

# Hydrogen Market and Opportunity

With Chris Holmes, Partner, Foresight



Foresight

# Hydrogen at a Glance

Hydrogen is very versatile molecule used for a range of application in energy, heavy industry and transport. A vector of energy that is a great substitute to natural gas in high heat industrial processes and a key molecule to produce carbon neutral fuels. Foresight recognize its importance in the energy transition and in the decarbonization of industry. We have, to date, invested in two hydrogen platforms developing large capacities of green hydrogen production in Europe.



**Abundant** - There are more hydrogen atoms in Earth's atmosphere than atoms in the rest of the elements of the periodic table combined

**Clean** - Non-toxic, colourless, odourless, and tasteless



**Electrolysis** - A process where hydrogen is produced by using electricity to drive electrolyzers which chemically split water molecules to produce pure hydrogen and oxygen gases; also termed Power-to-Hydrogen (PtH). Hydrogen from renewable energy powered electrolysis is carbon free



**Solution** - With excellent energy characteristics, hydrogen can be used in most high temperature industrial process. Hydrogen coupled with other molecules such as nitrogen or carbon dioxide can be transformed in derivatives to services other industries such as transport through fuels or agriculture through fertilisers

**Opportunity** - The ability to produce carbon-free hydrogen opens a vast opportunity to use the most abundant element in the universe to decarbonise many polluting industries

# The Global Hydrogen Landscape

Clean hydrogen is opening new markets as energy, industry and transport seek solutions to decarbonise

## Key drivers of current hydrogen market

- **Natural gas prices** – almost all of today’s hydrogen production is “grey” and fossil fuel based
- **Refiners and chemical network** – vast majority of demand is coming from three industries (refining, ammonia and methanol). Ties with refiners and chemical companies are essential to offtake current production
- **Local demand** – due to specific hydrogen use in industry, demand is very localised in industrial markets

## Key drivers of future hydrogen market

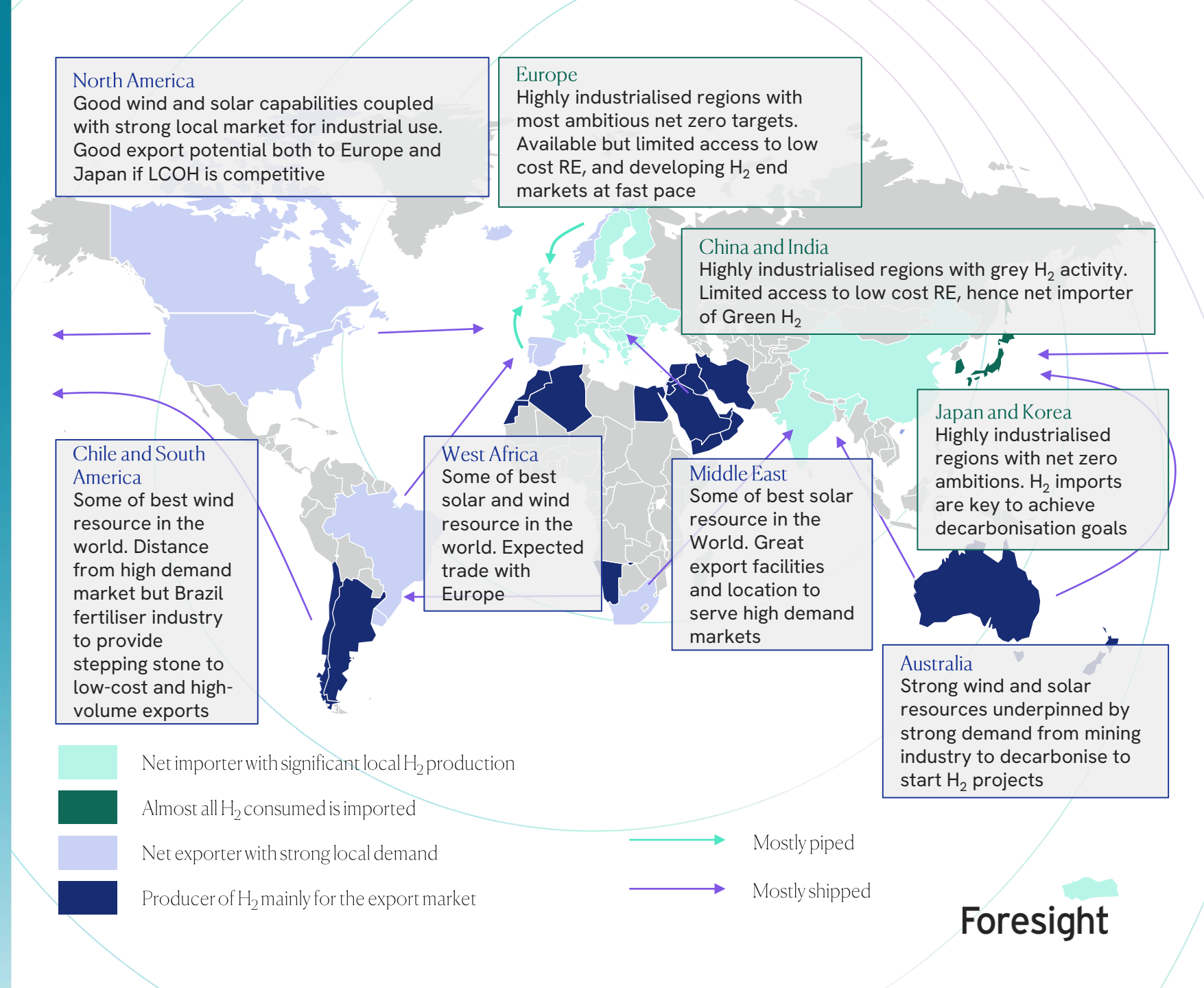
- **Electricity price** – in 2050 more than 50% of the supply is forecasted to come from electrolysis and electricity pricing for low levelized cost of production will be a key element of a project’s feasibility
- **Renewable energy** – 85% of the global hydrogen supply will be low-carbon in 2050. Hydrogen production driven by renewable energy both from direct sources and grid
- **Transport & export** – cost competitive energy source will be a key enabler of hydrogen production thus delocalizing production from demand based on renewable energy access

Sector	Application	Max demand (MMT), 2050	New market
Buildings	Space and water heating	106	✓
	Electricity generation	439	✓
Industry	Cement	87	✓
	Steel	90	✓
	Glass	1	✓
	Aluminum	8	✓
	Oil refining	25	✗
	Methanol	34	✗
	Ammonia	55	✗
Transport	Cars	80	✓
	Buses	5	✓
	Light trucks	34	✓
	Heavy trucks	319	✓
	Ships	87	✓

**1,370 MMT of hydrogen demand** derived from **new markets** benefitting from carbon-free energy source in 2050

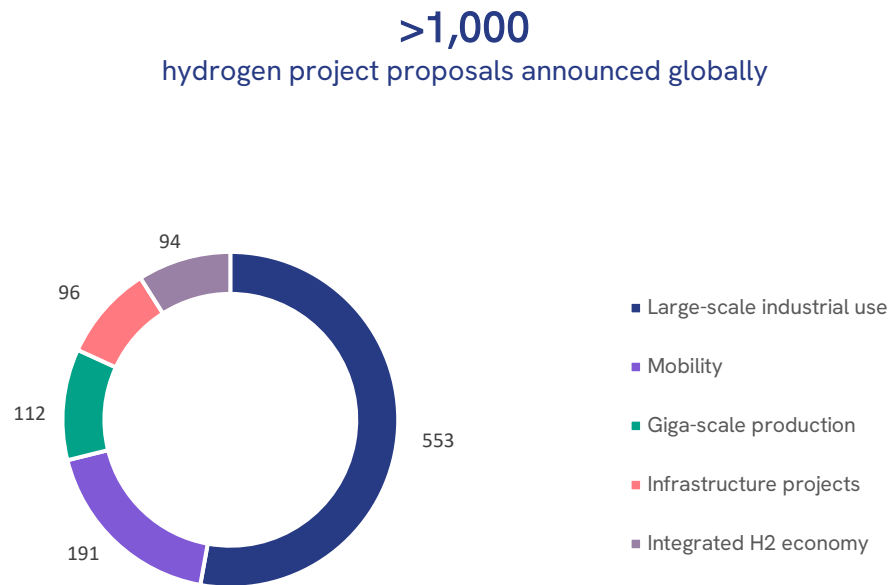
# Geography of Hydrogen

Best regions for hydrogen investments are defined by access to large amounts of low-cost energy and/or strong demand for hydrogen driven by energy, industry or mobility

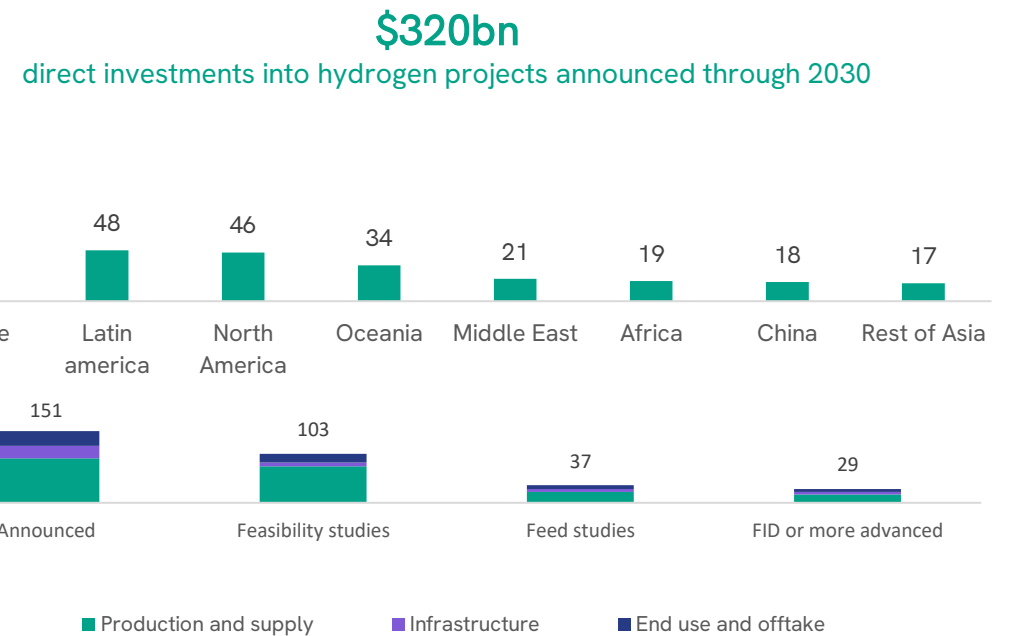


# The Global Hydrogen Opportunity

Significant growth in hydrogen projects announced fueled by low carbon hydrogen production and end-markets committing to sustainability



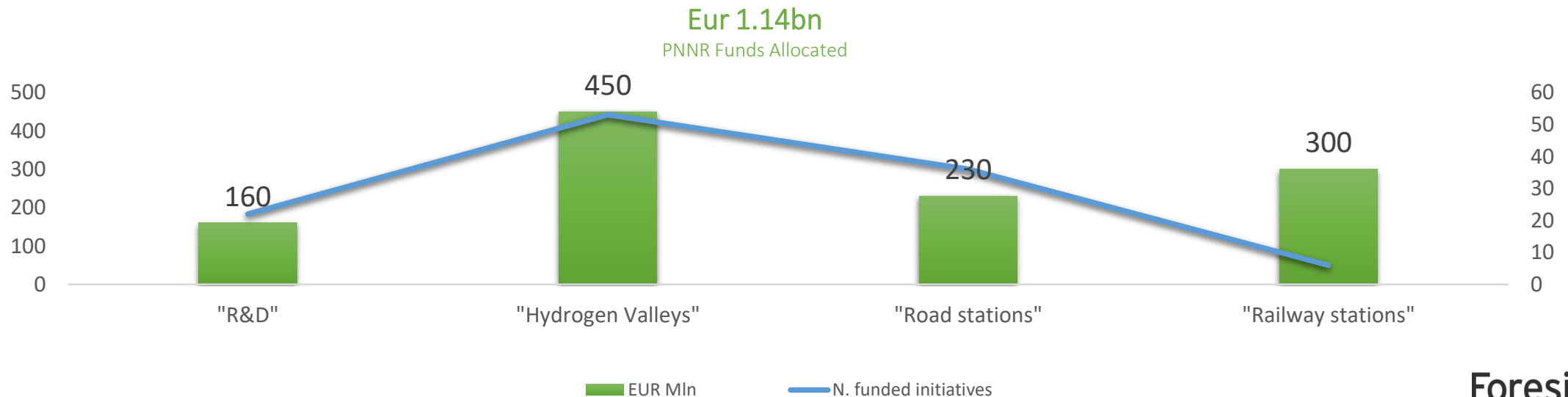
Majority of announced project are serving industrial sectors; mobility is expected to grow through the ramp of derivatives (e-methanol and SAFs)



Vast investment opportunity as \$290bn of projects plan to go through Final Investment Decision (FID)

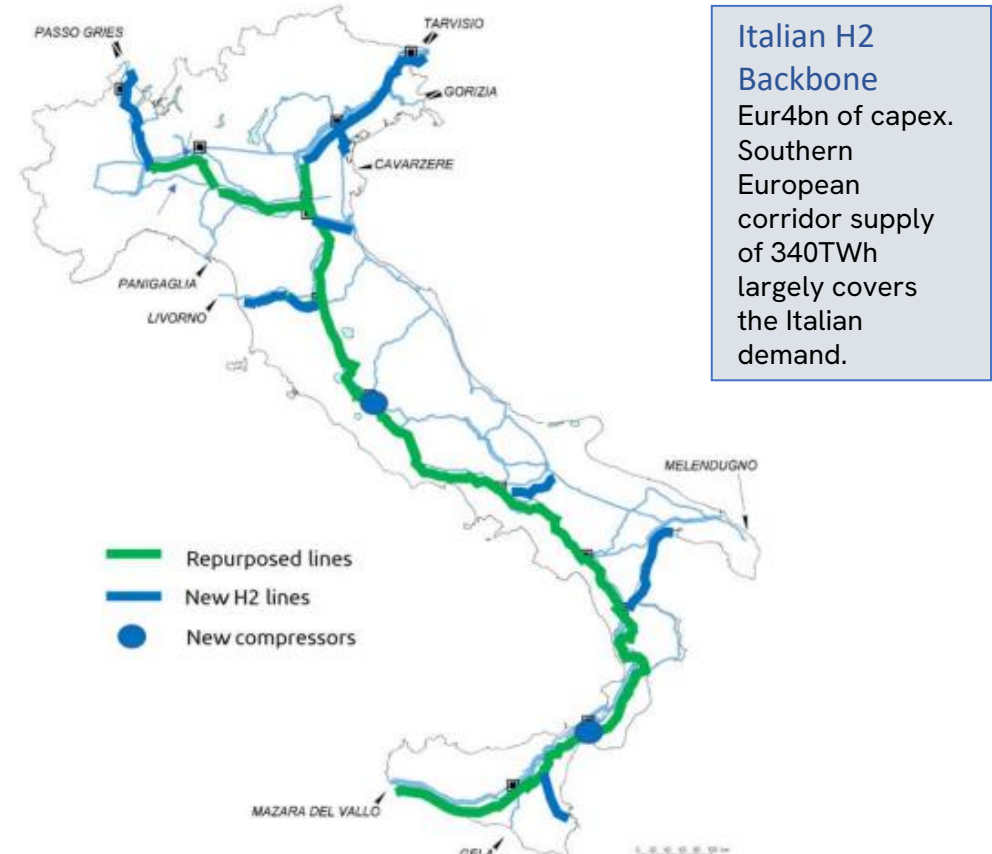
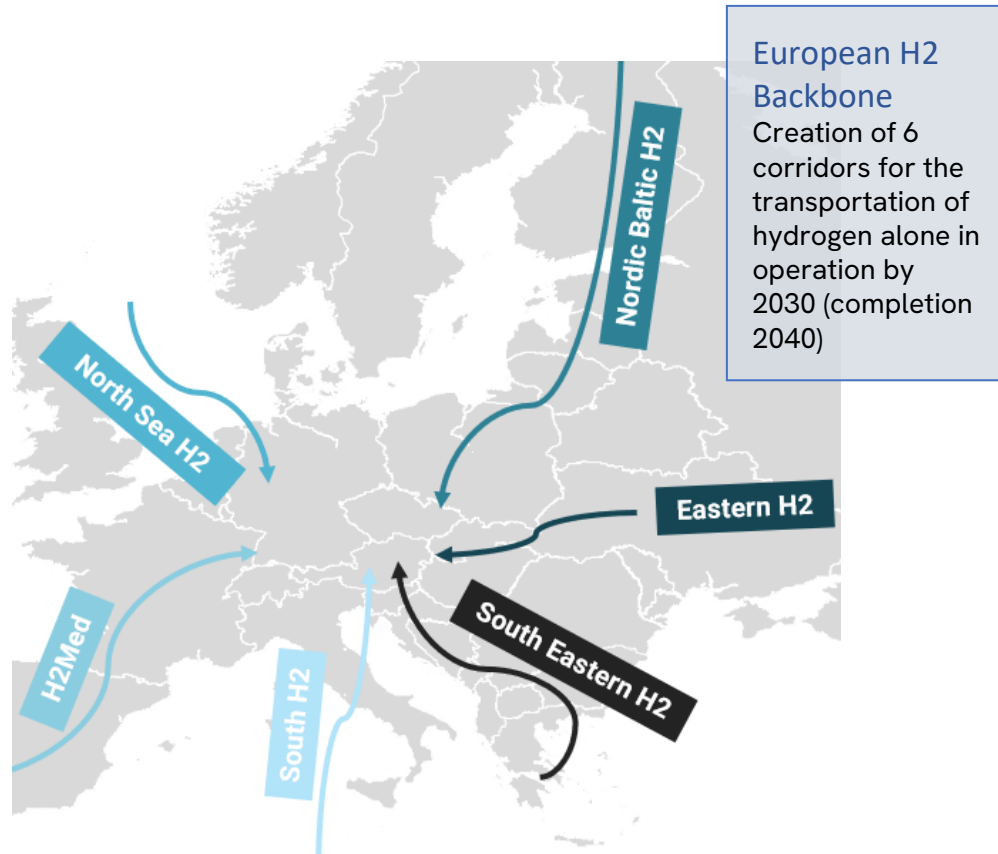
# The Italian Hydrogen Opportunity

More than 300 Italian initiatives in the hydrogen field have been detected with a strong increase in the H1 2023.



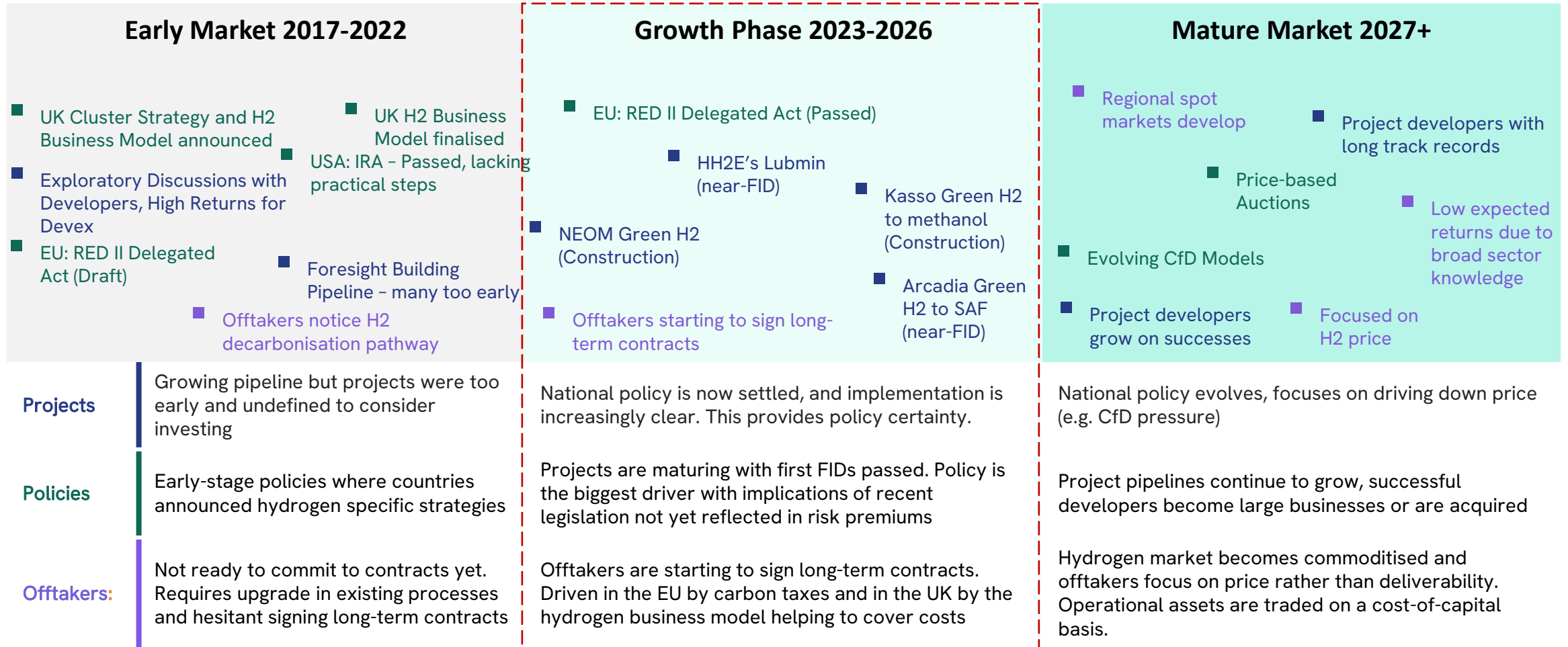
# EU Hydrogen Corridor : South Italian Hydrogen Backbone

Italian H2 backbone to be 2,800km of pipeline with a capacity of 450 GWh/day from North Africa



# Taking advantage of the regulatory framework







Optimal time to invest due to expected returns not reflecting the level of policy maturity

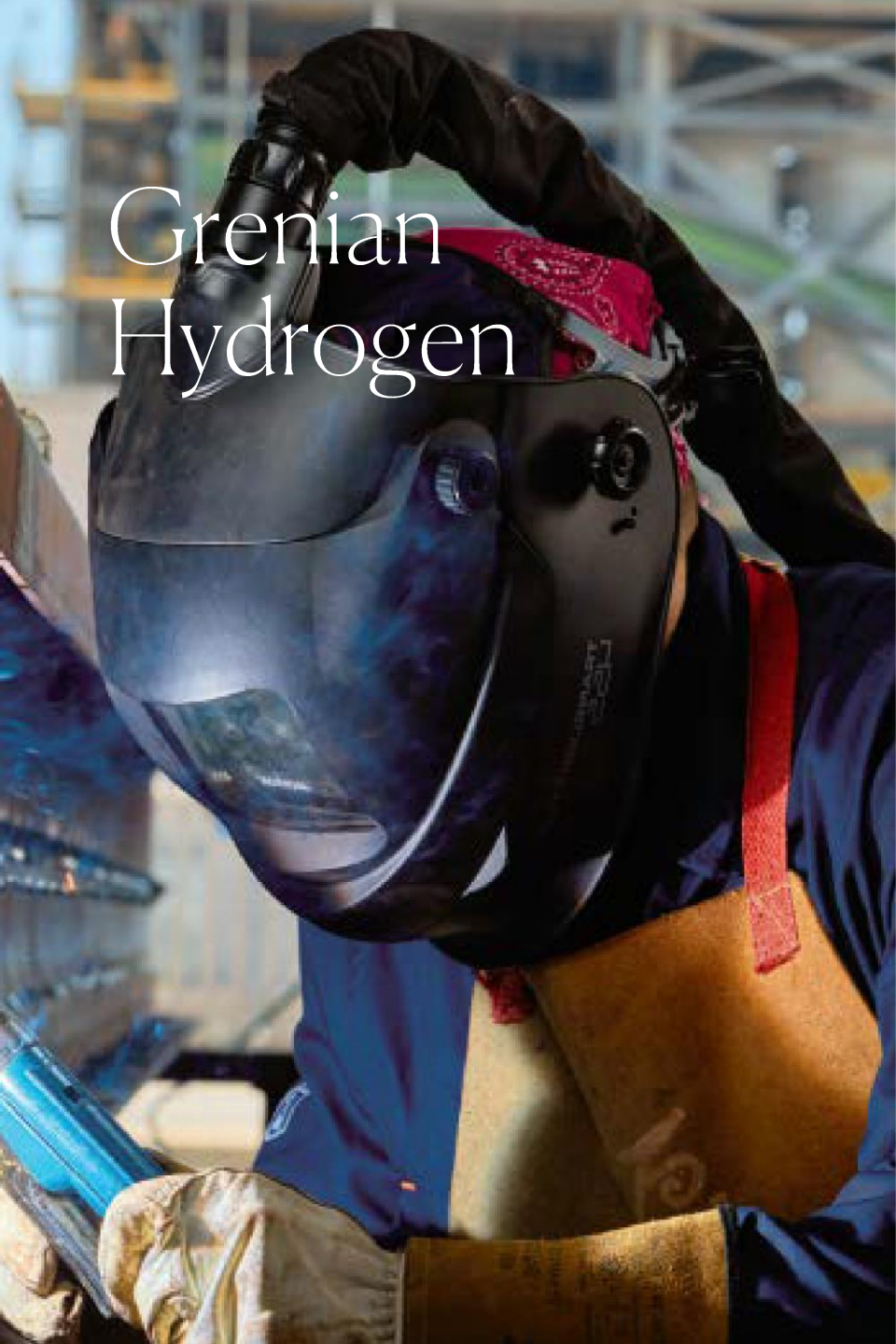




# Foresight Is Well Positioned to Capture Value in a Growing Hydrogen Economy

Strong track record in renewables and gas markets

Assets & Expertise		Adding Value to Foresight Hydrogen Operations
 <p><b>3.3 GW</b> Operational Renewables</p>	<ul style="list-style-type: none"> <li>Technologies: onshore wind, offshore wind, solar, hydro, biomass, AD, energy from waste</li> <li>Investments across Europe, UK and Australia</li> </ul>	<ul style="list-style-type: none"> <li>Very high institutional knowledge of electricity markets and renewable generation</li> <li>Numerous opportunities for growth, co-location, or project expansion</li> </ul>
 <p><b>1 GW</b> Gas Generation Plants</p>	<ul style="list-style-type: none"> <li>Plants range from large power stations providing baseload generation to a diverse portfolio of smaller units providing peaking reserve power, assets in UK and Australia</li> </ul>	<ul style="list-style-type: none"> <li>Experience purchasing and handling gas</li> <li>Requirement to decarbonise businesses will drive potential opportunities</li> <li>Knowledge and experience in energy flexibility</li> </ul>
 <p><b>700 MW</b> Energy Storage</p>	<ul style="list-style-type: none"> <li>A range of projects under development or construction</li> <li>Technologies include Li-ion batteries, sodium sulphur batteries, and pumped hydro</li> </ul>	<ul style="list-style-type: none"> <li>Deep understanding of how renewables will drive demand for flexibility</li> <li>Expertise in assessing various technology maturities and performance profile</li> </ul>
	<ul style="list-style-type: none"> <li>Ownership of gas distribution business in Australia</li> <li>The company is aiming to transition to a renewable gas business underpinned by biomethane and hydrogen</li> </ul>	<ul style="list-style-type: none"> <li>Experience handling wholesale gas products</li> <li>Deep technical experience moving and marketing gas to corporates</li> <li>Collaboration opportunities as TasGas decarbonises product</li> </ul>
	<ul style="list-style-type: none"> <li>Largest bio-compressed natural gas (“CNG”) refuelling station network in the UK</li> <li>Predominantly corporates operating large fleets of HGVs</li> </ul>	<ul style="list-style-type: none"> <li>Experience purchasing and handling gas</li> <li>First-hand experience of road transport decarbonisation trends</li> <li>Potential collaboration opportunities as market evolves</li> </ul>
 <p>Technology Venture Capital</p>	<ul style="list-style-type: none"> <li>Foresight venture capital team is investing in emerging deep technology in partnership with Williams Advanced Engineering</li> </ul>	<ul style="list-style-type: none"> <li>Institutional knowledge of emerging trends and technologies within sector as well as access to ecosystem of innovative companies</li> </ul>



# Grenian Hydrogen



Grid connected electrolyzers providing hydrogen for industrial decarbonisation



Foresight, Progressive Energy and Statkraft have formed a JV to develop multiple green hydrogen projects delivering 200MW with further opportunities to expand beyond that.



The most advance project is shortlisted for the first UK CfD allocation round. Four other projects well advanced in Devex subsidy process.



Central to the portfolio is the proposed 30 MW Cheshire Green Hydrogen project, which will use renewable electricity from Foresight's managed Frodsham wind farm in Cheshire to power the electrolyzers

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Foresight invested into the German developer HH2E AG along with the signing of a development funding agreement.

HH2E is developing a number of hydrogen projects across Germany which will provide hydrogen and steam to industrial and municipal off-takers.

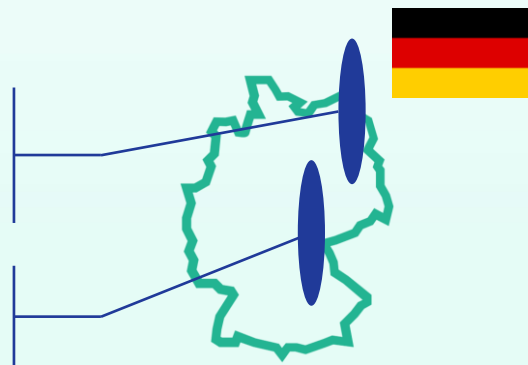


HH2E's plants are designed to use its **HH2E-Werk concept** - this allows production of hydrogen and steam to occur when wind or solar output is high and hence electricity prices are low. Due to the forecast growth in wind and solar capacity across Germany, the opportunities provided by this concept are expected to increase accordingly. This concept is further optimised with **long duration batteries** on site enhancing revenue and production profiles.

#### Announced HH2E projects funding by Foresight (100MW per project)

**Lubmin** - Located on the Baltic sea coast with the best gas infrastructure in Europe and where all Baltic Sea German offshore wind farms connects. The congested network the plant can fill up on energy that counts as green under RED at a low-cost during curtailment periods.

**Theirbach** - Located close to the Leipzig airport where DHL operates a large part of its fleet. DHL just signed an MoU for 100,000t of hydrogen p.a. for eSAF production. Local chemical industry is also relying on hydrogen and a significant potential off-taker.



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# Thank You

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