Hydrogen Valleys

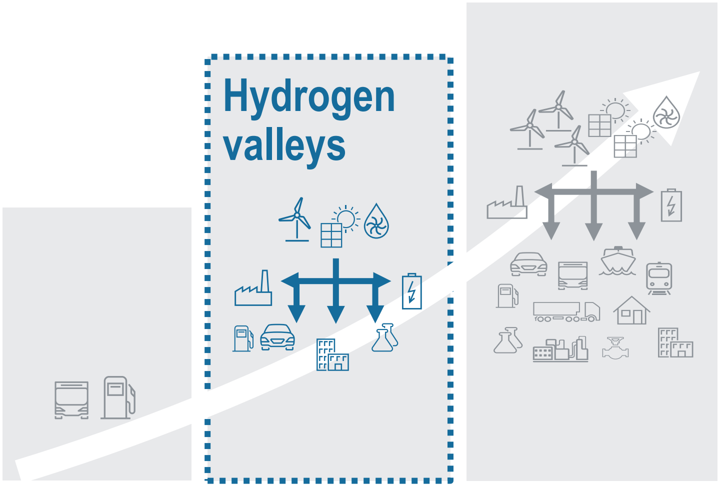
Lessons learned from global hydrogen project development

European Commission FCH MI Inycom innovation technologies Roland Berger

MI, EC and FCH JU want to push "Hydrogen Valleys" globally – as local market makers for clean hydrogen

The topic

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

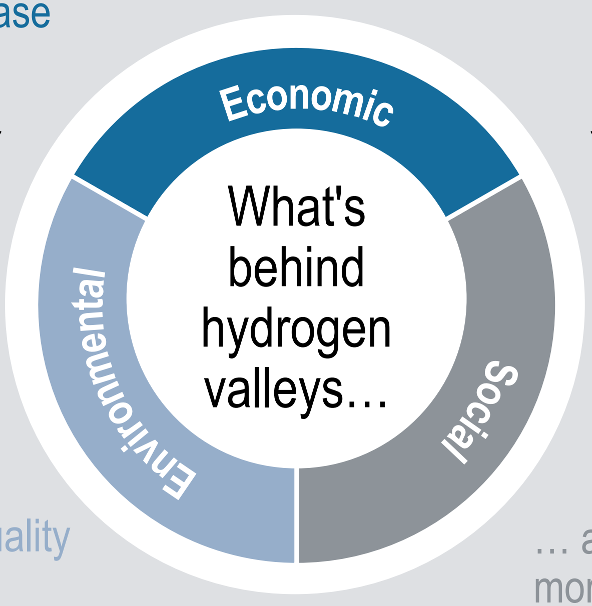


The underlying drivers

Promising business case

Industrial policy

Strategic regional assets



Climate policy

Reducing local emissions

Improving quality of living

Security of energy supply

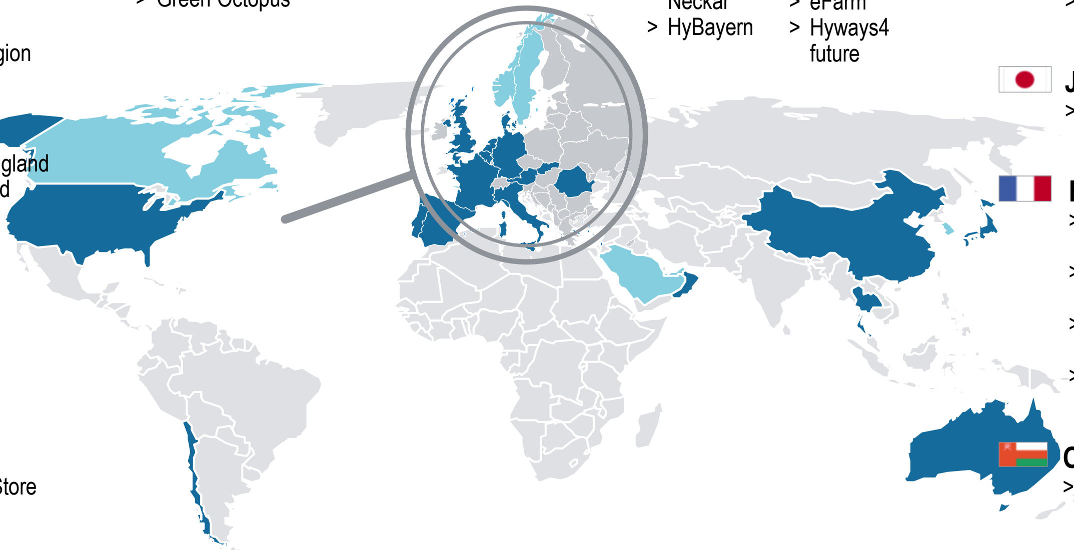
Showcasing hydrogen

… and many more

Source: FCH JU, Inycom, Roland Berger

Hydrogen Valleys have become a global phenomenon, with integrated projects emerging all around the world

A fast-growing landscape of globally leading projects …



Netherlands
- > HEAVENN
- > Hydrogen Delta
- > H2 proposition Zuid-Holland/Rotterdam
- > Port of Amsterdam region

EU IPCEI
- > Blue Danube
- > Black Horse
- > Green Octopus
- > Green Crane
- > New Green Flamingo

Germany
- > H2Rivers/ H2Rhein-Neckar
- > HyBayern
- > Norddeutsches Reallabor
- > eFarm
- > Hyways4 future

China
- > Pearl River Delta (Foshan)
- > Beijing-Zhangjiakou
- > Rugao

United Kingdom
- > HyNet North West England
- > BIG HIT Orkney Island

Japan
- > FH2R Fukushima

Chile
- > Hydrogen Facility Initiative

France
- > Zero emission valley Auvergne-Rhône-Alpes
- > Normandy Hydrogen Deployment Plan
- > Hydrogen Territory Bourgogne Franche Comté
- > CEOG, French Guiana

USA
- > ACES, Utah
- > Port of LA, Shore to Store Project, California

Oman
- > Green Hydrogen and Chemicals Oman

Spain
- > Green Hysland Mallorca
- > Basque Hydrogen Corridor (BH2C)

Denmark
- > HyBalance

Thailand
- > Phi Suea House

Italy
- > South Tyrolean hydrogen valley

Austria
- > WIVA P&G

Australia
- > Neoen Crystal Brook Energy Park
- > Eyre Peninsula Gateway

Countries with hydrogen valleys on the initial platform

Additional countries with major hydrogen valley activity where outreach is ongoing

… featured on the new platform

> 34 valleys from 19 countries

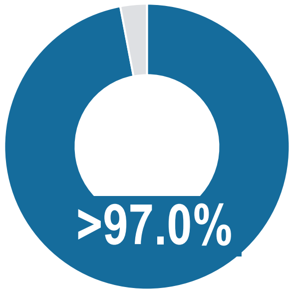
> 3,500 data points

10 in-depth best-practice profiles

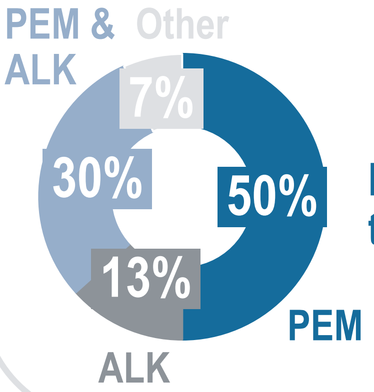
Source: FCH JU, Inycom, Roland Berger

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

Upstream

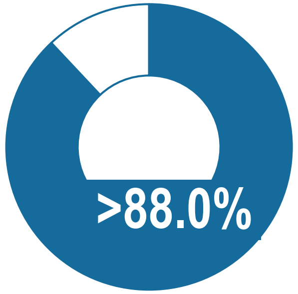


Green hydrogen production

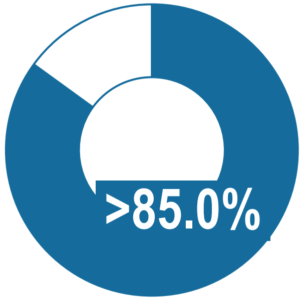


Electrolyzer technologies

Midstream

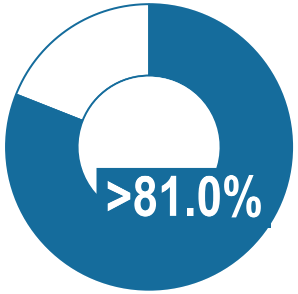


Storage (mainly compr. gaseous and liquefied H_2)

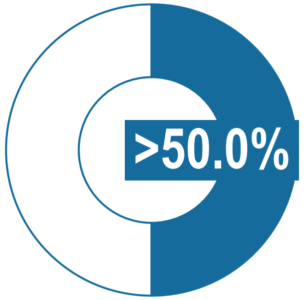


Transportation (mainly by trucks and pipeline)

Downstream



Mobility end uses (mainly buses, trucks and cars)



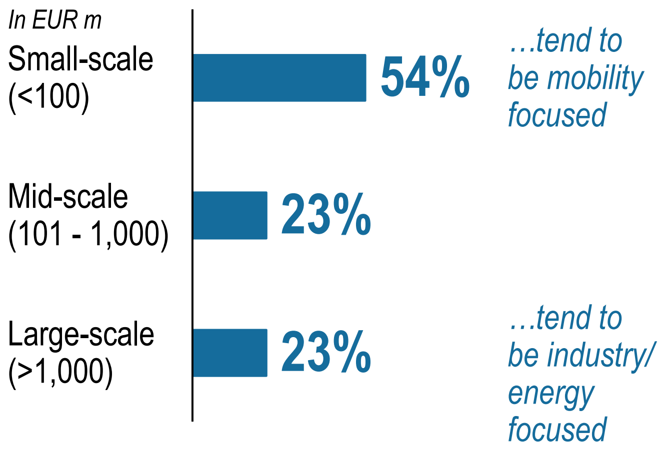
Industrial off-takers (esp. chemical industry, refineries and steel)

Source: FCH JU, Inycom, Roland Berger

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

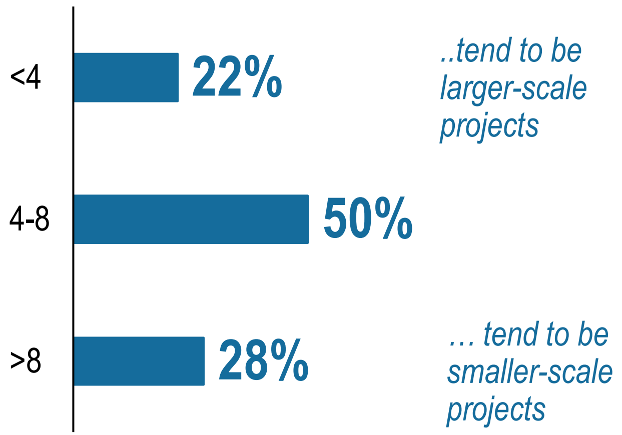
Investment

> EUR 30 bn
total investment



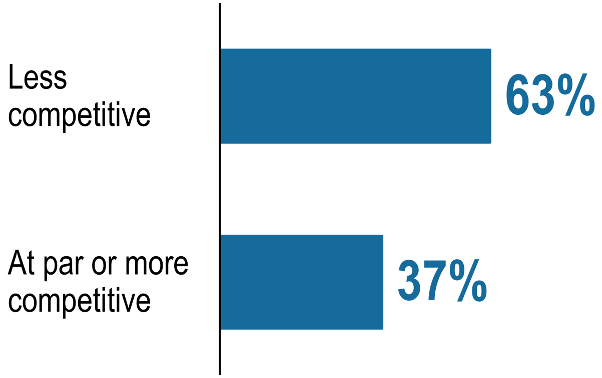
Hydrogen cost

Ø 6.3 EUR/kg
hydrogen cost



Competitiveness

…and **more confident**
commercially



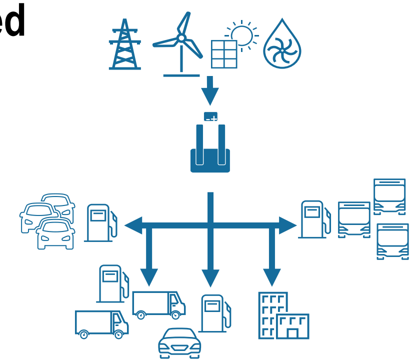
Compared to conventional offering, as per developers' own assessment

Source: FCH JU, Inycom, Roland Berger

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

Archetype 1:

Local, small-scale & mobility-focused

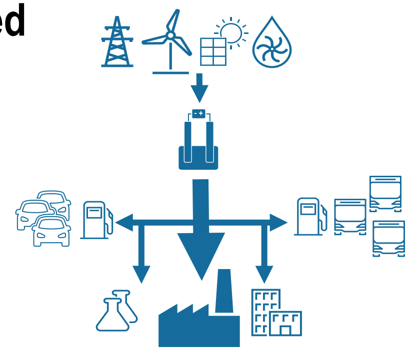


- Local (green) hydrogen production projects serving mobility applications
- Key focus is on aggregating consumption volumes and sharing refuelling infra (e.g. HRS)
- Legacy of mobility/electrolyzer demo projects
- Mostly led by public-private initiatives

Examples: Hyways For Future (Germany), Zero Emission Valley Auvergne-Rhône-Alpes (France), Hydrogen Valley South Tyrol (Italy)

Archetype 2:

Local, medium-scale & industry-focused

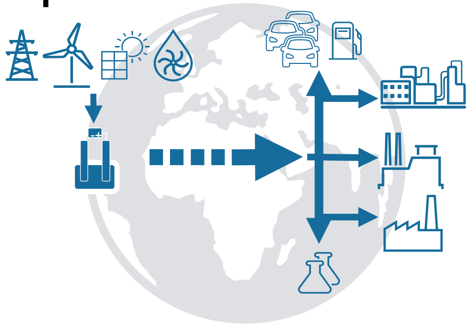


- Local (green or blue) hydrogen production projects centered around 1-2 large off-takers as "anchor-load", smaller mobility off-takers as add-on
- Making use of existing infra around industrial plants, often replacing grey H2 supply
- Mostly led by private sector

Examples: Basque H_2 Corridor (Spain), Advanced Clean Energy Storage (USA), HyNet North West England (UK)

Archetype 3:

Larger-scale, international and export-focused



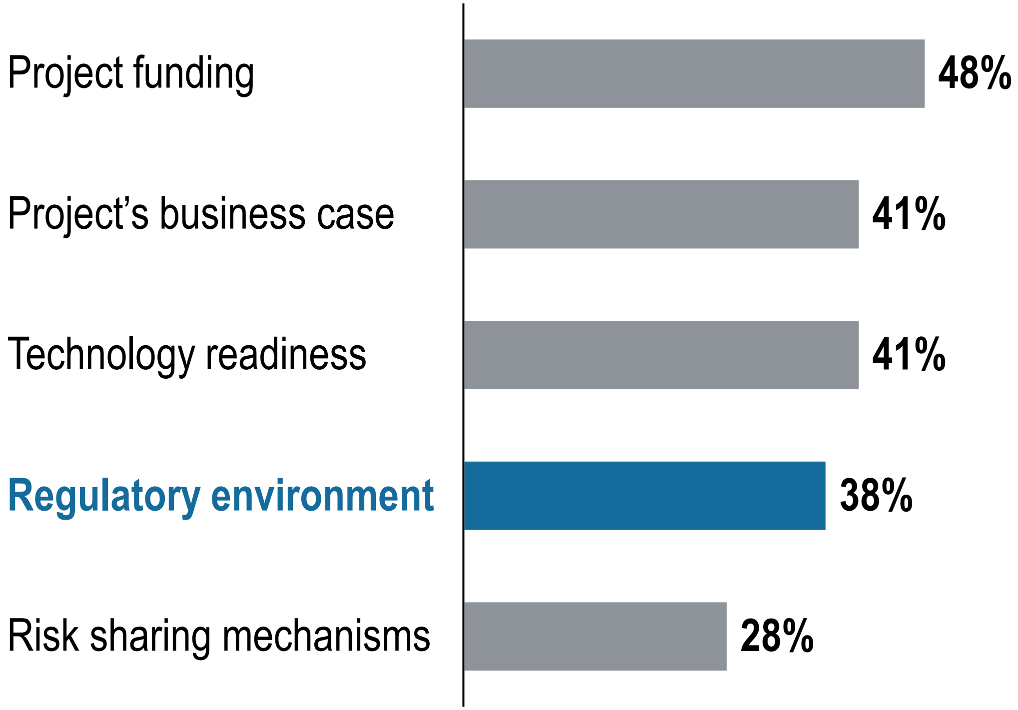
- Large-scale projects with low-cost (green or blue) production, ultimately aiming for long-distance hydrogen transport to large off-takers abroad
- Focus on connecting supply and demand internationally
- Mostly led by private sector

Examples: Eyre Peninsula Gateway (Australia), Blue Danube (IPCEI), Green Crane (IPCEI)

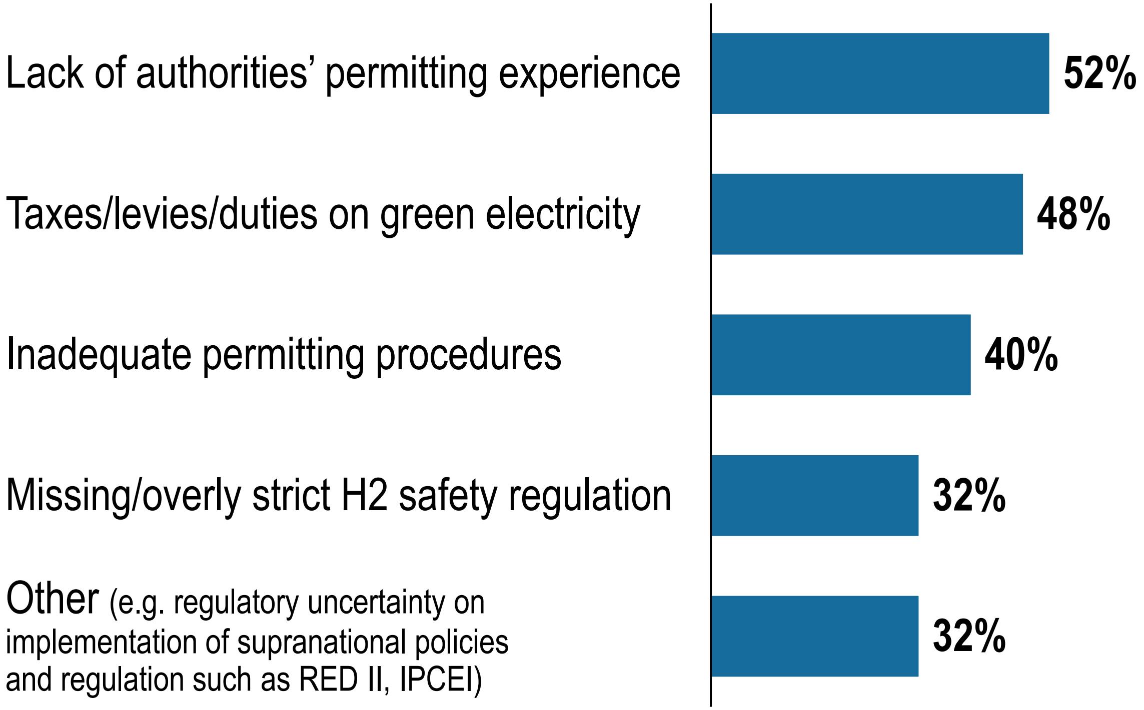
Source: FCH JU, Inycom, Roland Berger

Developers face common challenges, especially concerning business cases and regulation

Top overall challenges when developing hydrogen valley initiatives[1]



Most significant regulatory hurdles when developing hydrogen valley initiatives[1]



1) Top 5 answers from survey; multiple answers possible

Source: FCH JU, Inycom, Roland Berger

Hydrogen Valleys still need support – Remaining barriers are being addressed on EU level

Key remaining barriers for Hydrogen Valleys

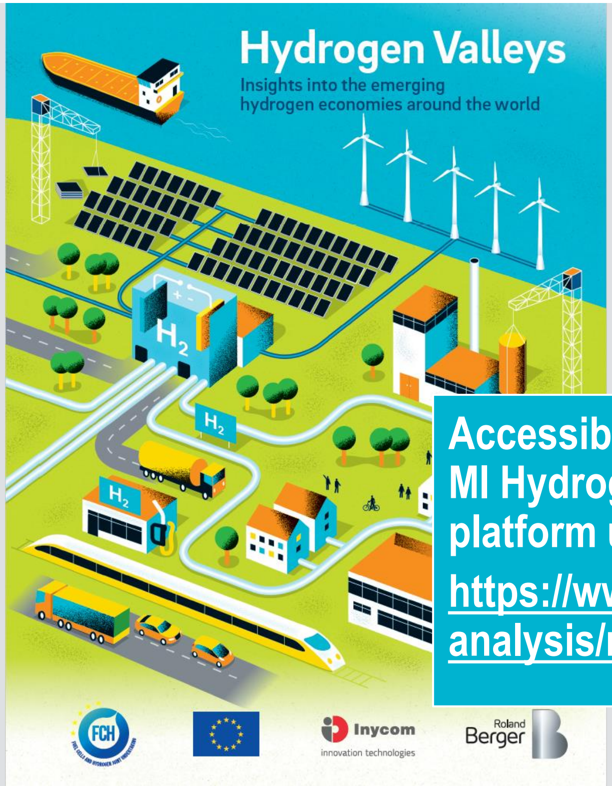
> Obtaining public funding support to close the remaining funding gaps

> Finding green hydrogen off-takers and signing long-term contracts to make projects bankable

> Ensuring technology readiness of all fuel cells and hydrogen applications required

> Ensuring adequate legal regulatory support (carbon pricing, standardization, fast permitting, etc.)

More information available in the report



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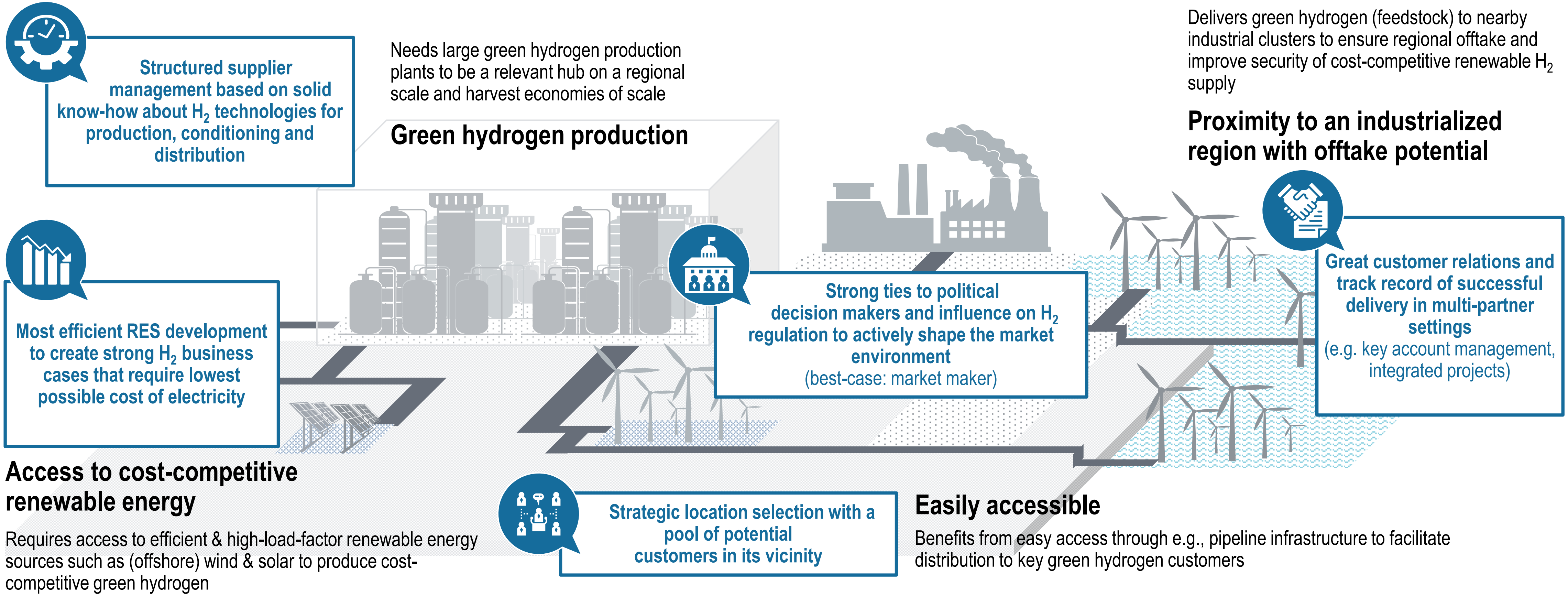
Accessible on the MI Hydrogen Valley platform under:
https://www.h2v.eu/analysis/reports

Source: FCH JU, Inycom, Roland Berger

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

Key capabilities required in the market

Illustrative



Required capabilities

Source: Roland Berger

Roland Berger

THINK:ACT