



HYDROG(E)NICS

SHIFT POWER | ENERGIZE YOUR WORLD

HYDROGEN ECONOMY: FROM MANUFACTURERS TO END-USERS

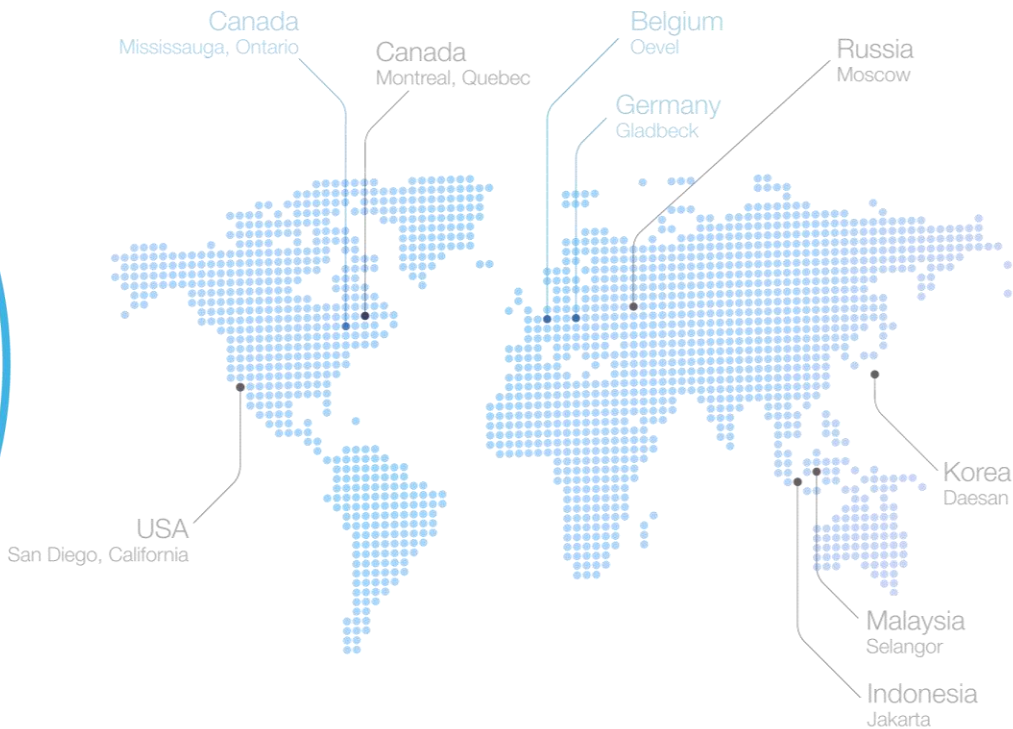


FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING

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Shifting Power Across Industries Around the World



Accomplishments in 10 years of FCH-JU (2007-2017)

↑ HYDROGENICS Technologies ↓



Electrolysis



Fuel cells

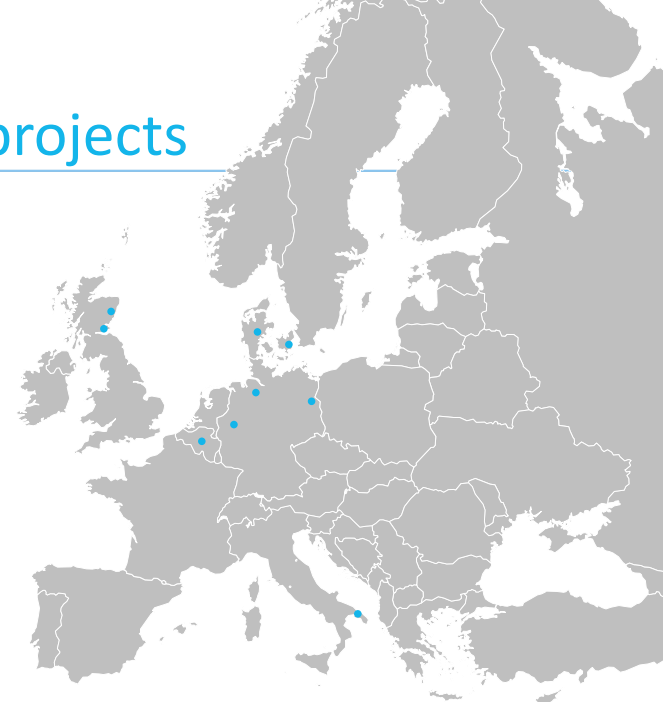


Overtaking Incumbent 100 year old solutions



Renewable hydrogen

Lessons learnt from recent demonstration projects



Country	Project	Size	Year	Electrolyser technology	Power	Gas	Industry	Mobility	Fuel
Thailand	EGAT	1.2 MW + 500 kW FC	2017	PEM	•				
Canada	Embridge P2G	2 MW	2017	PEM		•			
Germany	MefCO2	1 MW	2017	PEM					•
Denmark	HyBalance	1.2 MW	2017	PEM			•	•	
UK	Levenmouth	370 kW + 100 kW FC	2016	Alkaline + PEM	•			•	
Denmark	BioCat	1 MW	2016	Alkaline		•			
Italy	Ingrid	1 MW	2016	Alkaline	•	•	•		
UK	Aberdeen	1 MW	2016	Alkaline				•	
Germany	WindGas Reitbrook	1.5 MW	2015	PEM		•			
Canada	Raglan Copper mine	350 kW + 200 kW FC	2015	Alkaline	•				
Belgium	DonQuichote	150 kW	2015	Alkaline + PEM	•			•	
Germany	WindGas Falkenhagen	2 MW	2014	Alkaline		•			

Main conclusions from these projects:

1. Hydrogen **technologies work fine** and deliver according to expectations.
2. There is still room for further technical improvement but **no technology breakthrough is expected**.
3. There is a important potential for further **cost reduction**: going from project manufacturing to product manufacturing (high volumes)
4. Energy **regulatory framework is no suited** for these applications and **business operation** of these projects **remains very challenging**

Most Important Drivers for Hydrogen & Fuel Cell Industry

Scale

The most important
bottle neck to growth

Low Scale
High Cost

China demand
alone will change this

Policy

Climate Change
Carbon Reduction
Off diesel

Air pollution mitigation

Germany; Korea; China;
California; Canada; Japan

Important bridge to
trigger demand

Alternatives

Batteries<> Fuel Cell

Hydrogen offers larger
scale, longer range,
better life cycle cost

Recommendations for action at EU level

- **Accelerate** industry development in the EU by supporting the creation of a internal EU market through appropriate **regulatory changes**
- Move gradually **from direct support** (subsidies) **to market support** mechanisms
- **Create volumes to reduce costs**
- **Focus** on key differentiators, where the EU is leading
- **Coordinate efforts** at EU level for market development and innovation stimulation: a PPP like the FCH-JU is a wonderful instrument
- Keep supporting **R&D&D programs**
- **Communicate better** towards external stakeholders and policy makers

Thank you for your attention



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