DH2 energy
Hydrogen is The New Oil

ArcelorMittal

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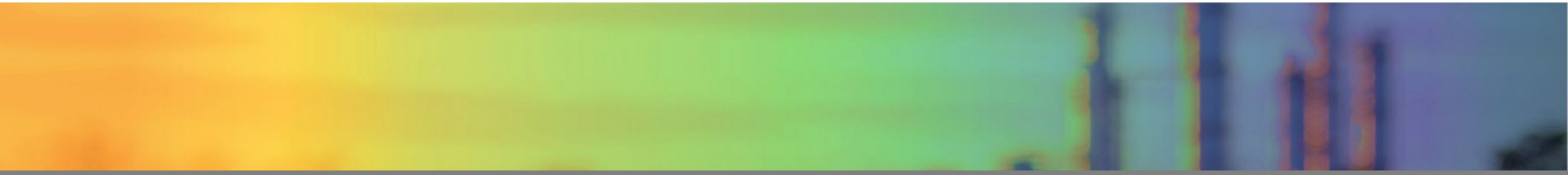
Soladvent
Competitive green hydrogen now



HyDeal España Presentation

March 2022

HyDeal Ambition: ranked by IRENA as world's largest green hydrogen project

1. **HyDeal Ambition (67GW)** ..... Western Europe
2. **Unnamed (30GW)** ..... Kazakhstan
3. **Western Green Energy Hub (28GW)** ..... Australia
4. **AMAN (16GW)**[a] ..... Mauritania
5. **Asian Renewable Energy Hub (14GW)** ..... Australia
6. **Oman Green Energy Hub (14GW)**[a] ..... Oman
7. **AquaVentus (10GW)** ..... Germany
8. **NortH2 (10GW)** ..... Netherlands
9. **H2 Magallanes (8GW)** ..... Chile
10. **Beijing Jingneng (5GW)** ..... China
11. **Project Nour (5GW)**[a] ..... Mauritania
12. **HyEnergy Zero Carbon Hydrogen (4GW)**[a]. Australia
13. **Pacific solar Hydrogen (3.6GW)** ..... Australia
14. **Green Marlin (3.2GW)** ..... Ireland
15. **H2-Hub Gladstone (3GW)** ..... Australia
16. **Moolawatana Renewable Hydrogen Project (3GW)**[a] - Australia
17. **Murchison Renewable Hydrogen Project (3GW)** - Australia
18. **Unnamed (3GW)** ..... Namibia
19. **Base One (2GW)**[a] ..... Brazil
20. **Helios green Fuels Project (2GW)** ..... Saudi Arabia

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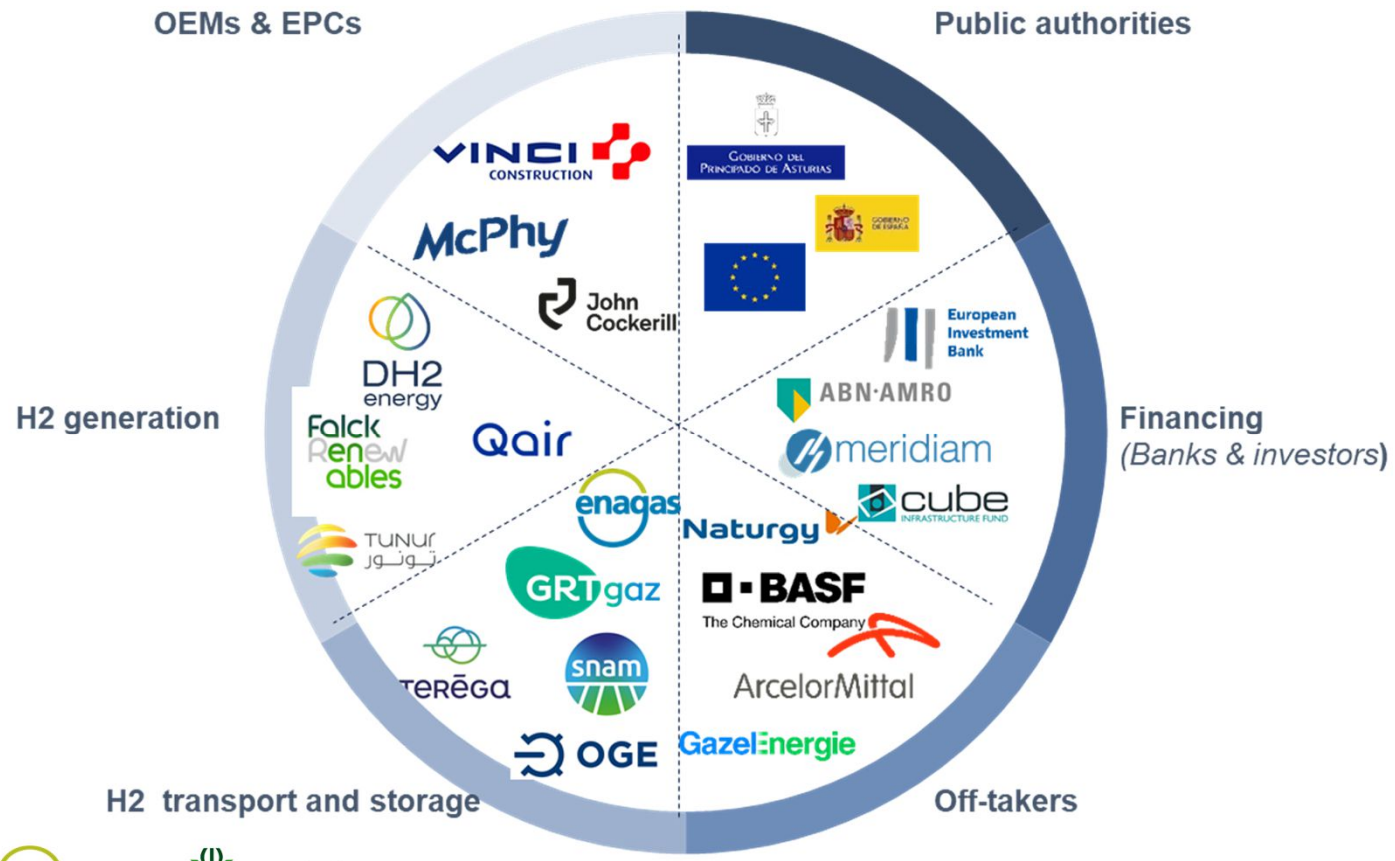
HyDeal Ambition: total vertical integration of green hydrogen value chain



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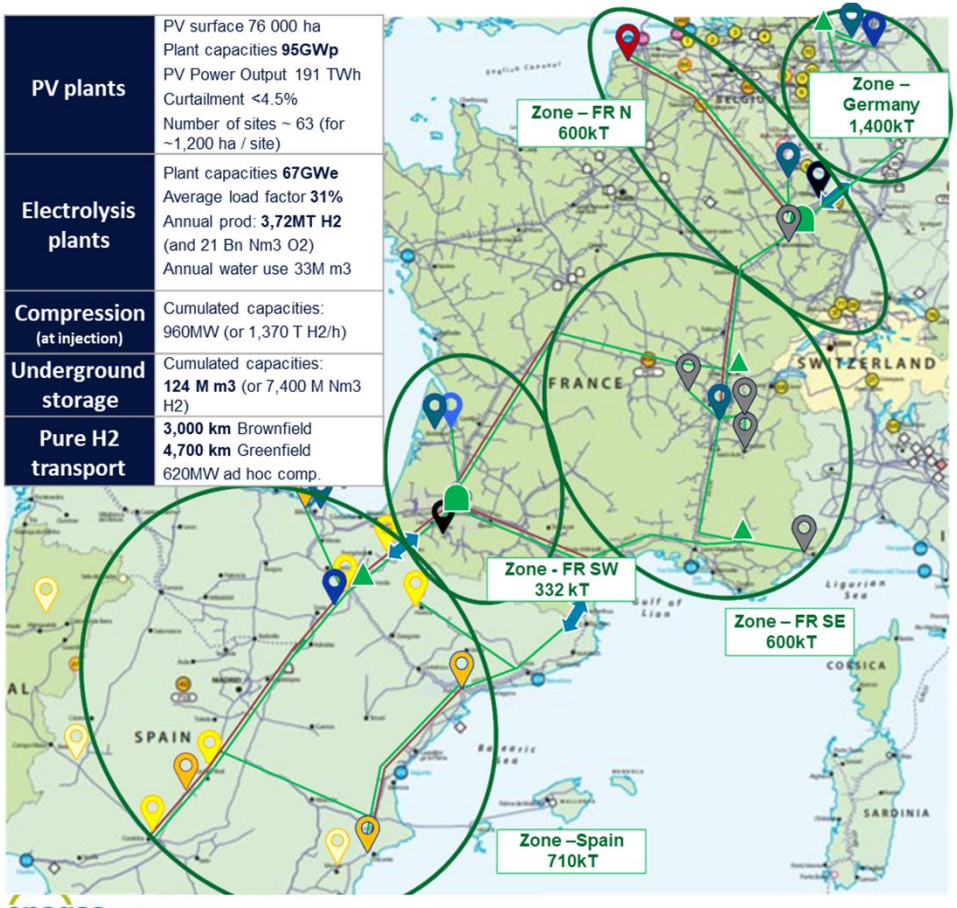
Total ressource: 1% of Europe's energy demand in 2030 from just 0.02% of its area

PV plants	PV surface 76 000 ha Plant capacities **95GWp** PV Power Output 191 TWh Curtailment <4.5% Number of sites ~ 63 (for ~1,200 ha / site)
Electrolysis plants	Plant capacities **67GWe** Average load factor **31%** Annual prod: **3,72MT H2** (and 21 Bn Nm3 O2) Annual water use 33M m3
Compression (at injection)	Cumulated capacities: 960MW (or 1,370 T H2/h)
Underground storage	Cumulated capacities: **124 M m3** (or 7,400 M Nm3 H2)
Pure H2 transport	**3,000 km** Brownfield **4,700 km** Greenfield 620MW ad hoc comp.



Legend

- Area to produce and inject H2 into the H2 pipeline
- Non integrated areas
- Non-assigned baseload off-take (**Exact off-takers and profiles to be determined**)
- Ammonia production plants
- Cement plant
- Steel plant
- Thermal plant
- Fuel Cell hub (**Exact location to be determined**)
- Refineries
- Possible Storage sites – Salt Cavity
- Possible Storage sites – Aquifer
- Potential greenfield H2 pipe based on current NG grid
- Potential brownfield H2 pipeline
- Potential International connections

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HyDeal España Project: A pioneering at-scale green H2 supply system in Europe, leveraging highly competitive renewable (RES) solar sources in Spain, to decarbonize Asturias' industrial base while bringing cost advantage – **Vision by 2030**

1 **Supply of ~200kt to ~330kt* of low-cost green H2 by 2025 to 2030 to Asturias industrial players,** with ArcelorMittal and Fertiberia as a **key first off-takers** supporting project development

2 **Integrated H2 system ("hub") approach, developing Up., Mid. and Downstream at the same time…**

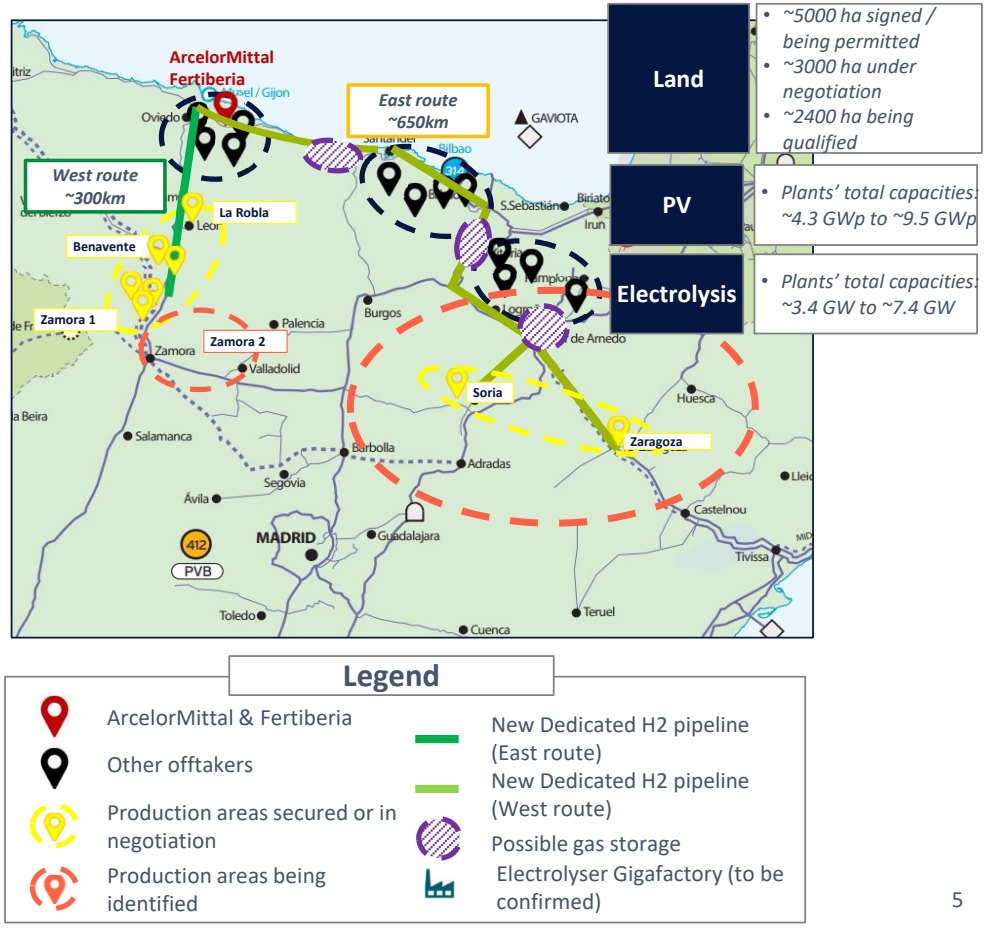
- … allowing to develop **large scale off-site green H2 generation plants**, capturing the best cost production conditions…
- … while bringing bankability to all project's assets

3 **H2 demand aggregation logic into a single "portfolio" of large industrial off-takers…**

- … unlocking scale potential and sharing effects on midstream cost
- … mixing demand profiles to optimize system costs of supply
- … allowing series effects on H2 plants building and learning curve
- … Reducing the off-take and supply risk

4 **Captive solar to gas H2 generation plants, injecting into dedicated H2 transmission lines**

- Among the most competitive green H2 generation sources in Europe**
- Direct impact on Off-takers "scope 1" and CO2 costs



*) Possibility to expand system development until 450kt with additional off-takes aggregation and system expansion

**) For electrolysis installed costs < 400€ / Kw

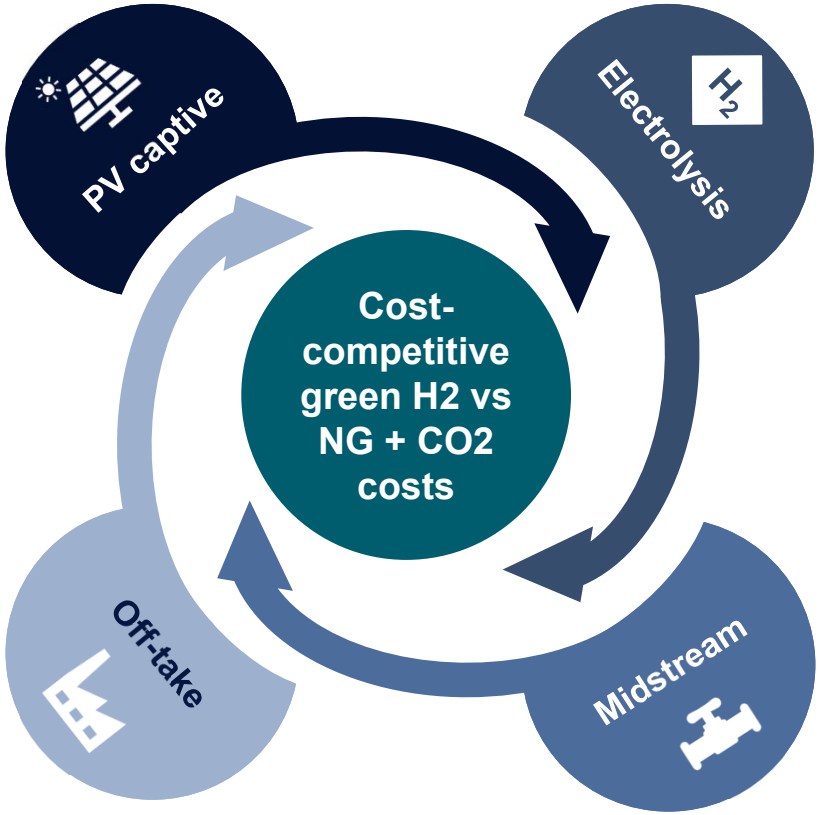
HyDeal España project's setup and scale allow to activate the key optimization levers to target a competitive green H2 versus Natural Gas + CO2 costs

Solar PV

- **Cheapest RES energy for green H2 production** as long as electrolysis platforms are < 400€ / KW (preference for low-cost RES energies vs long load factors)
- **Utility scale projects** (0.5 - 1 GW), enabling cost reduction (optimized procurement & construction costs, sharing effects at BOP level...)
- **Captive production** with solar power supplied at LCOE level + internal connexion costs without paying grid fees

Off-take

- Proximity to an **offtake basin with large H2 needs** allowing a portfolio effect
- Off-takers with **long term contracts** allowing to guarantee the bankability of the project and optimize WACC
- Supply of H2 on site impacting CO2 **'scope 1' emissions** (no blending with NG)



Electrolysis

- **30 bar pressurized alkalyne technology** as most competitive solution in CAPEX on the mid-term allowing load following
- **Utility scale projects**, enabling to leverage key cost reduction levers (gigafactory, industrialized design, mutualization cost effects on BOP...)
- Discussion of sourcing contracts on a **fleet of permitted projects**, with standardized conditions, to allow to optimize sourcing conditions of electrolyzers and learning effects on erection

Midstream

- **Dedicated gas pipeline network** to supply H2 as cheapest conditioning and transport solution (vs. chemical carrier, ...) and **key conditions to link cheap generation sites versus demand**
- **Mass scale storage** (saline cavity) as most competitive solution to allow profiles transformation and supply security to off-takers

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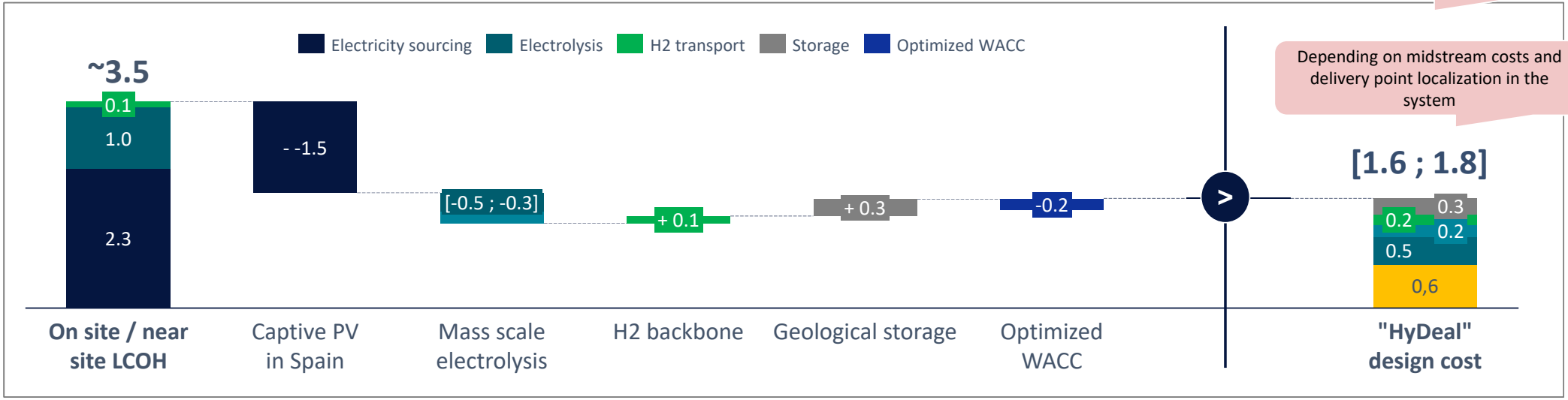
Total cost reduction with optimal green H2 system design

Waterfall between estimated current market costs in Spain versus optimal green H2 system design (HyDeal), LCOH in €/kg_{H2}

Vs 3.11 €/kg_{H2} taking a benchmark NG + CO2 with current market conditions (03/11)[1]



Depending on midstream costs and delivery point localization in the system

- Sourcing on the electricity market (~45€/MWh) – load factor70 to 80%
- Electrolysis – 20 MW platform with 2MW stacks (~0.9M€/MW)

- Cheapest RES energy for green H2
- Utility scale projects
- Captive production
- Load factor @ 31%

- Fleet effects, with standardized conditions
- Utility scale projects
- ~ 0,4 M€ / MW

- Dedicated gas pipeline network
- Key condition to link cheap generation sites versus demand

- Mass scale storage (saline cavity)
- Key condition to adjust profiles & supply security to off-takers

- Mutualizing LT offtake contracts
- Strong bankability of the project and optimized WACC (derisking effect)

"HyDeal" ambition optimal green H2 system design

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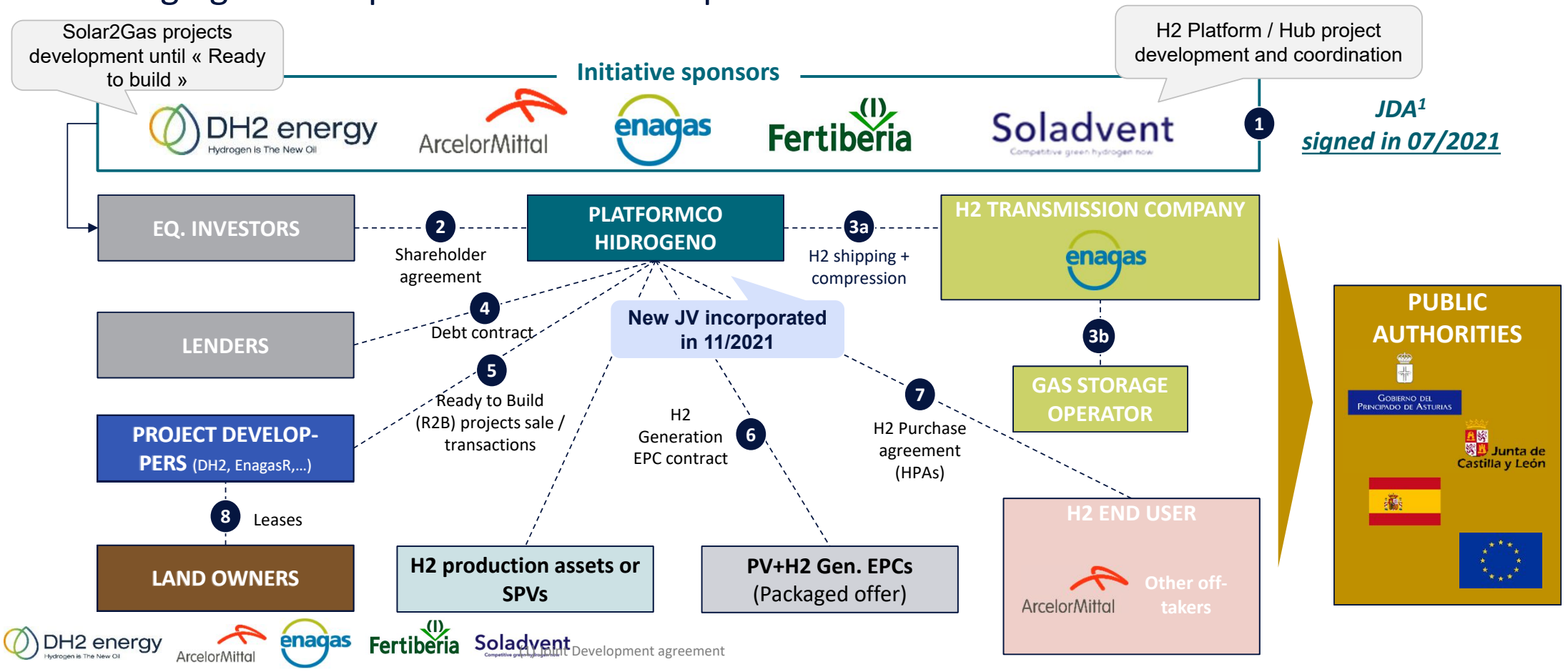
[1] Based on current NG prices (~68€/MWh_{HHV} on 03/11/2021 – source TTF) and carbon price (~59,5€/t_{CO2} on 02/11/2021 – source EU ETS)
P_{H2} (€/kg_{H2}) = H2 energy content (MWh/kg_{H2}) * P_{NG} (€/MWh) + H2 energy content (MWh/kg_{H2}) * NG carbon emission factor (kg_{CO2}/MWh) * P_{CO2} (€/kg_{CO2})

Project's sponsors have established a **Joint Development Company (PlatformCo)** to address the project's specificities (development of a "H2 system"), while bringing solid required industrial competencies



A 5-year industrial plan, from design to build, entering its 'pre-launch' phase which should last 9 to 10 months until end June 2022