

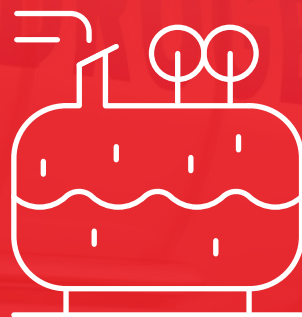


&



Joint Venture of **two leading companies**
to deliver competitive **green hydrogen**

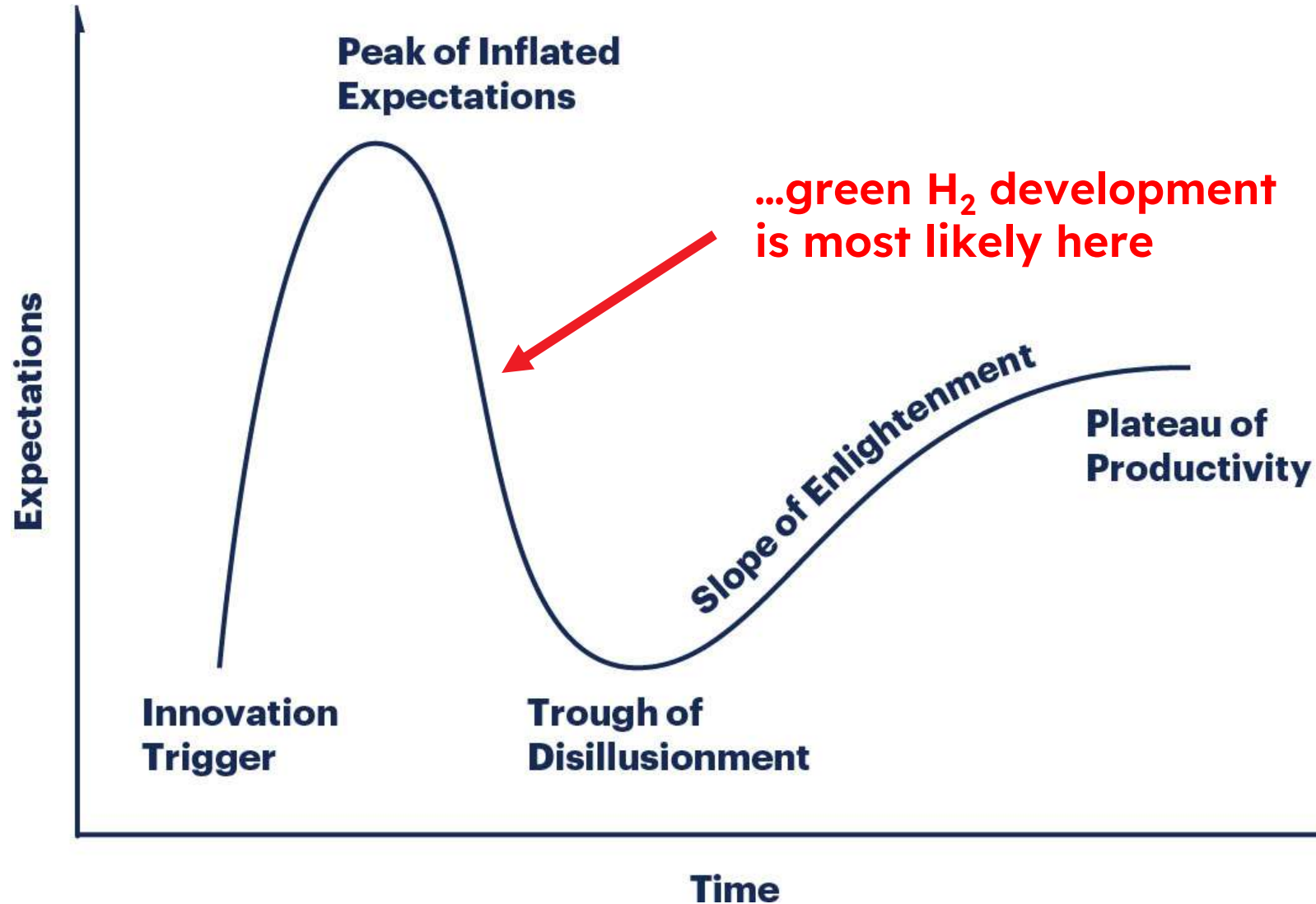
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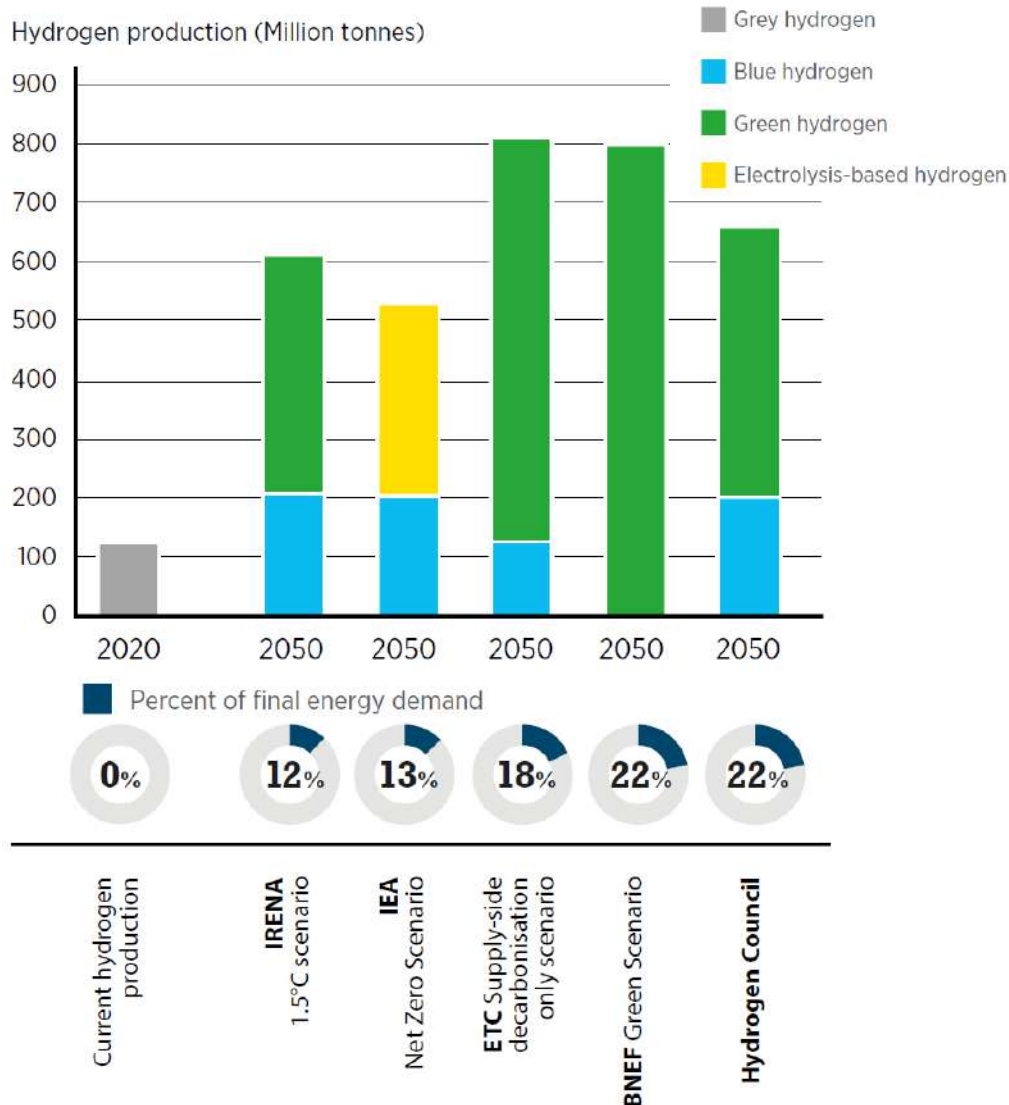
HYDROGEN

What is the current situation regarding costs, subsidies and regulatory measures?

ACCORDING TO THE **GARTNER HYPE CYCLE**...



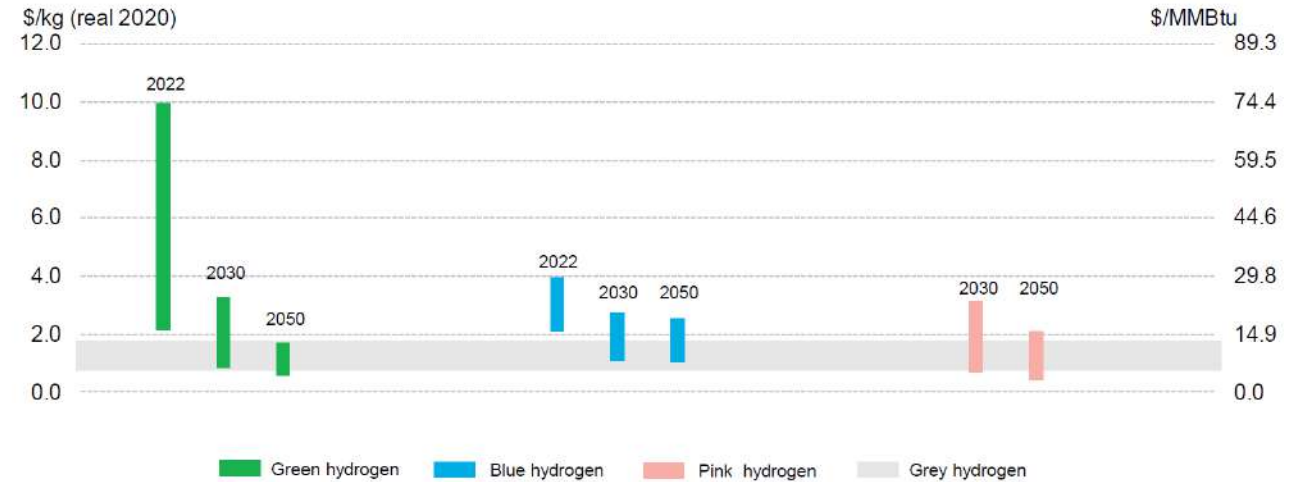
HIGH EXPECTATIONS RAISED...



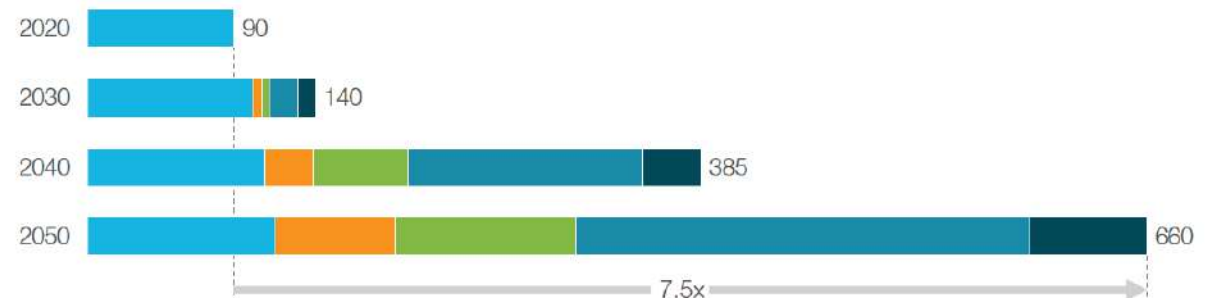
Source: [Geopolitics of the energy transformation. The hydrogen factor](#) (IRENA, 2022)

Hydrogen production costs – the promise

Liebreich Associates

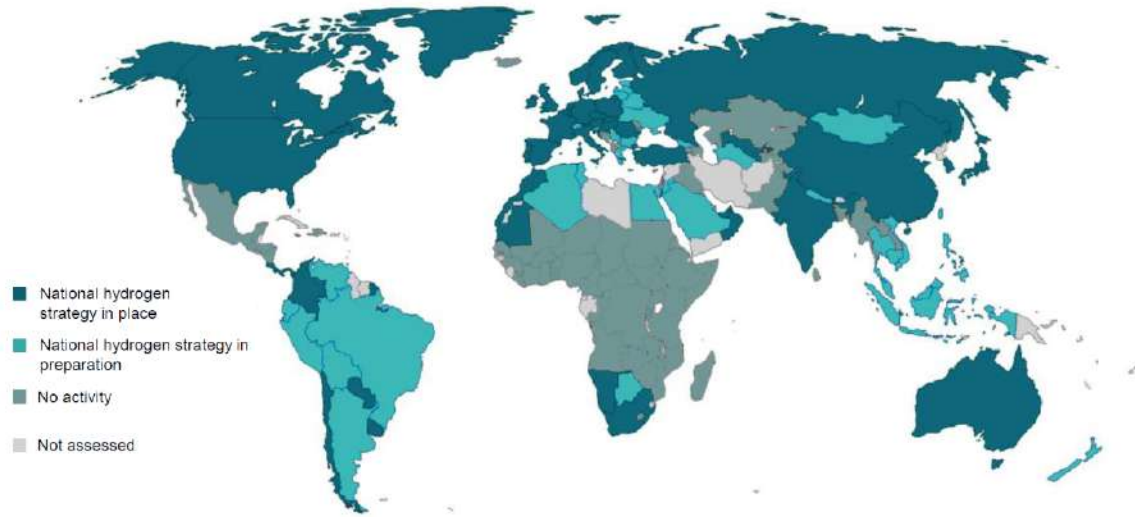


Hydrogen demand, million tons



Source: [Global Hydrogen Flows: Hydrogen trade as a key enabler for efficient decarbonization](#) (Hydrogen Council, 2022)

...UNREALISTIC TARGETS SET



Spanish Hydrogen Roadmap (October 2020), and PNIEC 2023 draft



~ 0,5
Mill Tn

Present

300-600
MW

2024



2030



11 GW
installed
(15% UE)



Portuguese Hydrogen Strategy (August 2020) 2023 update



~
0,05
MTn

Present

2024

2030



5,5 GW
installed
(8% UE)



European Union (2030 goals)

EU Hydrogen Strategy (July 2020)

40 GW

Fit for 55 Package (July 2021)

44 GW

REPowerEU (May 2022)

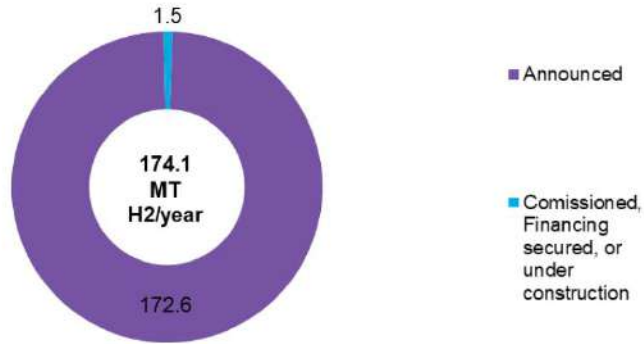
65-80
GW

→ 10 Mt

+ 10 Mt imported

ALONG WITH **INFLATION** AND **HIGH INTEREST RATES**, LEADING TO **DELAYS** AND **NO FIDs**

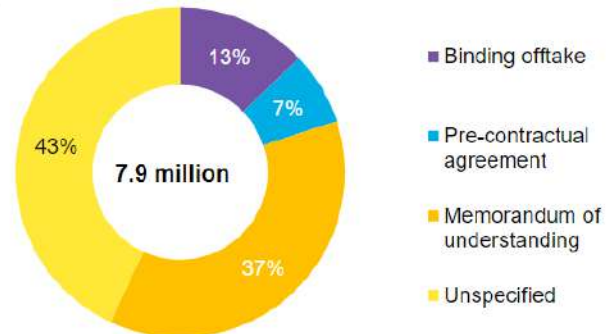
Announced vs funded clean hydrogen production projects by year



Sources: BNEF Clean Hydrogen Database, Liebreich Associates

Low-carbon hydrogen offtake by agreement type

Metric tons/year



Fuente: RTPA, 22 de septiembre, 2023 © 14:18

La Agencia Internacional de la Energía avisa de retrasos en los planes de hidrógeno verde



Sólo se concretaron un 4% de los proyectos previstos para 2030

La Agencia Internacional de la Energía avisa que los proyectos de Hidrógeno Verde están más parados de lo esperado.

Sólo se han concretado un 4% de los previstos para 2030. Si saliera todo lo planificado, en esa fecha se obtendrían 38 millones de toneladas de Hidrógeno Verde pero las inversiones, en su mayoría, aún no se han concretado.

Hydeal retrasa a 2028 la producción de hidrógeno para ArcelorMittal y Fertiberia

El consorcio, que inicialmente preveía comenzar el suministro en 2025, reduce a la mitad la potencia de los parques solares y electrolizadores



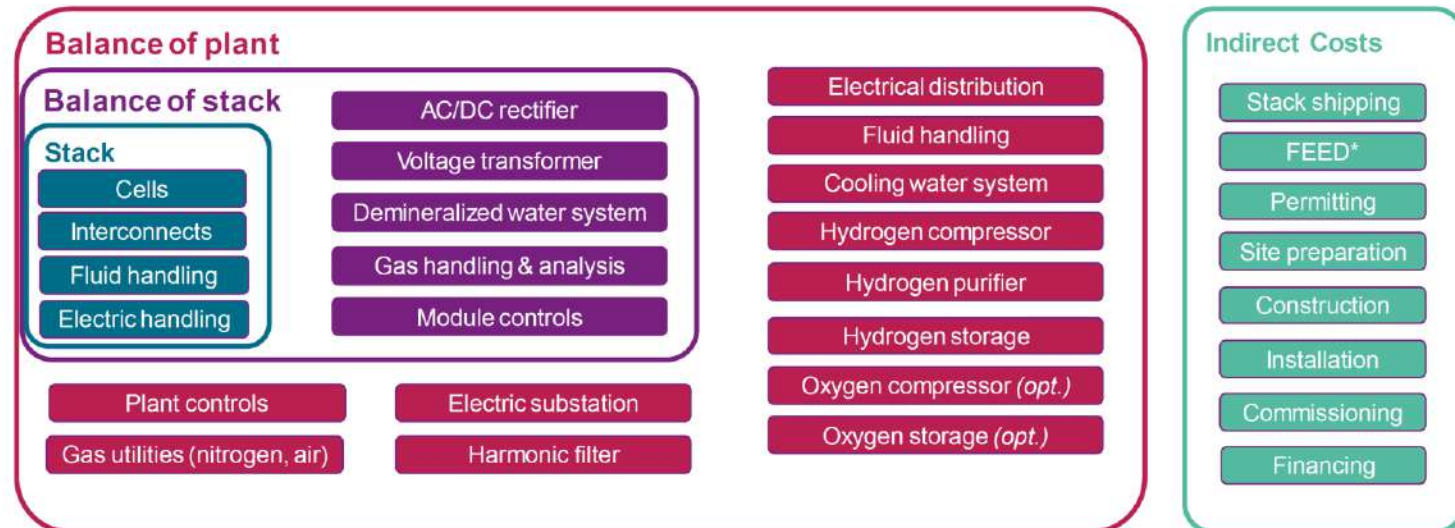
2024 VS 2022 PREDICTIONS (BLOOMBERG, S&P GLOBAL)



Electrolysis system benchmark CAPEX rises 46-65 % from 2022 predictions, up to \$2,000 - \$3,000 / kW due to:

- Overoptimistic assumptions about market scaling and inflation returning to 2%
- Projects in a very early stage of development underestimated system complexity and spending

Source: BloombergNEF, March 2024



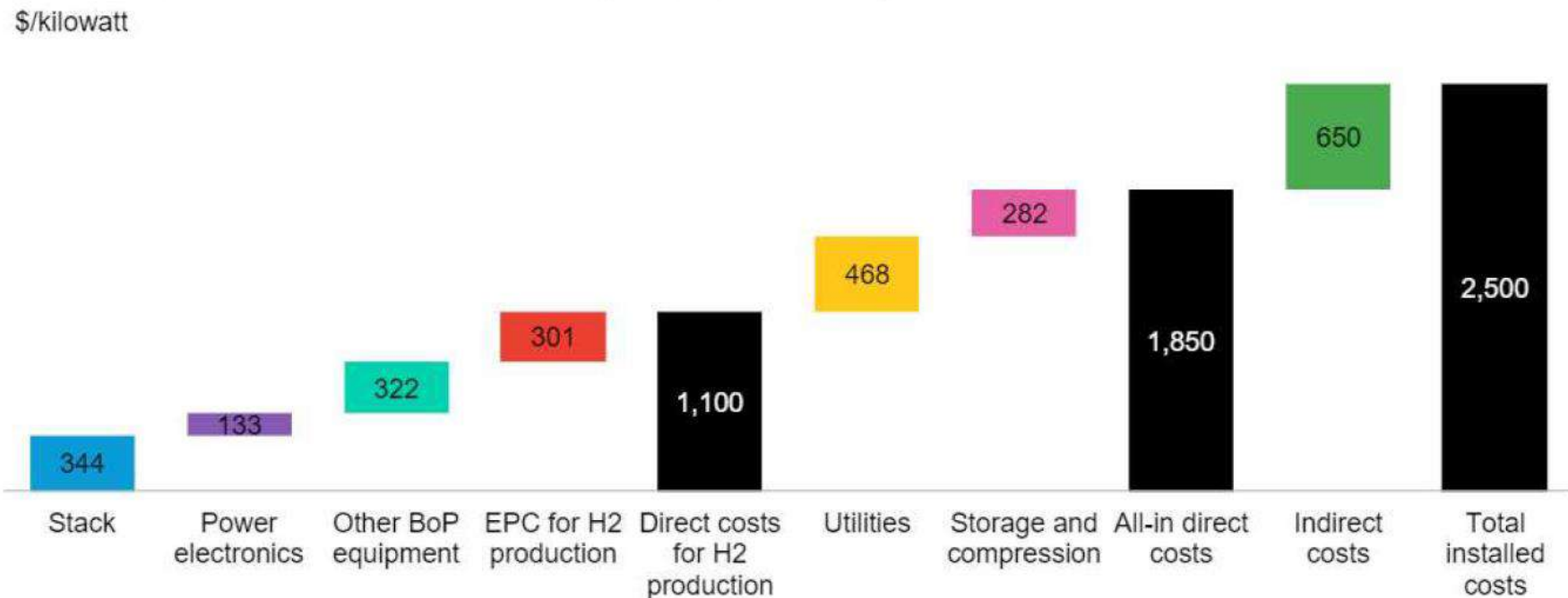
Electrolyzer OEMs are often providing only Stacks, or Stacks with Balance of stack...

...meanwhile, balance of plant and indirect costs are major cost drivers

Source: S&P Global, January 2024

2024 PREDICTIONS ON ELECTROLYSIS SYSTEMS, CAPEX

- Alkaline/PEM electrolysis projects in EU and the US: regarding CAPEX structure for electrolysis systems, BoP, utilities and indirect costs have become major cost drivers for both alkaline and PEM technologies

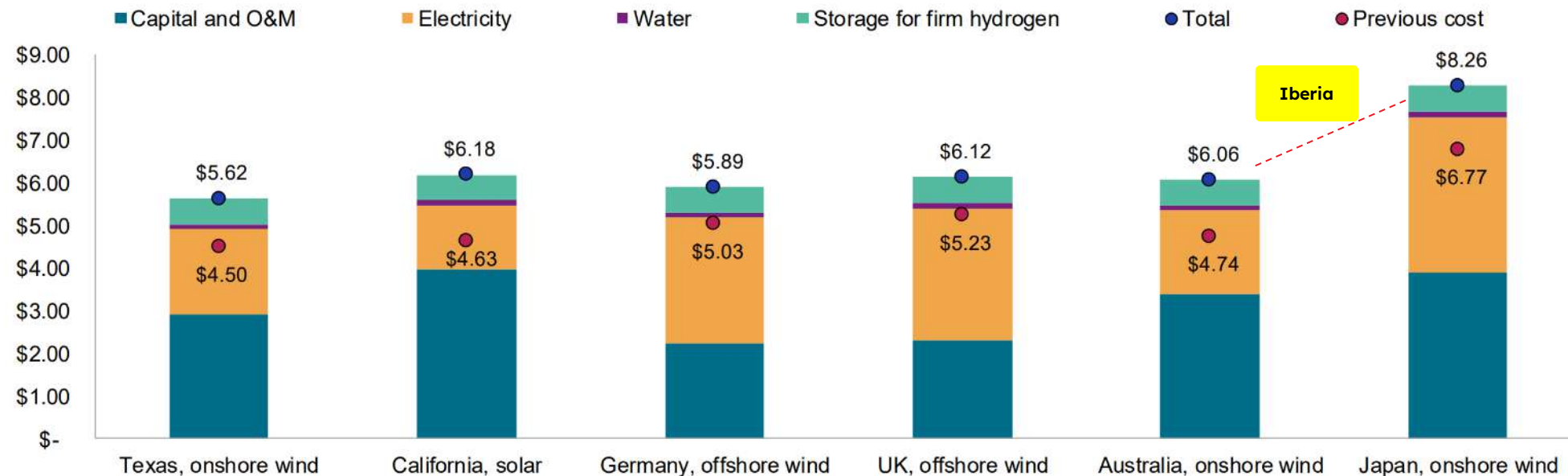


Source: BloombergNEF. Note: Values are for 100-megawatt-scale systems. BoP = balance of plant, EPC = engineering, procurement and construction.

2024 PREDICTIONS ON LEVELIZED COST OF H₂, CAPEX & OPEX

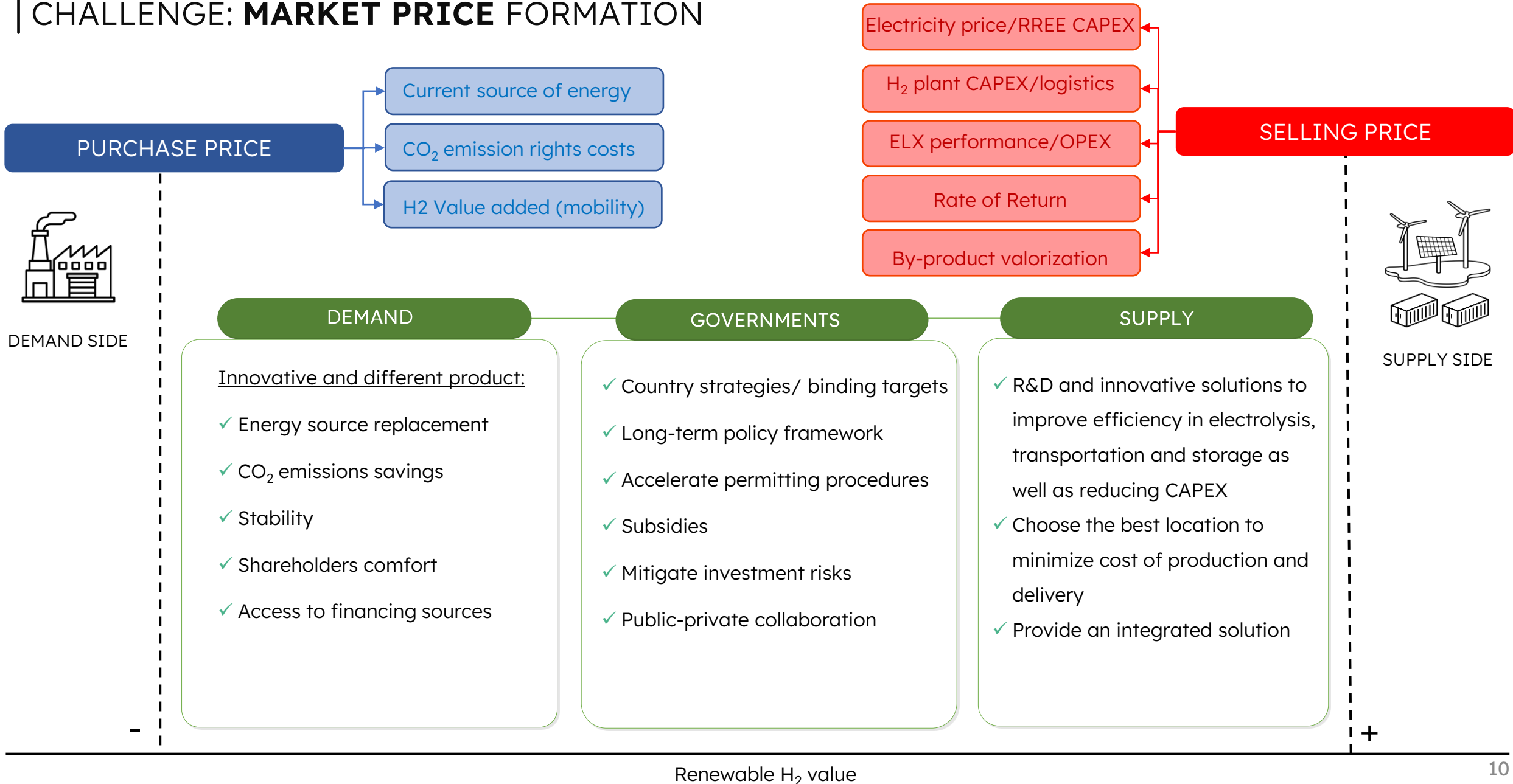
- Alkaline/PEM electrolyzer cost increase raises levelized costs by 10-30% in cases using dedicated, single-source renewables with matching capacity factor. Hybrid systems of wind and solar can decrease levelized costs.
- In Europe, electrolytic hydrogen is about twice the cost of hydrogen produced from natural gas using CCS

Levelized cost of hydrogen, current and previous costs, PEM electrolyzer (\$/kg H₂)



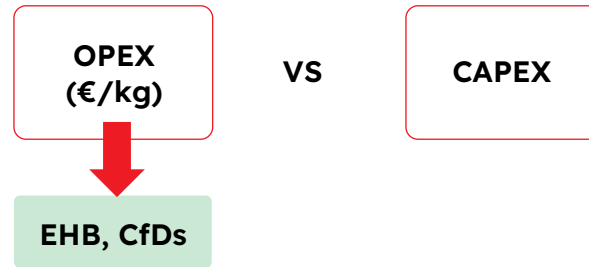
Data compiled on January 22, 2024.
Source: S&P Global Commodity Insights.

CHALLENGE: MARKET PRICE FORMATION



REGULATORY MEASURES & SUBSIDIES COULD **HIGHLY IMPACT LCOH**

- 1 Sufficient and **compatible subsidy programs** to improve business competitiveness.



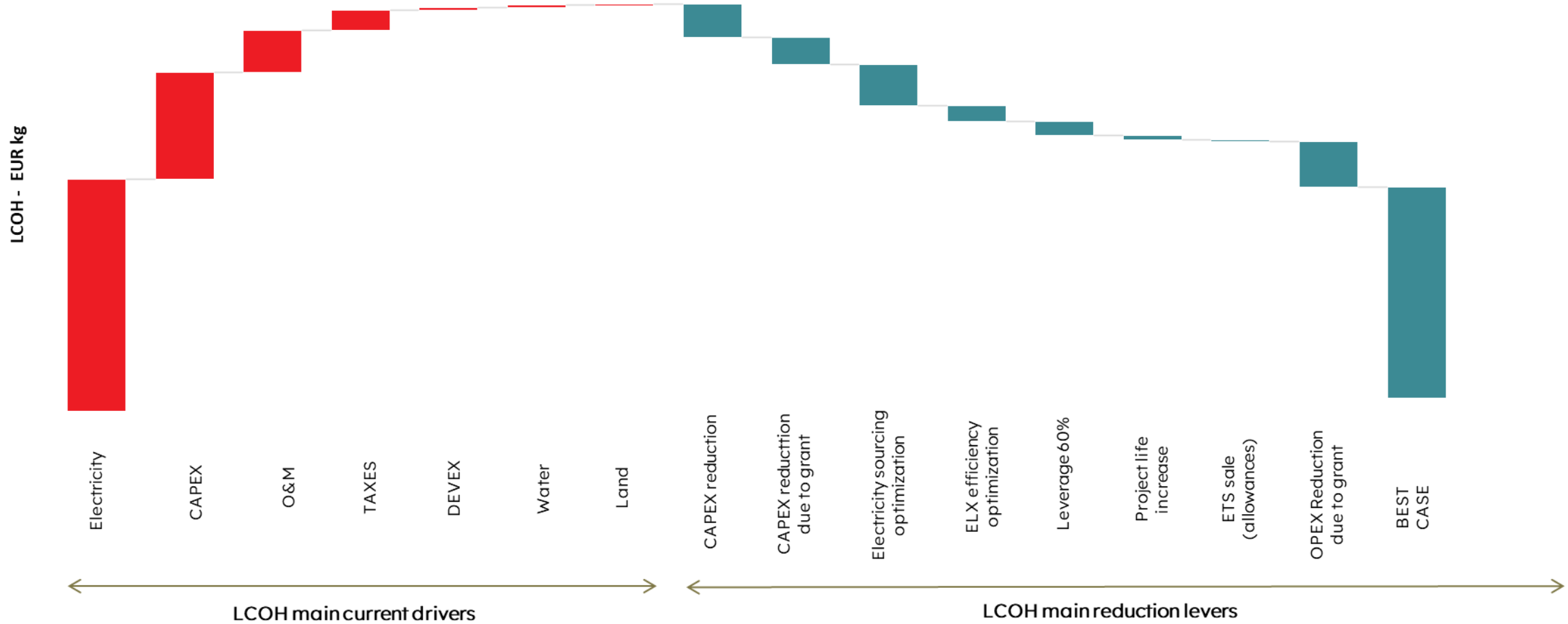
- 2 Regulatory measures to **reduce grid-PPA prices** (tax exemptions to kWh)



- 3 Speed up procedures and accelerate regulatory developments to **minimize the business model's uncertainty**:

- ❖ Environmental and access permits for renewable facilities dedicated to the production of renewable H₂
- ❖ Special permits for rural lands
- ❖ Public declaration of dedicated electrical lines
- ❖ Sustainability certificates/ guarantees of origin according to DAs
- ❖ RED III transposition, Low Carbon DA publication

LCOH OPTIMIZATION: CURRENT DRIVERS & REDUCTION LEVERS

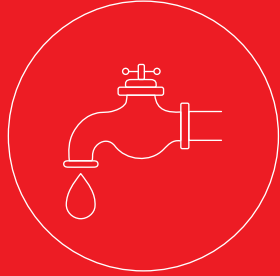


RENEWABLE HYDROGEN **VALUE**



Renewable hydrogen is a versatile product for different applications: **energy source, energy transport vector or energy storage.**

Applications range from raw material, energy source for thermal processes replacing natural gas to fuel for mobility, logistics, storage...



Produced with water and renewable energy through a process called electrolysis, thus **avoiding any CO₂ emissions.**

It is a **decarbonization vector** with great potential and can also involve energy savings in some processes.



Through a long-term purchase, the consumer achieves **price stability** and thus **reduces uncertainty** in the cost of their energy source, hedging against market price fluctuations.

In turn, this allows for **better planning and accurate estimates.**



Increasingly, shareholders and society demand **companies to contribute to sustainability.**

Incorporating renewable H₂ **gives shareholders confidence** in complying with decarbonization plans with a **positive impact on brand image.**

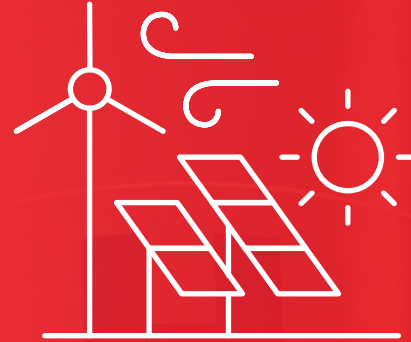


Companies with higher decarbonization rates and ambitious sustainability plans can access **several financing sources with more favorable conditions.**

02

ACCIONA PLUG

Joint Venture of
two leading companies to
deliver competitive **green**
hydrogen



H₂
HYDROGEN

EFFICIENT SOLUTIONS BASED ON **RENEWABLE HYDROGEN**

ACCIONAPLUG is the 50/50 JV of ACCIONA Energía and Plug Power.

Exclusive vehicle for the development of renewable hydrogen in Spain and Portugal, aiming to become a leading provider of hydrogen solutions in Iberia.



World's leading renewable energy operator

30 years of experience

c11,8 GW of total installed capacity

Availability rate of 97% and 60% of technical incidents resolved remotely



Leader in hydrogen solutions and fuel cells

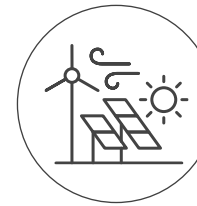
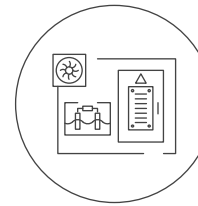
Large patent portfolio (currently 123)

600M hours of operation

+39M combustible supply - 23.5M kg of H₂

ACCIONAPLUG

Development of renewable hydrogen production plants



P2P (Power To Power)



P2X (Power To Product)



P2M (Power To Mobility)

Renewable hydrogen for several applications



Joint Development in Spain and Portugal

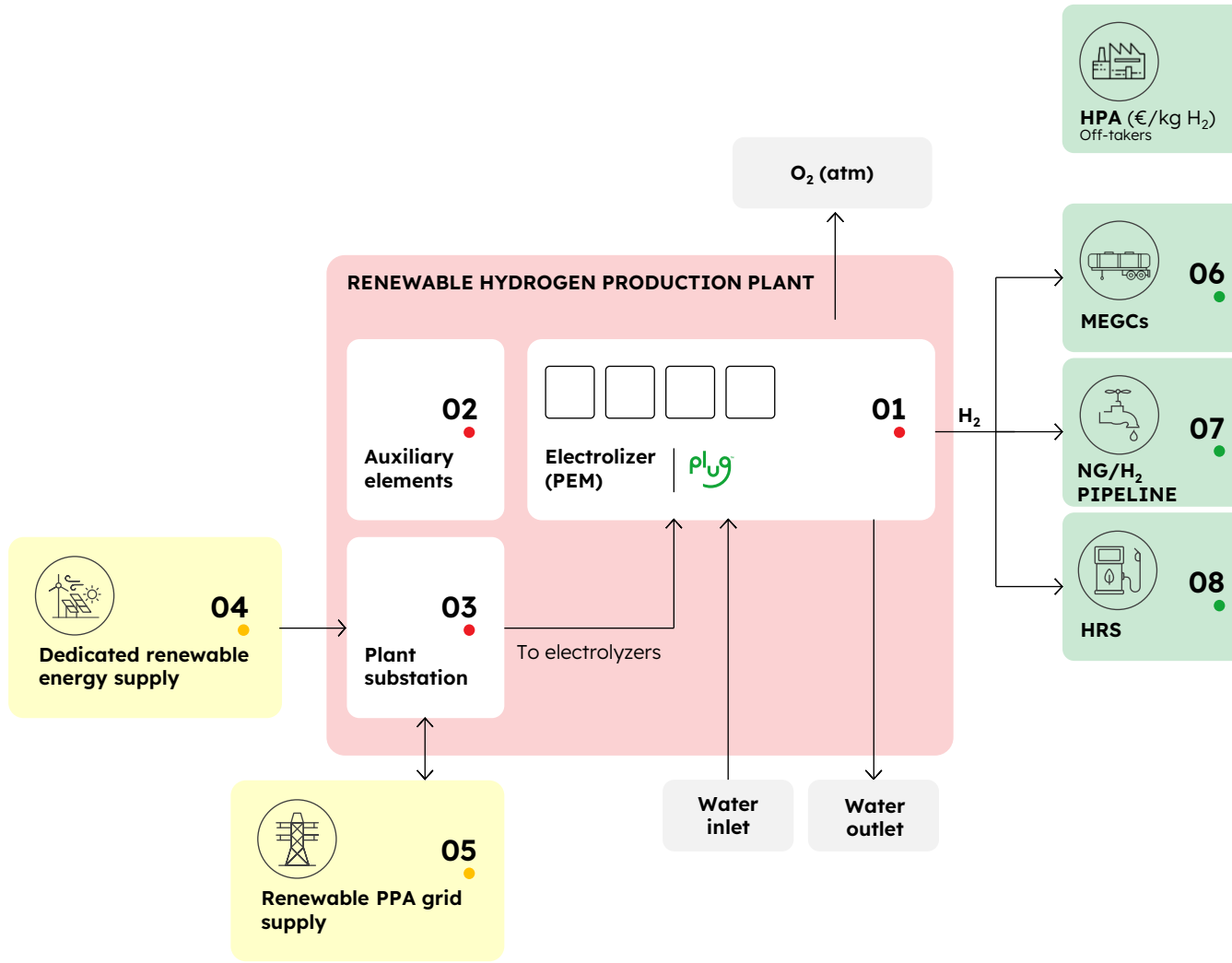


Potential expansion to other markets



Combined capabilities

BASIC PROJECT CONFIGURATION



RENEWABLE HYDROGEN PRODUCTION:

- **01** Electrolyzer: PEM technology from Plug Power. Where the electrolysis process takes place.
- **02** Auxiliary elements: compressors, storage tanks, truck loading bays, HRS, etc. Key to determine customers' logistics, can significantly change project configuration.
- **03** Plant substation: electrical equipment to ensure renewable supply from different sources.

RENEWABLE ELECTRICITY SUPPLY:

- **04** Dedicated renewable facility with a direct connection to the electrolyzer. Configured as self-consumption, with/without surplus evacuation to the grid.
- **05** Grid-sourced renewable PPA contract to supply/supplement power during hours when the dedicated renewable facility is not operating at full power.

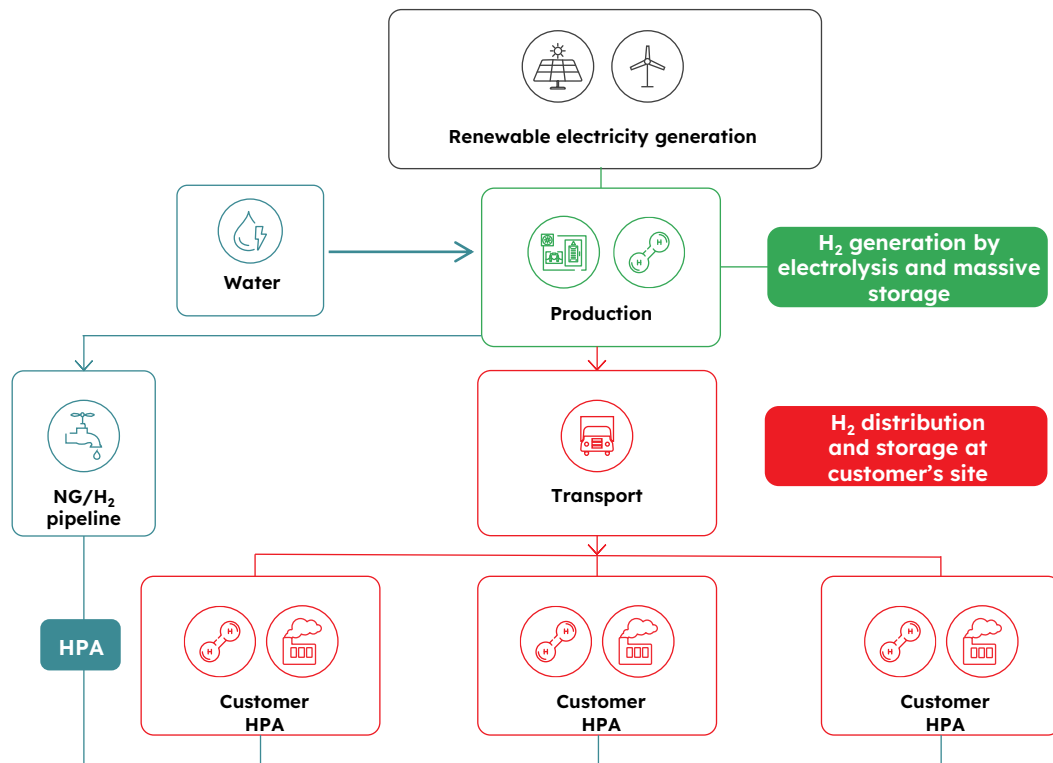
RENEWABLE HYDROGEN DISTRIBUTION:

- **06** Multiple-Element Gas Containers (MEGCs)
- **07** H₂ pipeline connected to off-takers and/or Natural Gas pipeline (blending)
- **08** Hydrogen Refueling Station (HRS)

COMMERCIAL **APPROACH**

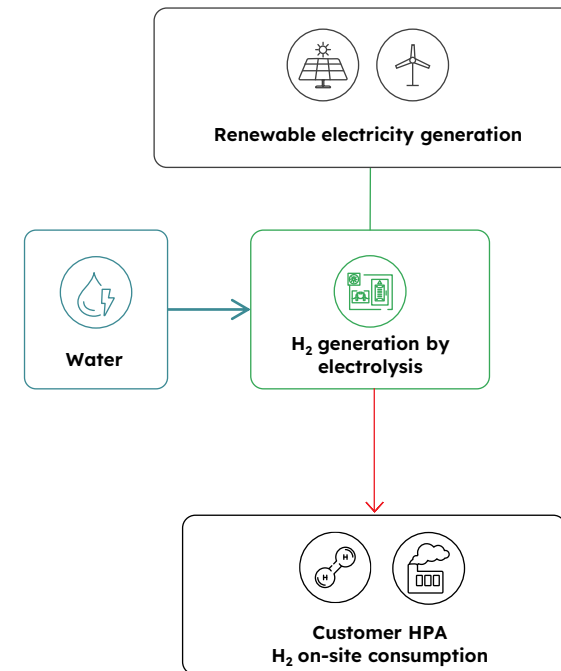
CENTRALIZED H₂ GENERATION

Hydrogen is generated and stored massively. Distributed by pipeline or transported to the customer through a physical or virtual HPA (Hydrogen Purchase Agreement)



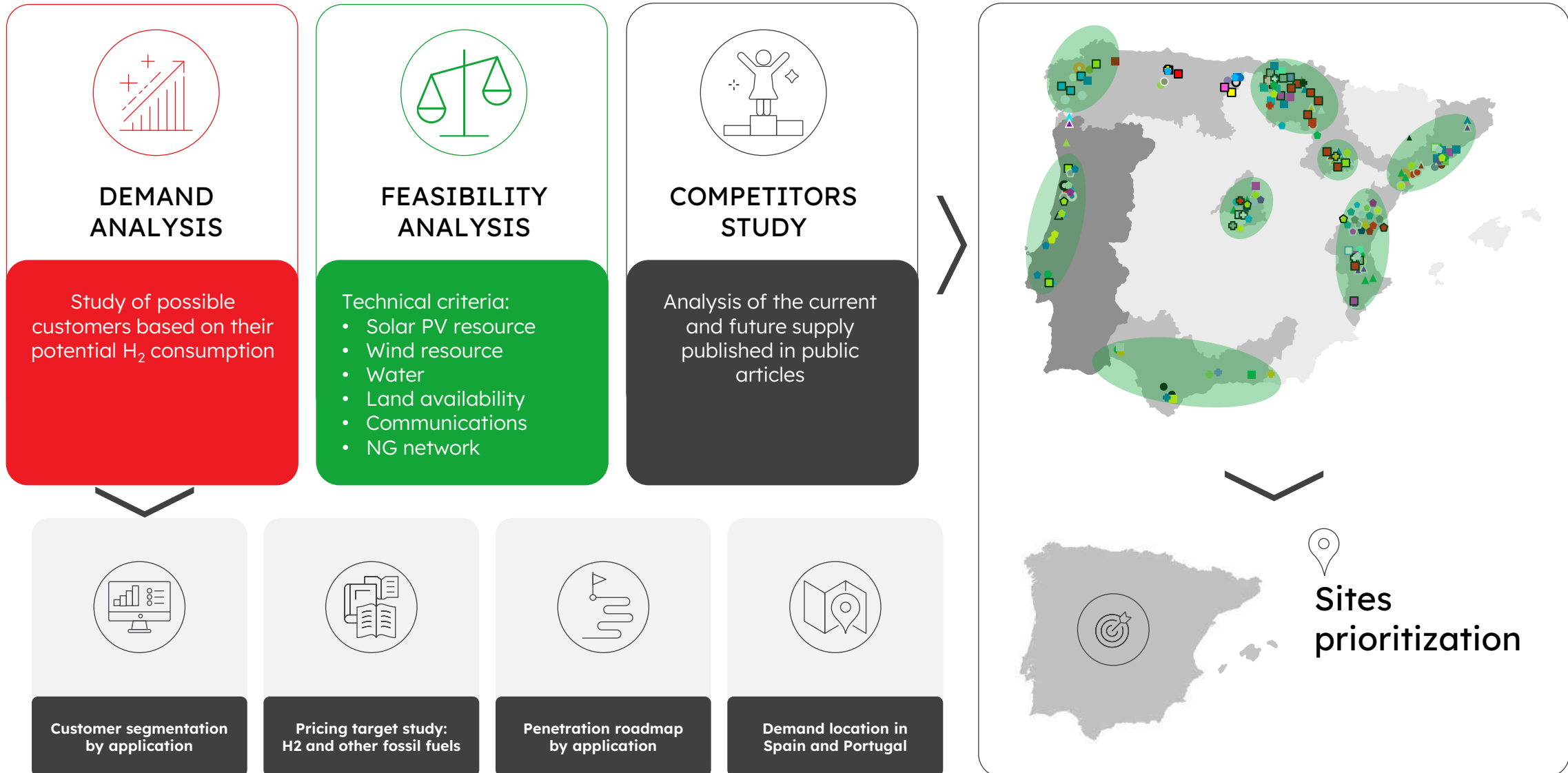
DISTRIBUTED H₂ GENERATION

Hydrogen is generated at the customer's location and supplied on-site via HPA. To supply electricity, a PPA on-site is also possible.



A mixed centralized/distributed business model is also possible, allowing a flexible solution

PIPELINE GENERATION METHODOLOGY



H₂V NAVARRA VALLEY



| RENEWABLE HYDROGEN PRODUCTION PLANT:



Electrolyzer
25 MW*



Renewable source

- Solar 25 MW
- Wind 24 MW



Annual production
3.880 t H₂



Use
Industrial and transport

* Possibility to scale up the electrolysis capacity up to 50 MW (phase 2)

H₂V Navarra Valley project was declared "Project of Regional Interest" in February 2023.

Decisive contribution to the Community of Navarra, achieving the strategic objectives defined in Navarra's Green Hydrogen Agenda.

First phase of 25MW electrolysis (PEM) expected to be commissioned by 2025.

ACCIONA ENERGÍA's biomass plant in Sangüesa is an ideal site for the construction of a renewable H₂ production plant:

- **01** Industrial land availability
- **02** Water availability
- **03** Renewable resources(wind and PV) available in the area (<5km)
- **04** Grid electricity network access (<1km)
- **05** NG network access (<10km)
- **06** Access by road and proximity to end consumers
- **07** Strong presence of ACCIONA in the region



Recovery, Transformation and Resilience Plan –
Financed by the European Union - NextGenerationEU



