



# Hi – we're Equinor

We energise the lives of 170 million people.  
Every day.

# Equinor | A broad energy company

Equinor is an international energy company committed to long-term value creation in a low-carbon future.

Our purpose is to turn natural resources into energy for people and progress for society.

Equinor's portfolio of projects encompasses oil and gas, renewables and low-carbon solutions, with an ambition of becoming a net-zero energy company by 2050.

Headquartered in Stavanger (Norway), Equinor is the leading operator on the Norwegian continental shelf. We are present in around 30 countries worldwide.



## Hydrogen Ambitions:

**3-5** Major industrial clusters

Clean hydrogen projects by 2035

**>10%**

Clean hydrogen market share in Europe by 2035

- A net zero carbon future will need hydrogen at scale
- We are developing both **renewable-based (green)** hydrogen and **low-carbon (blue)** hydrogen by using low emission natural gas from the Norwegian Continental Shelf (NCS)
- We believe both are needed to meet the projected demand for hydrogen in line with decarbonization targets

### Hydrogen Value Chain

#### Feedstock



Electricity from renewable sources

#### Production

Electrolysis



#### Output



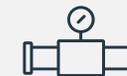
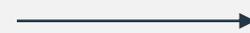
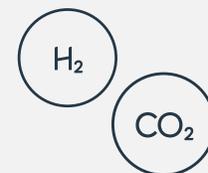
#### Link to CCS value chain

The CO<sub>2</sub> is transported to the injection facility, injected and safely stored at depths typically > 1 km below the sea bed

Low emission natural gas from the NCS



Natural Gas Reforming



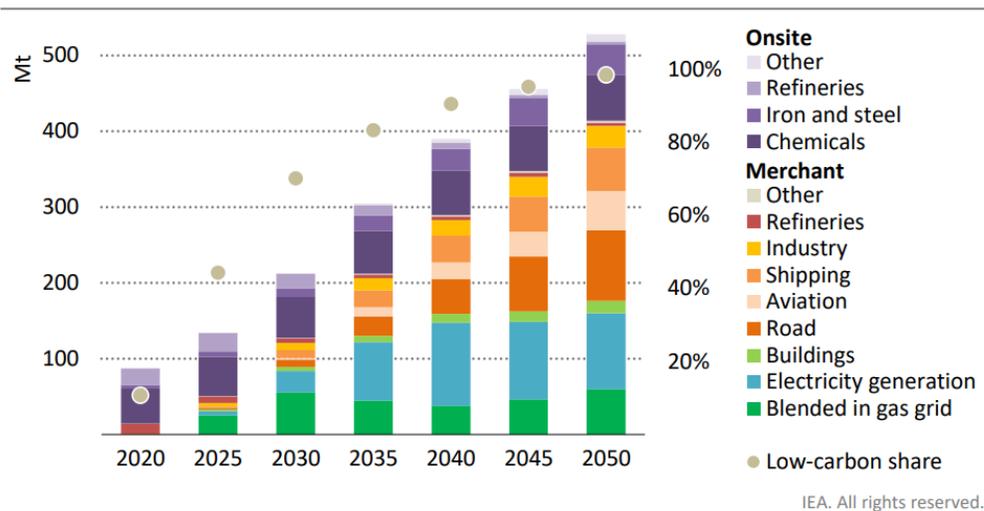
# Why H<sub>2</sub> | A requisite to meet climate goals

The International Energy Agency (IEA) states that now is the time to scale up technologies and bring down costs to allow hydrogen to become widely used. Hydrogen offers ways to decarbonise a range of sectors – including long-haul transport, chemicals, and iron and steel

## Global hydrogen use | Scenario to achieve net zero by 2050

From IEA's Net Zero by 2050 | A roadmap for the Global Energy Sector ([link](#))

**Figure 2.19** ▶ Global hydrogen and hydrogen-based fuel use in the NZE

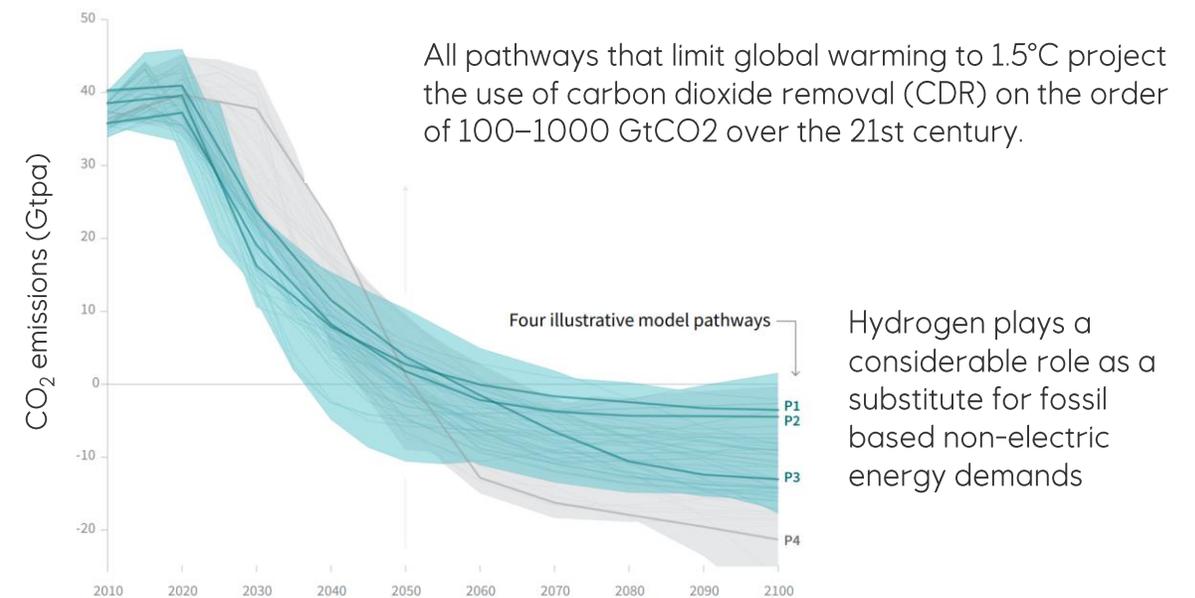


*The initial focus for hydrogen is to convert existing uses to low-carbon hydrogen; hydrogen and hydrogen-based fuels then expand across all end-uses*

Note: Includes hydrogen and hydrogen contained in ammonia and synthetic fuels.

## Global total net CO<sub>2</sub> emissions | Pathways to reach 1.5°C

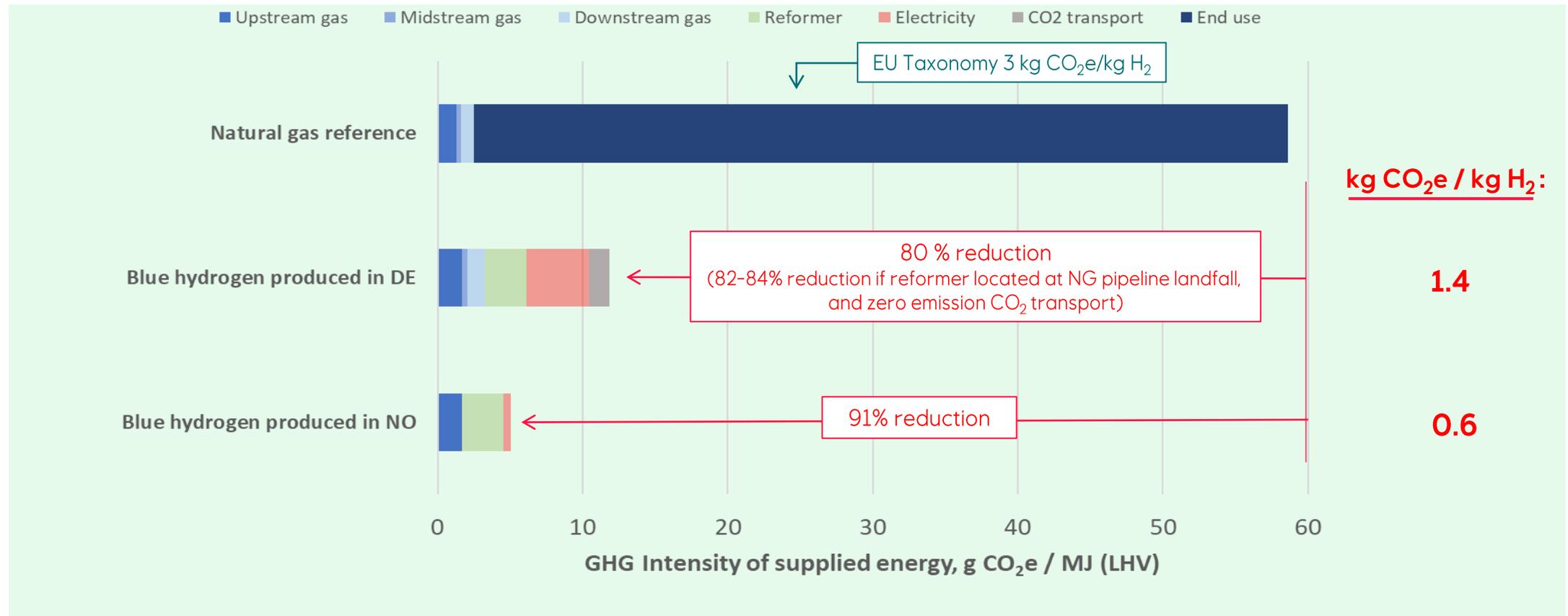
From IPCC Special Report on "Global Warming of 1.5°C" ([link](#))



Hydrogen plays a considerable role as a substitute for fossil based non-electric energy demands

# Norway | Best place in the world to produce blue H<sub>2</sub>?

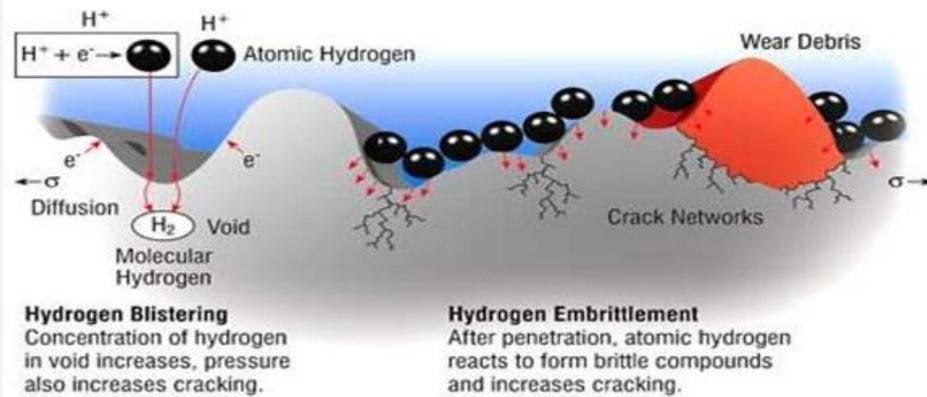
## NCS gas versus blue H<sub>2</sub> to end use in Germany as example



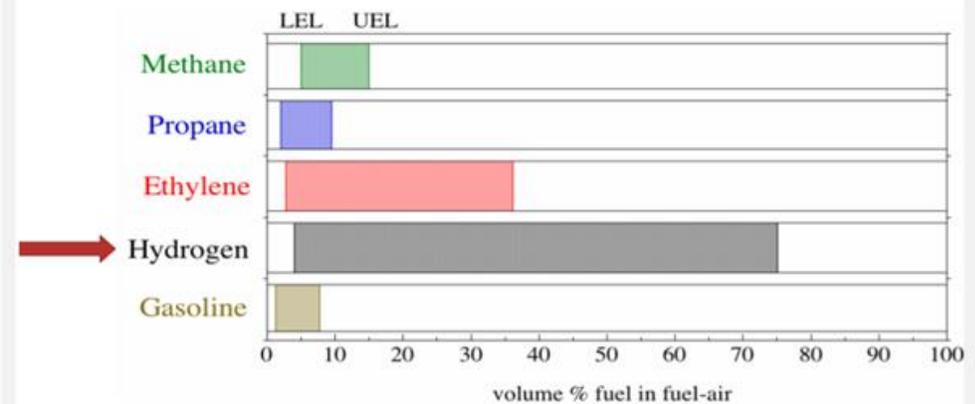
GHG intensity of natural gas supply from Norway to Germany: Upstream / Midstream / Downstream 1.3 / 0.3 / 0.9 g CO<sub>2</sub>e/MJ (LHV) (Equinor, 2021). Gas reforming carbon capture ratio 96%, natural gas input to reformer 3.25 kg/kg H<sub>2</sub>, electricity need of reformer 3.5 kWh/kg H<sub>2</sub>. Future (2030) grid electricity in DE assumed at 150 g/kWh, NO at 17 g/kWh. Including 2% loss in ship-based CO<sub>2</sub> transport from DE to NO.

H<sub>2</sub> has some challenging properties but with safety in design and operation it can be done in a safe manner

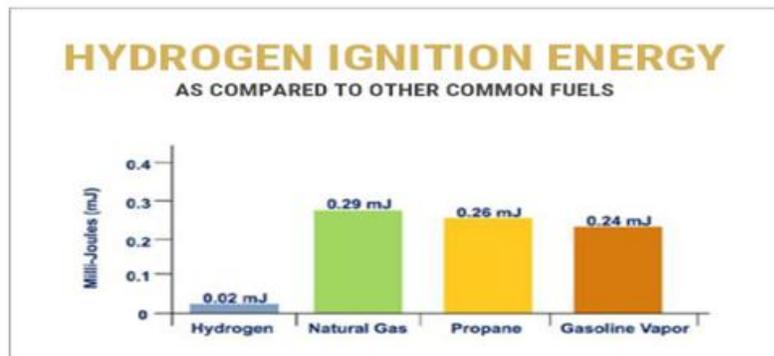
## Containment (small molecule + failure mech.)



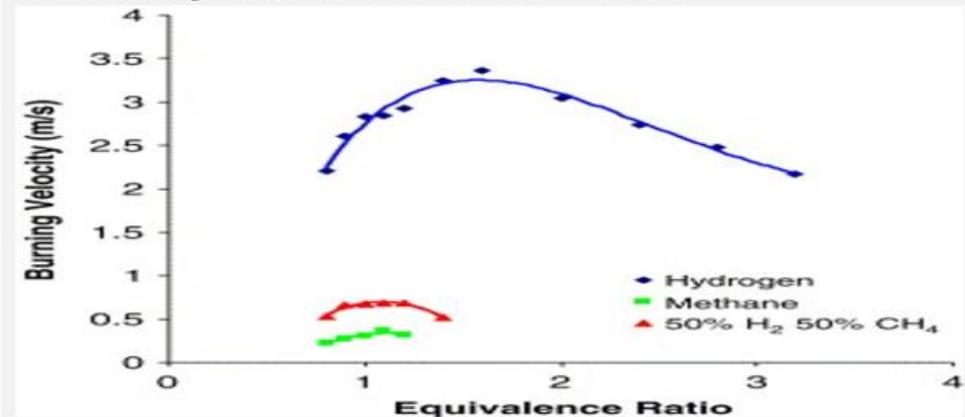
## Flammability (wide range)



## Ignitability (low energies)



## Reactivity (fast flame acceleration and DDT)



# A broad pipeline of H<sub>2</sub> projects targeting to supply the German market

H2M Eemshaven



Low-carbon H<sub>2</sub> from natural gas for hard-to abate industry and power.

Transport to off-takers by pipeline.

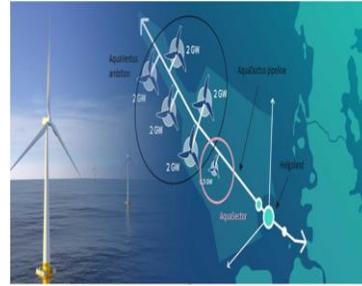
NorthH2



H<sub>2</sub> production from offshore wind.

Power to shore via cable – electrolyzer onshore.

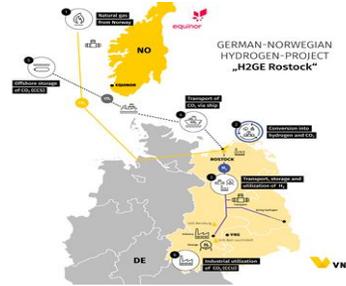
AquaSector



H<sub>2</sub> production from offshore wind.

Transported to shore via pipeline.

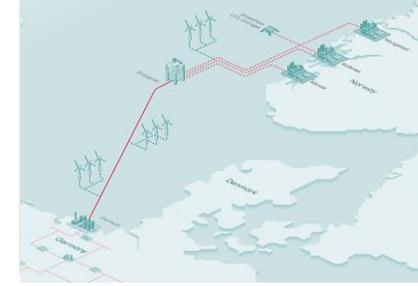
H2GE



Large scale low-carbon H<sub>2</sub> production from NCS gas

Transported to off-takers by pipeline.

Clean H2 to Europe



Large scale low-carbon H<sub>2</sub> production from natural gas for export.

Transported via pipeline to continental Europe and off-takers.

Barents Blue

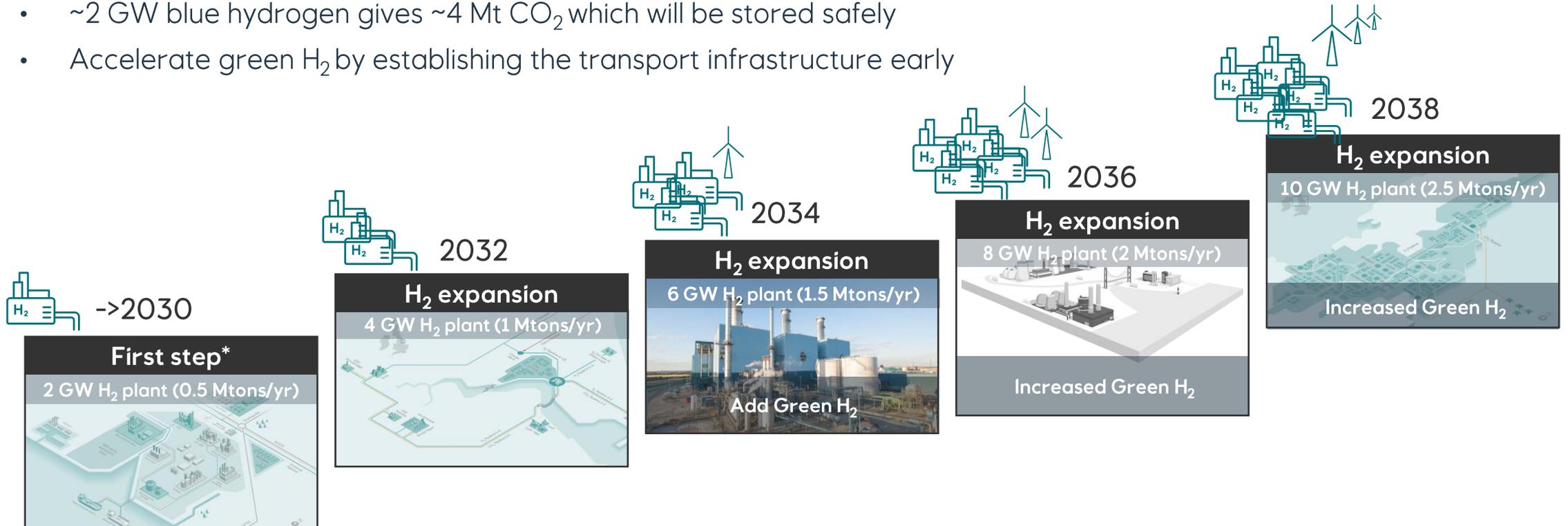


Low-carbon ammonia production from natural gas.

Transported to off-takers by ship.

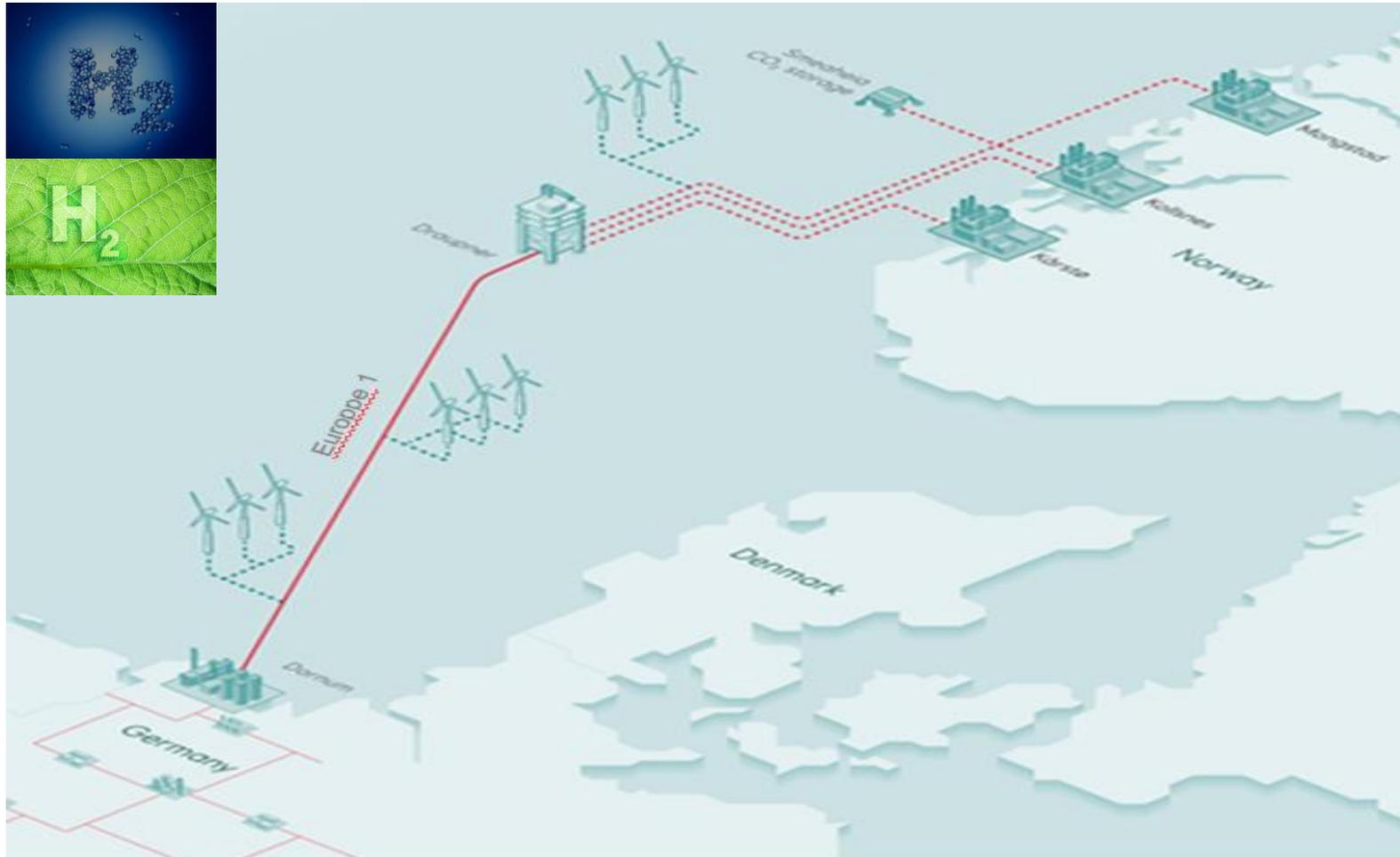
# Large Scale H<sub>2</sub> Production in Norway enabling exports to Europe

- Step by step scale up to manage market risk
- Blue hydrogen can be provided at scale earlier than green hydrogen
- Steps of ~2 GW every ~2 years
- ~2 GW blue hydrogen gives ~4 Mt CO<sub>2</sub> which will be stored safely
- Accelerate green H<sub>2</sub> by establishing the transport infrastructure early



# H<sub>2</sub> infrastructure can accelerate green H<sub>2</sub> to Germany

## H<sub>2</sub> Export Pipeline



Low-carbon H<sub>2</sub> from natural gas produced in Norway serving industrial off-takers in GER/ NWE.

New or partly new and partly repurposed natural gas pipeline. Feasibility study with Gassco ongoing.

PCI process initiated seeking to connect with the EU Hydrogen Backbone.

Built for future expansion and tie-in of H<sub>2</sub> from offshore wind along route.

[PCI Interactive map \(europa.eu\)](https://europa.eu)