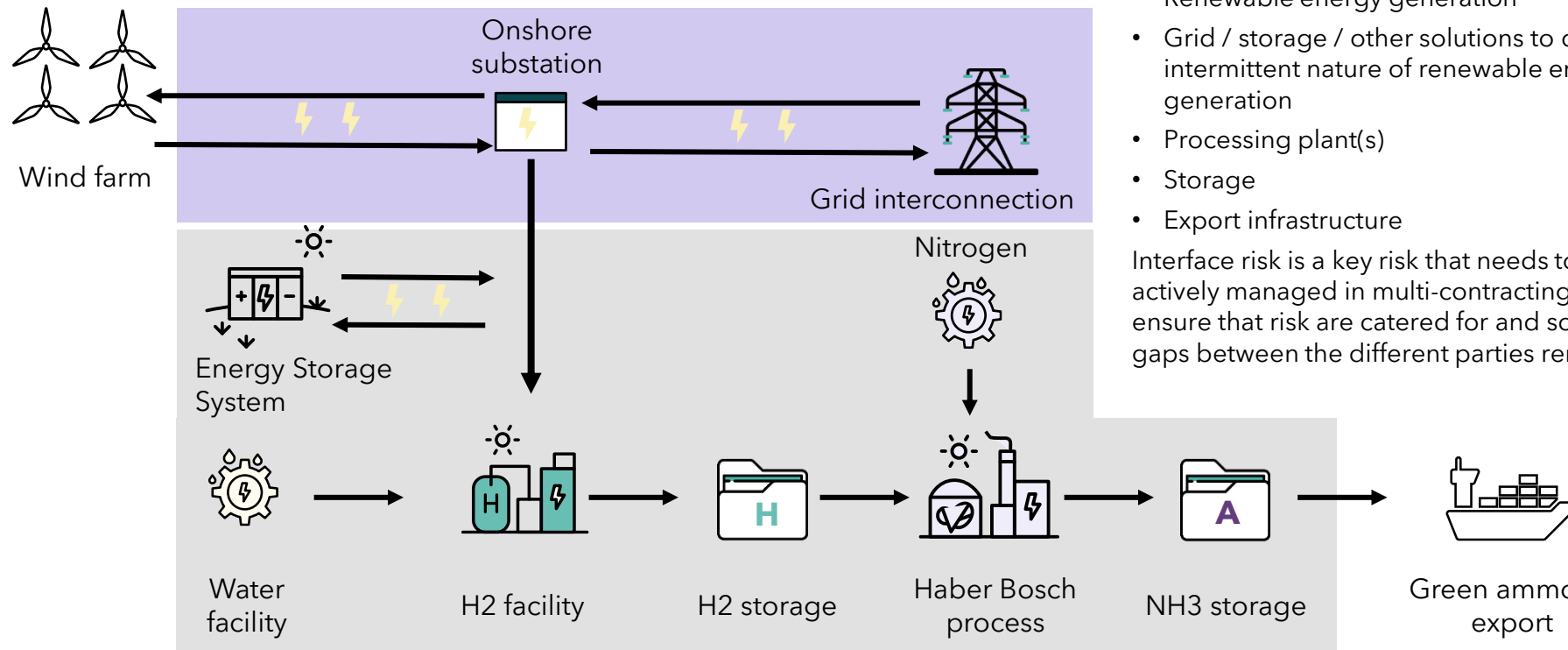
Green hydrogen capacity in the world announced



Source: IEA Hydrogen Database (Oct 2022), IEA Hydrogen Review (2023)

Business case certainty driven by regulatory framework and offtake prices will be the major driver to deployment

Hydrogen projects hold additional interface risks as multiple technologies / industries are involved

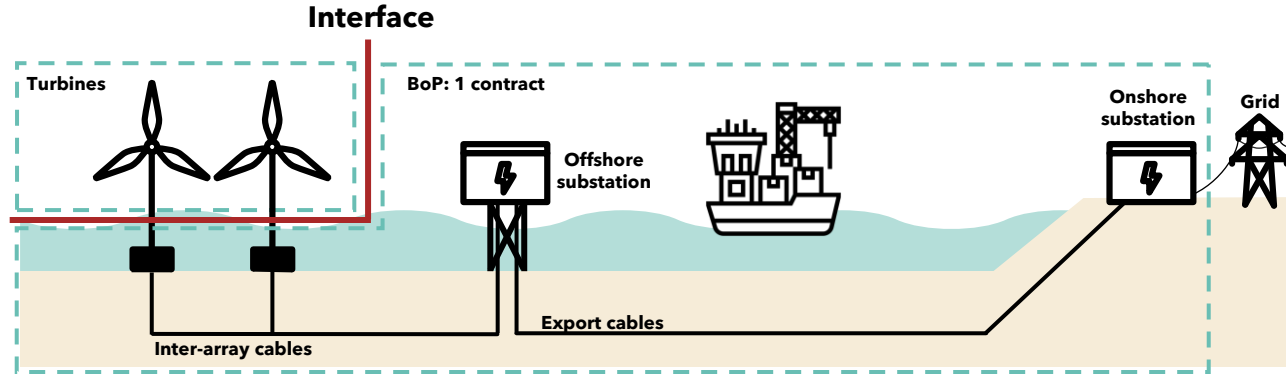


Green hydrogen / ammonia brings together

- Renewable energy generation
- Grid / storage / other solutions to cater for intermittent nature of renewable energy generation
- Processing plant(s)
- Storage
- Export infrastructure

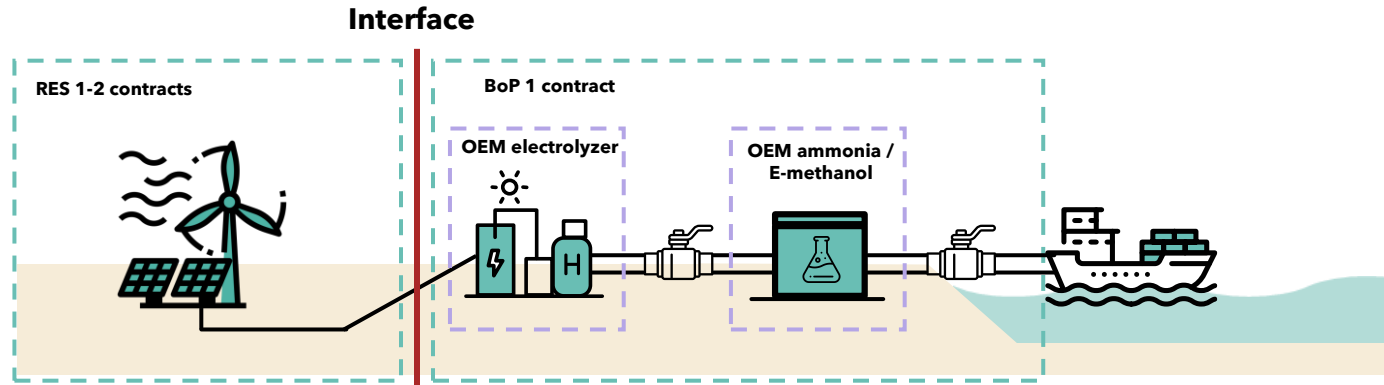
Interface risk is a key risk that needs to be actively managed in multi-contracting setup, to ensure that risk are catered for and scope gaps between the different parties remain

Learnings from offshore wind for giga-scale PtX



This contractual structure enabled project financing of first energy generating billion-euro projects

We believe a similar structure is required to finance the multibillion-euro PtX projects



Contractual structure of first OW as inspiration for the contractual structure that could make H2 bankable

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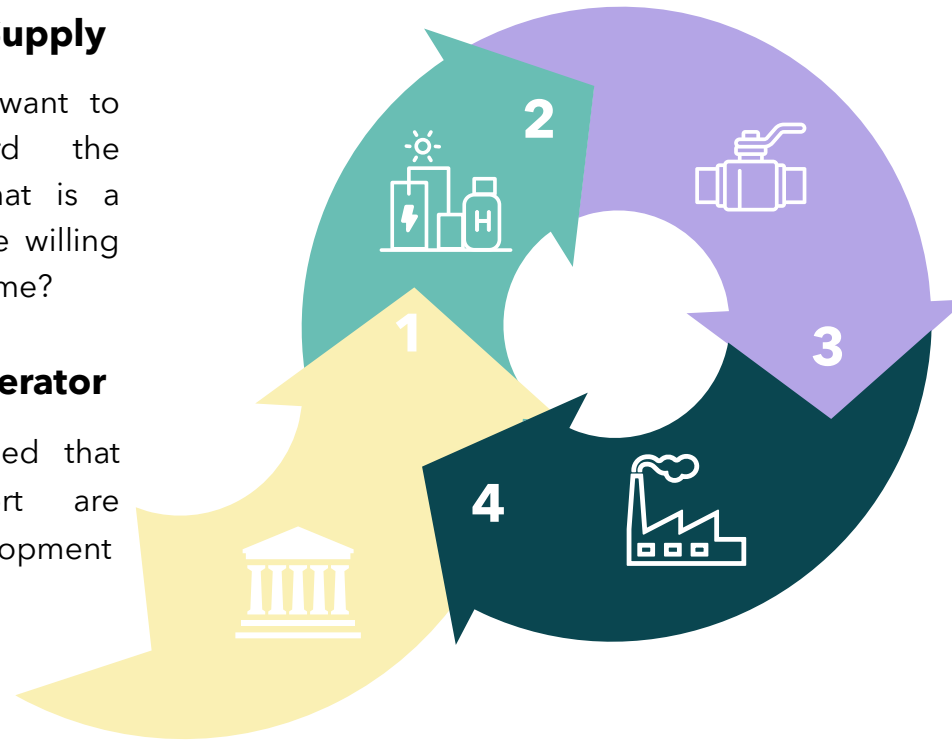
Step 1: Governments to unlock the chicken and egg stalemate to accelerate the energy transition?

Supply

Production projects will want to ensure they safeguard the business case - but what is a realistic price offtakers are willing to pay, and in what timeframe?

Government as accelerator

Policy-makers have realised that incentives and support are necessary for market development



Infrastructure

The business case for infrastructure requires significant scale and visibility on quantity, e.g. terminals and pipelines

Who takes responsibility for developing infrastructure?

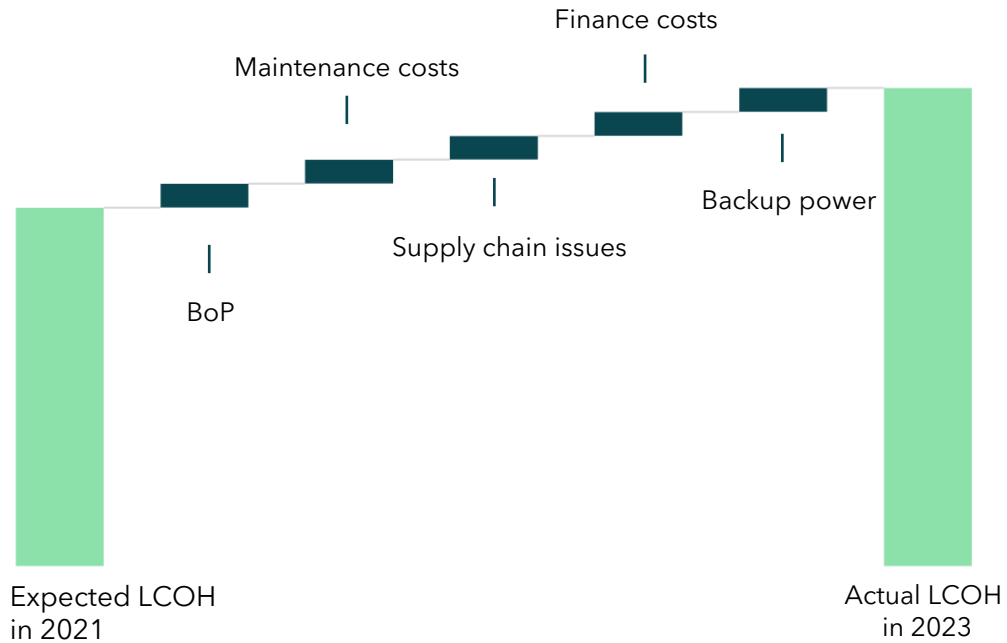
Demand

Offtakers of green hydrogen will want to ensure the right price for green hydrogen but how to do that in the current non-transparent market? And what volumes can be delivered when?

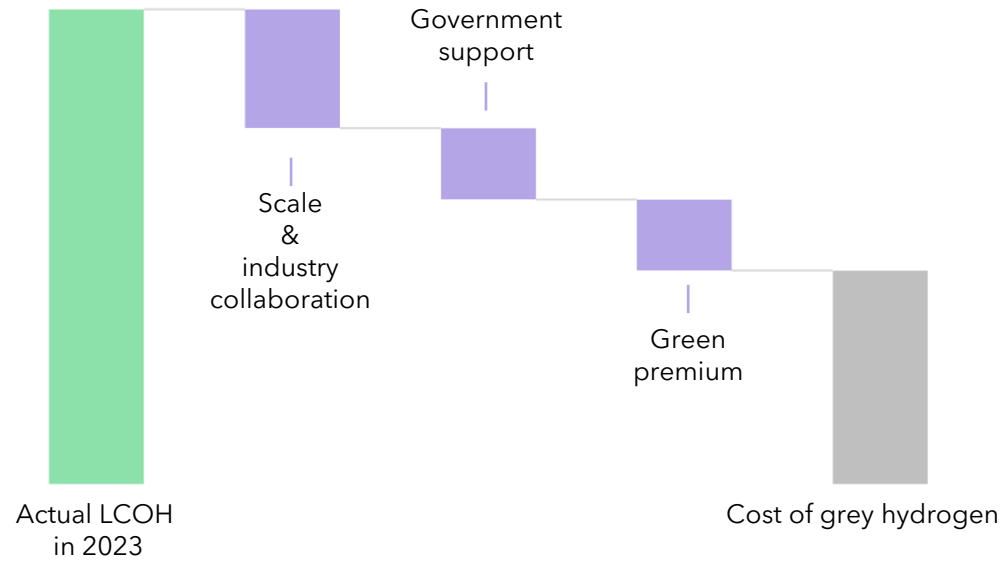
Setting up a new industry is like a dance - we all need to move together in the same pace but it starts with visibility

Step 2: Reduce the gap in cost price

The cost of green hydrogen is higher than anticipated in 2021



However, green hydrogen can be competitive with grey



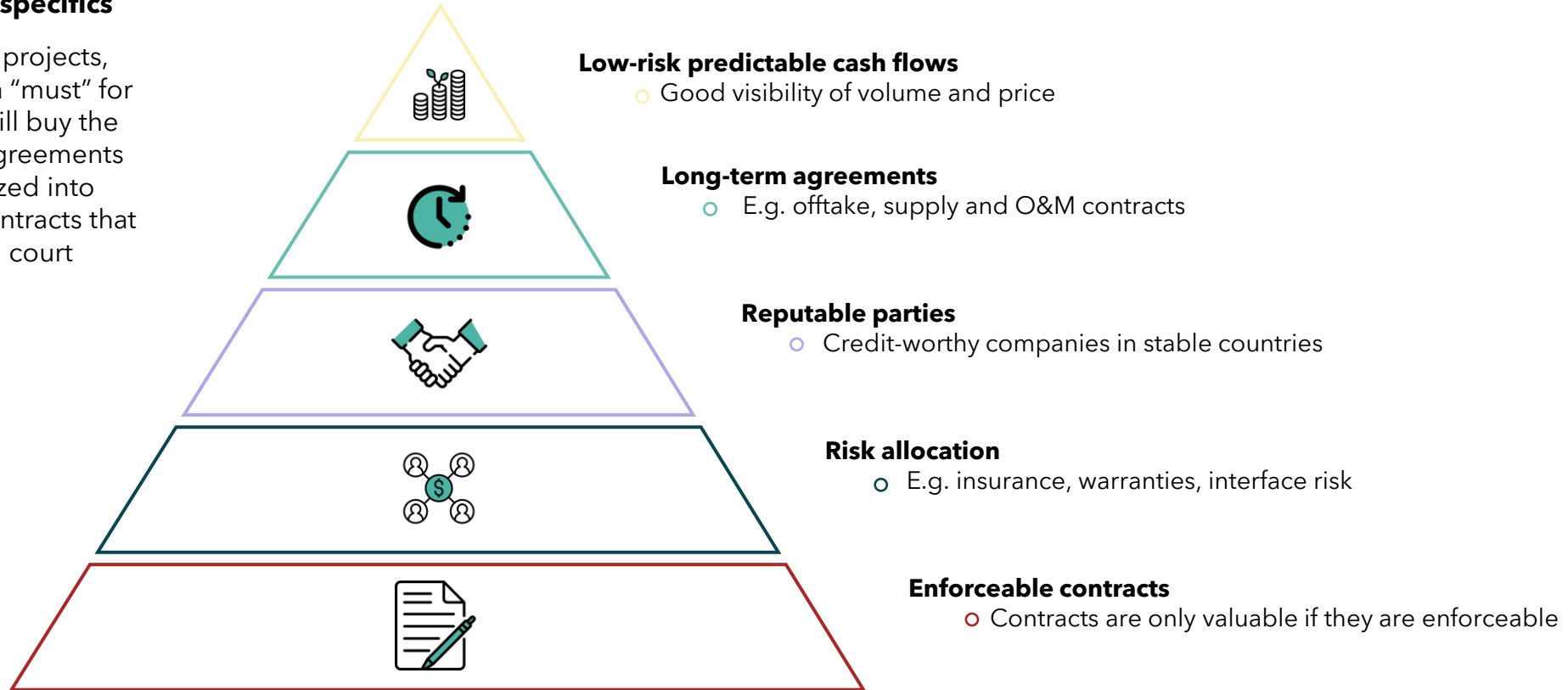
Note: Visual for illustrative purposes - does not reflect actual numbers

Collaboration is necessary for green hydrogen to be competitive with grey hydrogen

Step 3: Make it bankable – key structuring considerations to obtain equity and debt

Green hydrogen specifics

Particularly for H2 projects, project offtake is a “must” for banks - i.e. who will buy the H2? The offtake agreements should be formalized into well-structured contracts that are enforceable in court



Step 4: Project developers should



Design for PtX from the start

Plan for grid connection and storage needed, and consider optimal wind design layout for H2



First things first - Project economics / offtake

Focus on the major challenges - then turn to secondary challenges build giga projects in phases



Combine for synergies with other activities

Ability to win RE tenders with system integration requirements, or use hydrogen in own processes



Cooperative approach with all stakeholders

Old and new industries need to get together and dedicate time and effort to make it work

We have built a new toolkit for these projects, which need deep technical & financial model integration



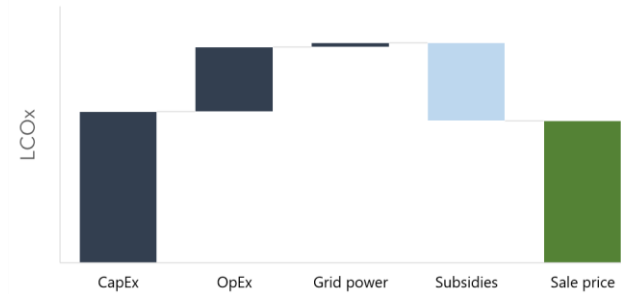
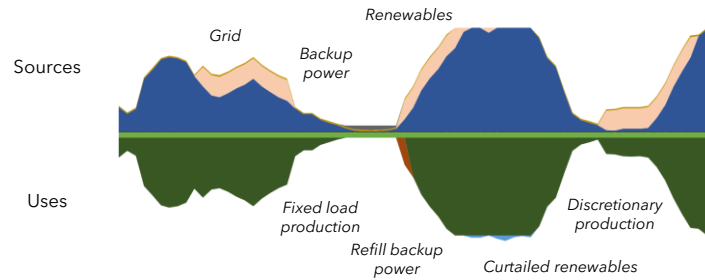
Renewable Energy



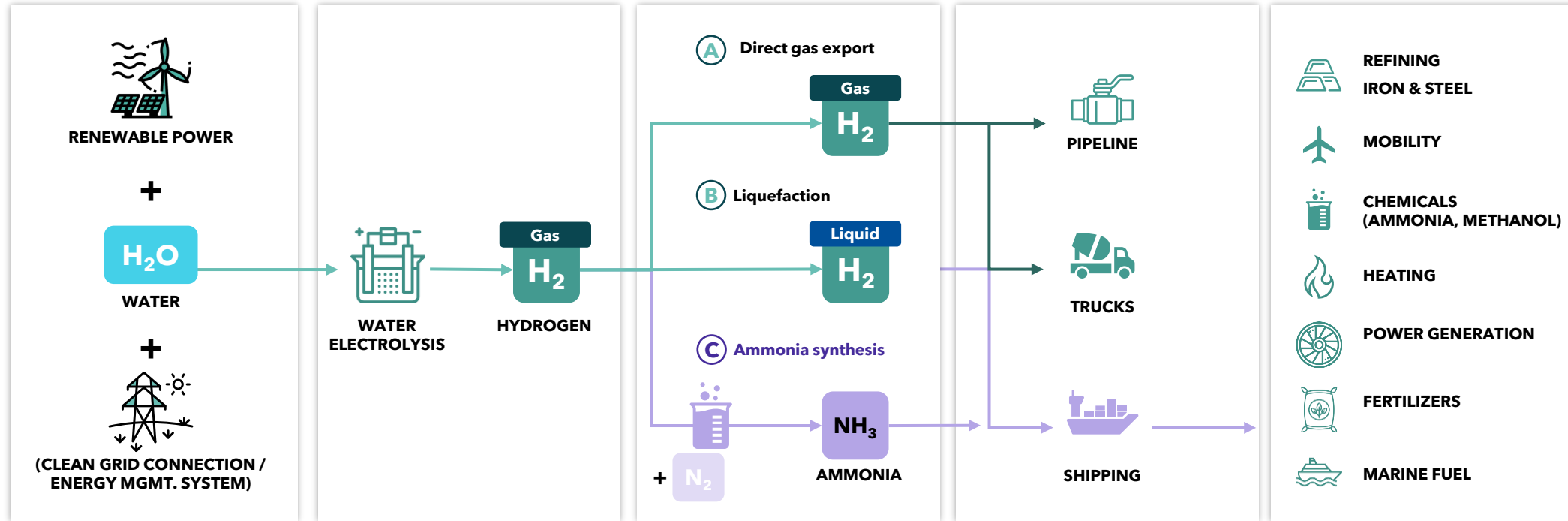
Power-to-X



We've built new models from the ground to integrate and optimize across this complexity



We have a deep understanding of the H2 value chain, from the power mix to the offtake design



And all require financing - so give us a call :-)



Green Giraffe Advisory

[GREEN-GIRAFFE.COM](https://www.green-giraffe.com)

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