



# South Asia Clean Energy Forum 2023

Catalyzing Partnership for Clean Energy Transition

Advancing Green Hydrogen through  
Collaborative Efforts in South Asia

Good practices: Framework and Collaboration

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# Roland Berger is a leading global consultancy of German heritage and European origin with more than 20 years of market presence in India

## Our global presence

**51** offices in **35** countries, with more than **3,000** employees of **67** nationalities

Over **320** partners, serving over **1,000** international clients in various industries

We have worked with more than **40%** of Fortune Global 500 companies in the last 5 years

One third of our projects in 2022 were served by **cross-border** teams

**46%** repeat clients in 2022



# The national green hydrogen mission is an essential component to reach India's energy independency by 2047 and Net Zero by 2070

## Mission outline



India's objective is to become the global energy hub for production, usage and export of green hydrogen and its derivatives



The mission will lead to economy-wide benefits through decarbonization of industrial, mobility and energy sectors



Four key components should be considered and addressed with further steps to succeed



The implementation will consist of two main phases: competence development and ecosystem expansion

# Four key components should be considered and addressed with further steps to succeed

	Description	Subsegments
<b>1 Demand generation</b>	An enabling regulatory environment for accelerated growth of green hydrogen production, uptake and exports	<ul style="list-style-type: none"> <li>Domestic demand: Apply regulation to shift from grey- to green hydrogen consumption</li> <li>Substituting imports: Decrease the demand of fossil fuel imports</li> <li>Export markets: Global demand is expected to increase</li> </ul>
<b>2 Financial support</b>	The aim is to create multiplier effect in investment using the government support to ensure establishment of a domestic manufacturing ecosystem	<ul style="list-style-type: none"> <li>Direct financial funds: Domestic manufacturing of electrolysers and green hydrogen production</li> </ul>
<b>3 Governance and stakeholders</b>	Effective implementation of the mission activities requires strong coordination among various ministries and departments of central and state governments, industry, institutions, and other stakeholders	<ul style="list-style-type: none"> <li>Empowered group: Ministries and industry experts</li> <li>Advisory group: Experts from academic and research institutions, industry, and civils</li> <li>Mission secretariat: Comprise subject matter experts and professionals</li> </ul>
<b>4 Pilot projects</b>	Projects that will help identify operational issues and gaps in terms of current technology readiness, regulations, implementation methodologies, infrastructure and supply chains	<ul style="list-style-type: none"> <li>Primary use-cases: Steel production, long-haul heavy-duty mobility and shipping</li> <li>Secondary use-cases: Railways and aviation</li> </ul>

In order to reach the targets, the Ministries need to define a support scheme and a detailed action plan – The framework structure is essential

Key challenges

## Challenges

As its given nature of the H<sub>2</sub> industry, it brings a lot of new challenges for all stakeholders:

- Unclear future development acceptance level
- Missing infrastructure and multiple technological solutions
- High fluctuation in availability and pricing of assets
- Unclear anticipations of future off-takers
- Missing or mixed regulatory framework
- Ununified understanding of definitions, standards

## Key question

- How does a profound framework shall be defined?

# Regulatory instruments aim at supporting both demand and supply side – CAPEX/OPEX subsidies and tax break are most popular

## List of possible regulatory instruments and link to H<sub>2</sub> support

	Description	Illustration	Potential beneficiaries	Currently in use in	
Technology supply <sup>1)</sup>	<b>Investment subsidy</b>	One-time non repayable subsidy directly received by the organization investing into prod. facilities	CATL investment into a battery production facility in Erfurt – Germany	All potential FCH OEMs realizing supply side investments	
	<b>Tax break</b>	Exclusion from tax payments / reduction of taxes for a defined sector to incentivize private investment	Electricity tax exemptions and rebates help reducing OPEX for manufacturing businesses	All potential FCH OEMs realizing supply side inv. to increase product availability	
	<b>Special economic zone</b>	Areas in which business / labor / trade laws differ from the rest of the country	Wuhan zone in China with integrated VC on H <sub>2</sub> fuel powered generators and H <sub>2</sub> FC for buses	All potential OEMs realizing supply investment – lower cost structure	<i>Not identified within the scope</i>
	<b>Customs tariff breaks</b>	Deferral of taxes for later payment / refund on inputs imported for manufacturing goods locally	Duty Drawback on imported goods that have been exported back out of the US (e.g., chemicals)	All potential OEMs realizing supply inv. (e.g., electrolysis equipment producers)	
Technology demand <sup>2)</sup>	<b>Guarantee</b>	Legally binding indemnity bond backed by a public instit. to ensure loan repayment in case of default	European Investment Bank guaranty for large-scale inv. projects to foster growth and innovation	Large scale public / private investment projects following specific political obj.	
	<b>CAPEX / OPEX subsidy</b>	Fixed-time subsidies to reduce initial investment requirements / increase confidence in investment	1 <sup>st</sup> NIP-funded HRS (DE) obtained OPEX relief funding based on actual costs due to low use rates	All potential OEMs and infra. operators, project promoters, individual customers	
	<b>Tax breaks</b>	Deduction / tax breaks / tax credits to stimulate purchase of new technologies and drive investment	Biodiesel subject to lower fuel tax when introduced in Germany	End-customers of FCH products, FCH OEMs, infra. operators, projects	
	<b>Repayable grants loans</b>	Funding with expected payback after a certain period / predetermined level of success	French Caisse des Dépôts et Consignations giving repayable advances for energy efficiency projects	Potential project promoters for FCH deployment, indiv. customers of the techno.	<i>No H<sub>2</sub> funded project identified</i>
	<b>Match funding</b>	Tool to guide indus. activity in a specific area of interest through boundary conditions	FCH JU overall budget raised by a match funding obligation (50% EU + 50% industrial players)	Hydrogen projects (indus. advances in techno / applications), indiv. customers	
	<b>Usual energy instruments</b>	Contracts for difference / Feed-in tariffs / capacity compensation to stimulate investments	Bio-methane possibly injected into the French gas-grid based on an agreed tariff of EUR c.18 t/kWh	FCH OEMs and infrastructure operators, investors (e.g., HRS, facilities, etc.)	<i>Not existing for H<sub>2</sub> / FCH sector as of today</i>

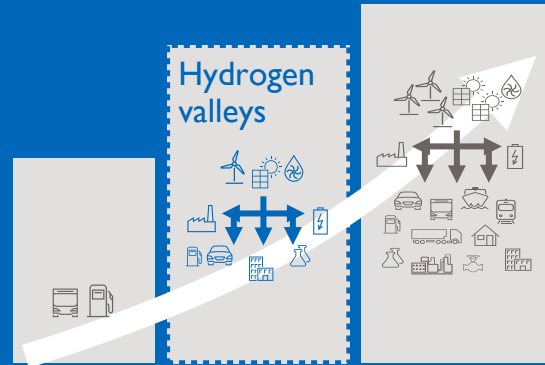
1) Instruments supporting the build up of H<sub>2</sub> and FCH technology production capacities (regular industrial policy tools with generally no specific H<sub>2</sub> / FCH focus)

2) Instruments supporting the deployment of H<sub>2</sub> and FCH technology in the market (mainly relying on public financial support)

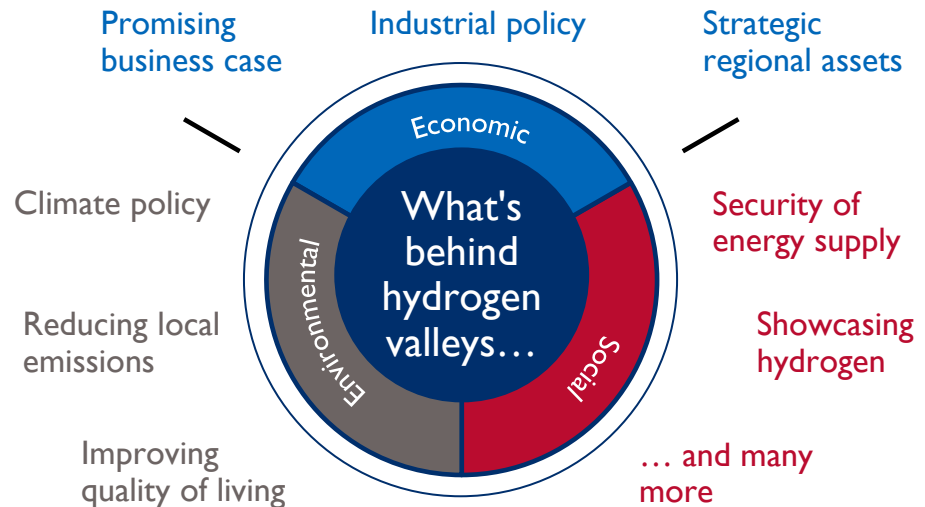
Coined and conceptualized in Europe, "Hydrogen Valleys" are seen as local market makers for clean hydrogen

## Hydrogen Valleys

- Next-generation market development
- Integrated (and larger-scale) projects covering more and more of the value chain – "mini hydrogen economies"



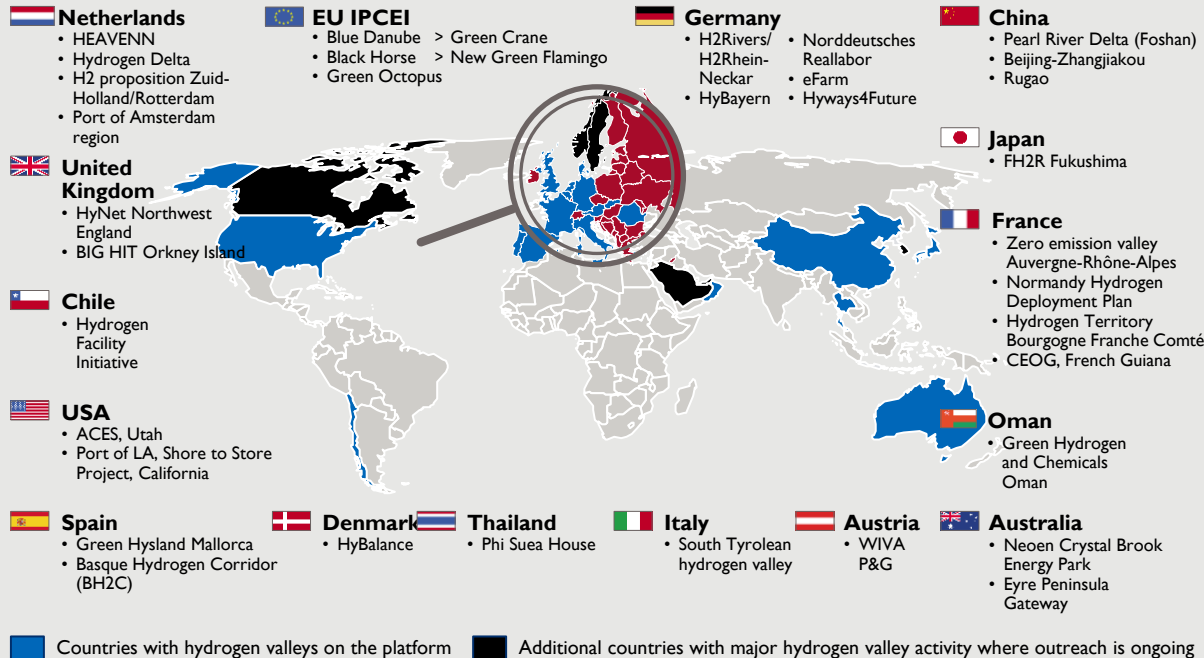
## The underlying drivers




# They have become a global phenomenon, with integrated projects emerging all around the world

A fast-growing landscape of globally leading projects ...

» ... featured on a new platform



 > 35 valleys from 19 countries

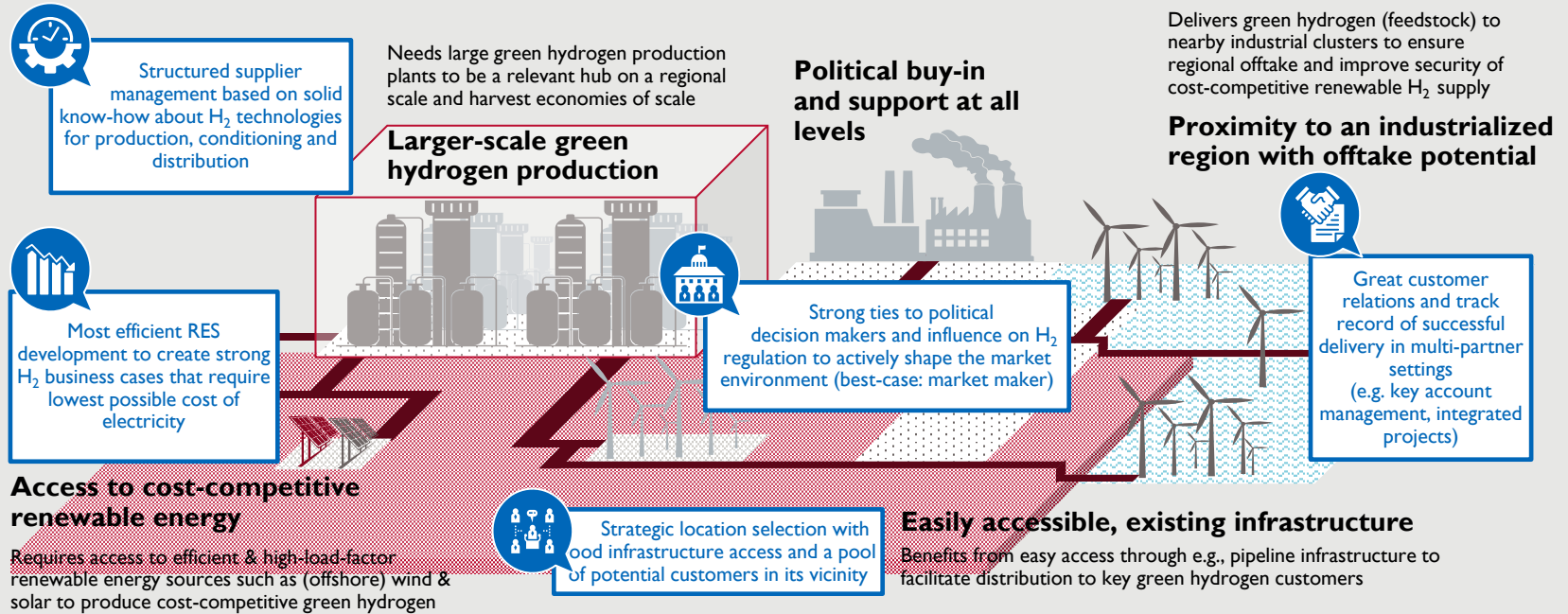
 > 3,500 data points

 10 in-depth best-practice profiles

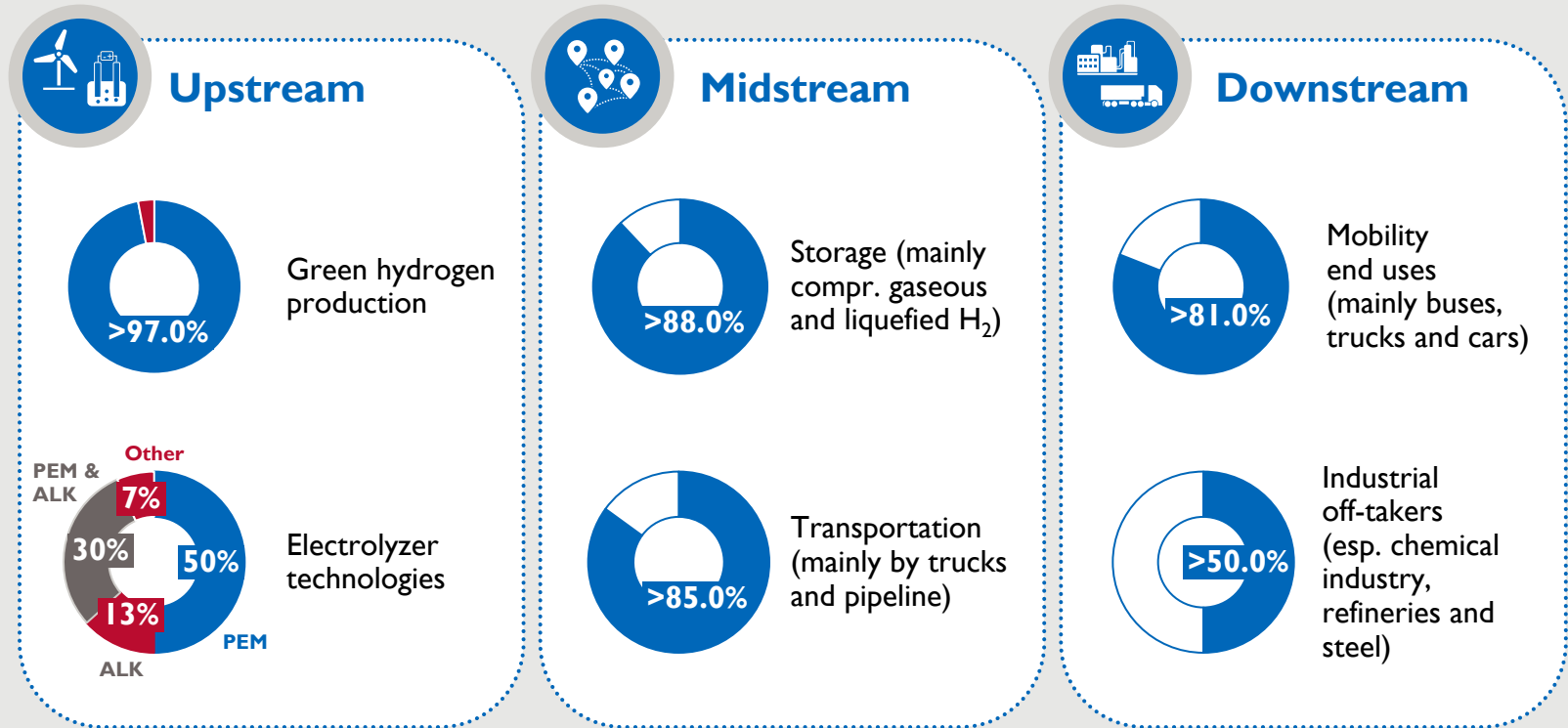


# Developers require strong upstream capabilities to ensure lowest possible cost as well as strong customer relations for offtake

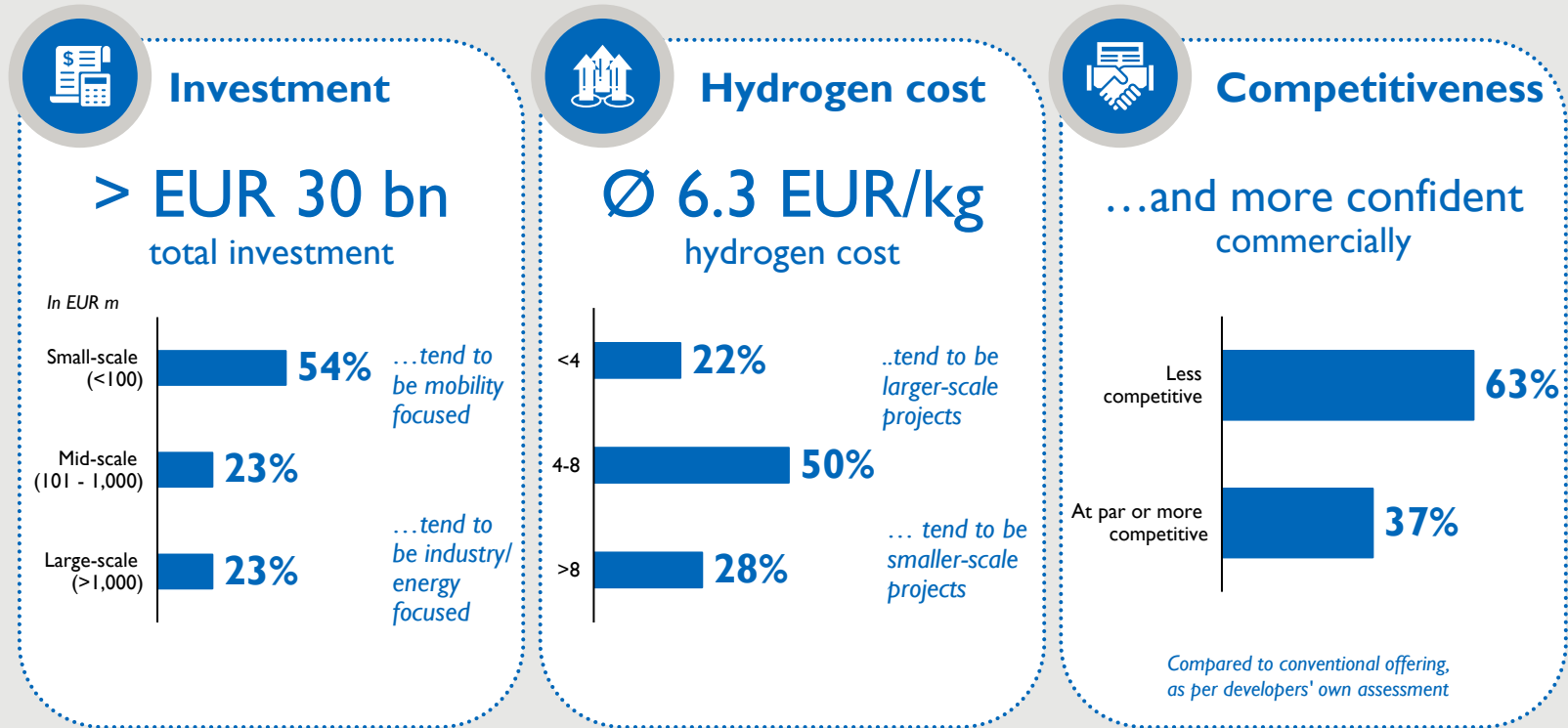
Key valley success factors and developer capabilities required



# The valleys are diverse in almost every way, but all feature different signs of a maturing market (1/2)



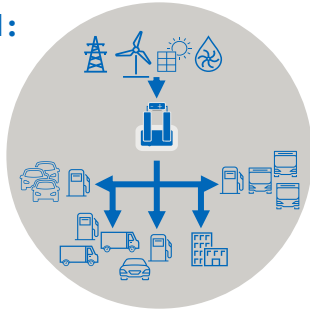
# The valleys are diverse in almost every way, but all feature different signs of a maturing market (2/2)



# Different projects, common themes: We see three basic archetypes of Hydrogen Valleys

## Archetype 1:

Local, small-scale & mobility-focused

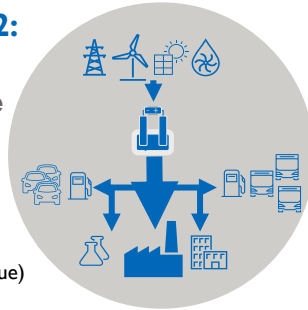


- Local (green) H<sub>2</sub> production
- Serving mobility applications
- Mostly led by public-private initiatives

Examples: Hyways For Future (DE), Zero Emission Valley Auvergne-Rhône-Alpes (FR), Hydrogen Valley South Tyrol (IT)

## Archetype 2:

Local, medium-scale & industry-focused

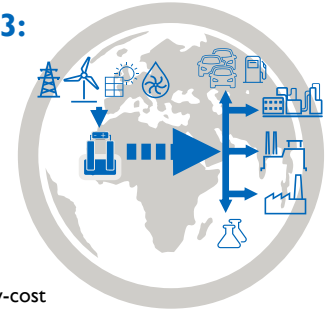


- Local (green or blue) H<sub>2</sub> production
- Centered around 1-2 large off-takers as "anchor-load", smaller mobility off-takers as add-on
- Mostly led by private sector

Examples: Basque H<sub>2</sub> Corridor (ES), Advanced Clean Energy Storage (USA), HyNet North West England (UK)

## Archetype 3:

Larger-scale, international & export-focused



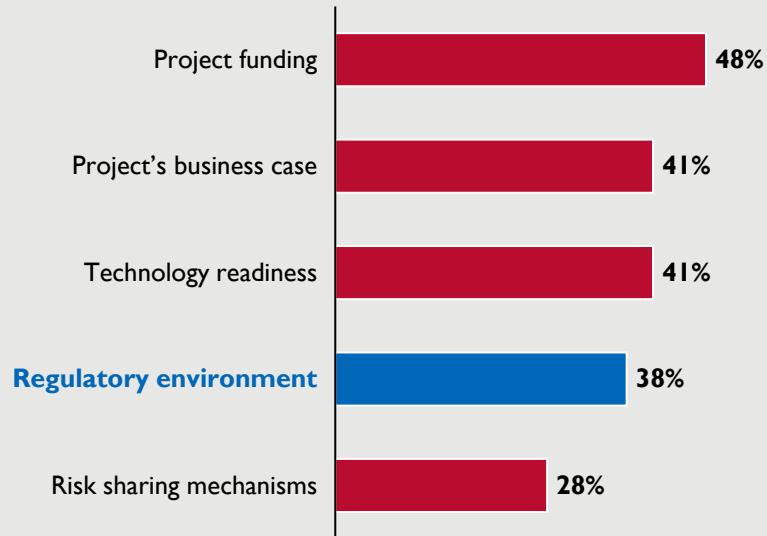
- Large-scale projects with low-cost (green or blue) H<sub>2</sub> production
- Focus on connecting supply and demand globally
- Mostly led by private or large sovereign investors

Examples: Eyre Peninsula Gateway (AUS), Green Hydrogen @ Blue Danube (IPCEI), Green Crane (IPCEI)

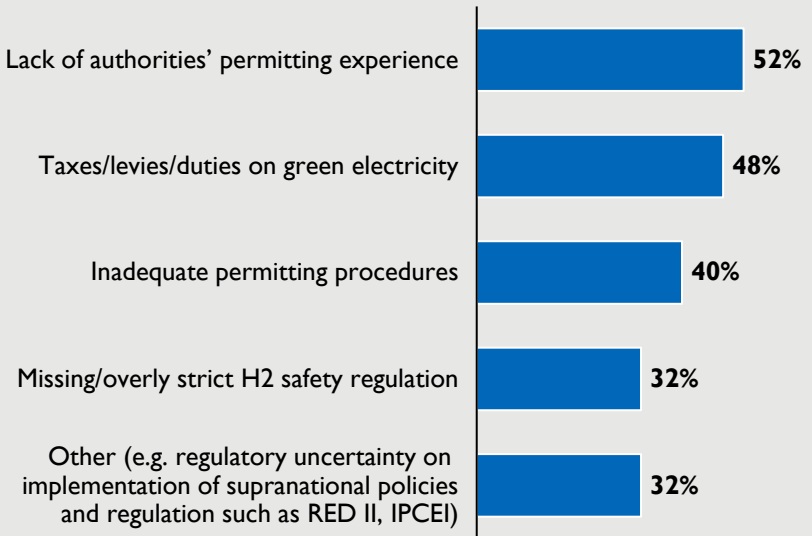
**Closed ecosystems of H<sub>2</sub> production, supply, and offtake – increasingly underpinned by long-term commercial arrangements**

# Developers face common challenges, especially concerning business cases and regulation

## Top overall challenges when developing hydrogen valley initiatives<sup>1)</sup>



## Most significant regulatory hurdles when developing hydrogen valley initiatives<sup>1)</sup>



<sup>1)</sup> Top 5 answers from survey; multiple answers possible

# The holistic set of tools for financing ensures a wide portfolio

European overview

RRF

IPCEIs

Cohesion funds  
and JTF

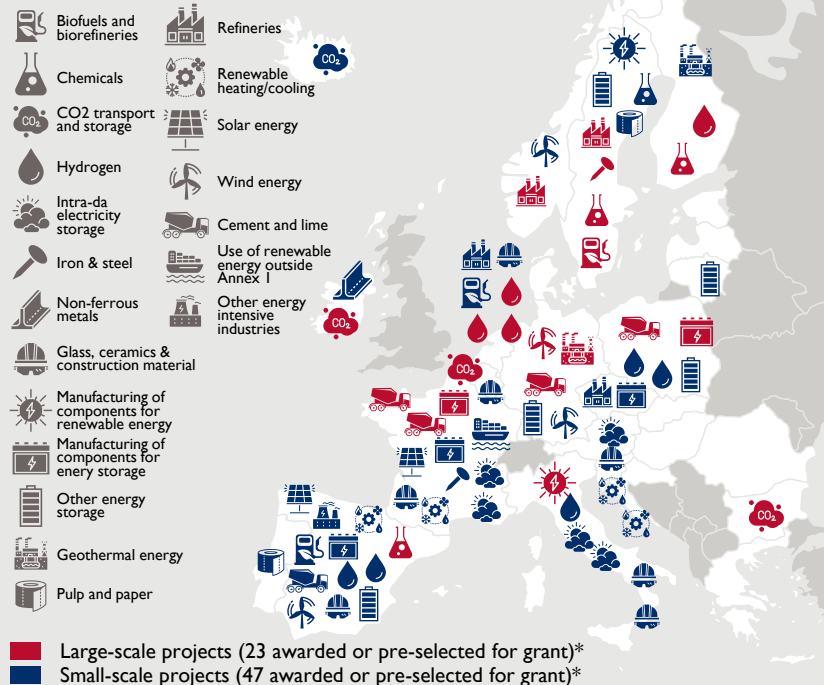
ETS Innovation  
fund

Clean Hydrogen  
Partnership

European  
Hydrogen Bank

# IF project portfolio reflects well the local and global needs

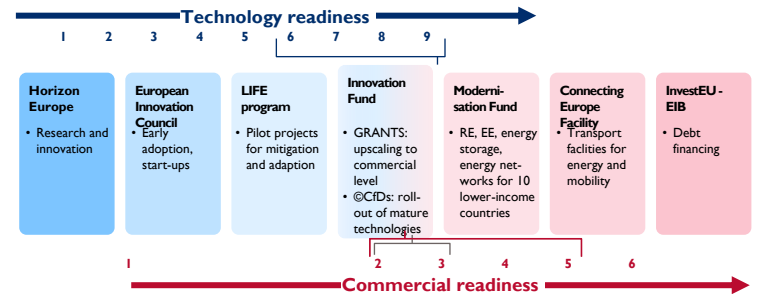
## Innovation Fund project portfolio



Size of EUR 38 billion, from 2020 to 2030 (at price level of EUR 75 / tCO<sub>2</sub>), for innovative low-carbon technologies, projects focusing on: **energy-intensive industries, CCU, CCS, RE generation and storage**. Projects selected by:

- **effectiveness** of greenhouse gas emissions avoidance
- degree of **innovation and scalability, maturity**
- **cost efficiency**

## National funding (including RRFs)



\*The number of symbols is higher than the number of projects, as some projects are implemented in multiple locations

# The role of the European Hydrogen Bank

## Supply certainty

- Production targets
- Import targets
- Green hydrogen partnership
- Investment support for end-users

First offtake agreements

## Demand certainty

- Consumption targets
- Hydrogen infrastructure
- Hydrogen market rules
- Investment support for H<sub>2</sub> production

**EU  
HYDROGEN  
BANK**

- It will be financial policy instrument which de-risks and creates bankable hydrogen projects
- Ensures competition on EU-level and avoids over-subsidizing projects
- Demand assessments
- Infrastructure needs (aligned with TEN-E)
- Hydrogen flows (EIB/EBRD projects, MoUs)
- H<sub>2</sub> cost assessments (create price transparency)



Existing challenges need to be addressed on policy, industry and project level: regulatory, commercial and technical

## Key success factors for Hydrogen Valleys

- Finding green hydrogen off-takers and signing long-term contracts to make projects bankable
- Ensuring adequate legal & regulatory support (carbon pricing, standardization, fast permitting, etc.)
- Obtaining public funding support to close the remaining funding gaps (CAPEX subsidies, CCfDs, etc.)
- Ensuring technology readiness of all fuel cells and hydrogen applications required

More information available in the report



**THANK YOU**