



Innowacyjna Energetyka rozwiązania dla Przemysłu, miast, gmin i społeczności lokalnych

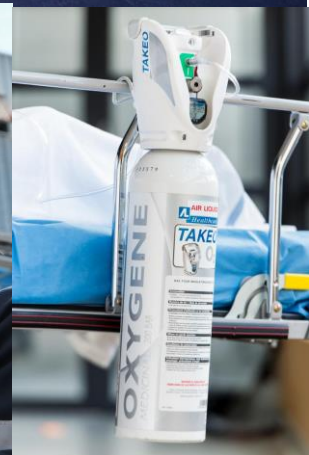
Konferencja Rynek Energii Elektrycznej Kazimierz 2017

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Marcin Skowron

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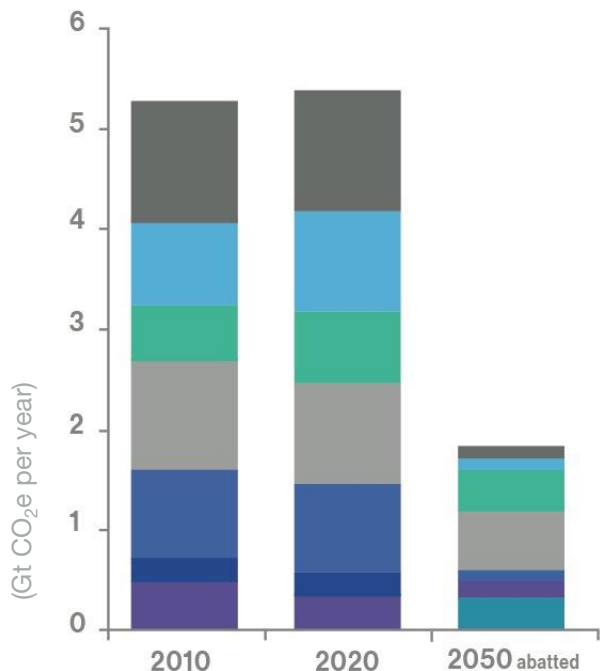


Europe's emissions challenge

Aggressive Energy & Climate policies

- Road transport and energy emissions are heavily impacted
- To meet targets we need to abate emissions from transport by 95% by 2050

EU 27 total GHG emissions



Sector	Total abatement
Power	95% to 100%
Road transport	95%
Air & sea transport	50%
Industry	40%
Buildings	95%
Waste	100%
Agriculture	20%
Forestry	-25 Gt CO ₂ e

(1) Large efficiency improvements are already included in the baseline based on the IEA. World Energy Outlook 2009, especially for industry.

(2) Abatement estimates within sector based on Global GHG Cost Curve.

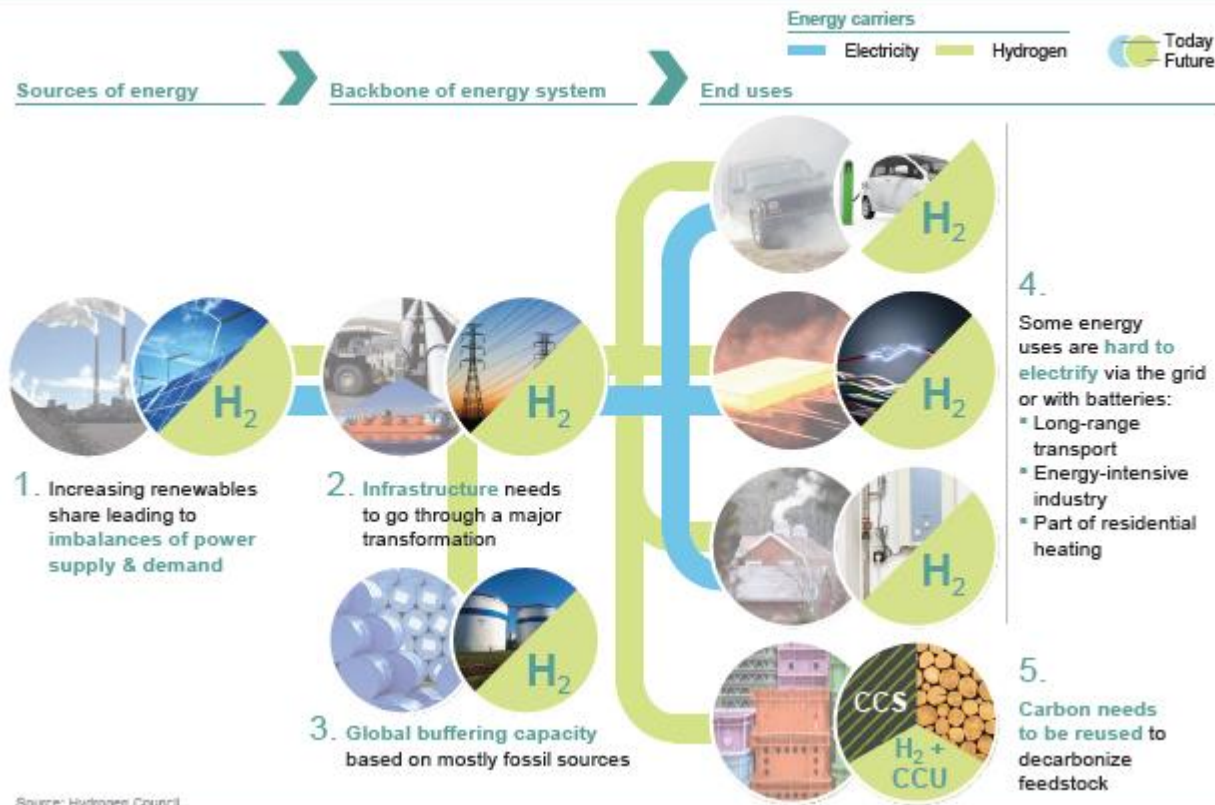
(3) CCS applied to 50% of large industry (cement, chemistry, iron and steel, petroleum and gas, not applied to other industries).

Source: www.roadmap2050.eu



PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

Key challenges of the energy transformation



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Source: Hydrogen Council

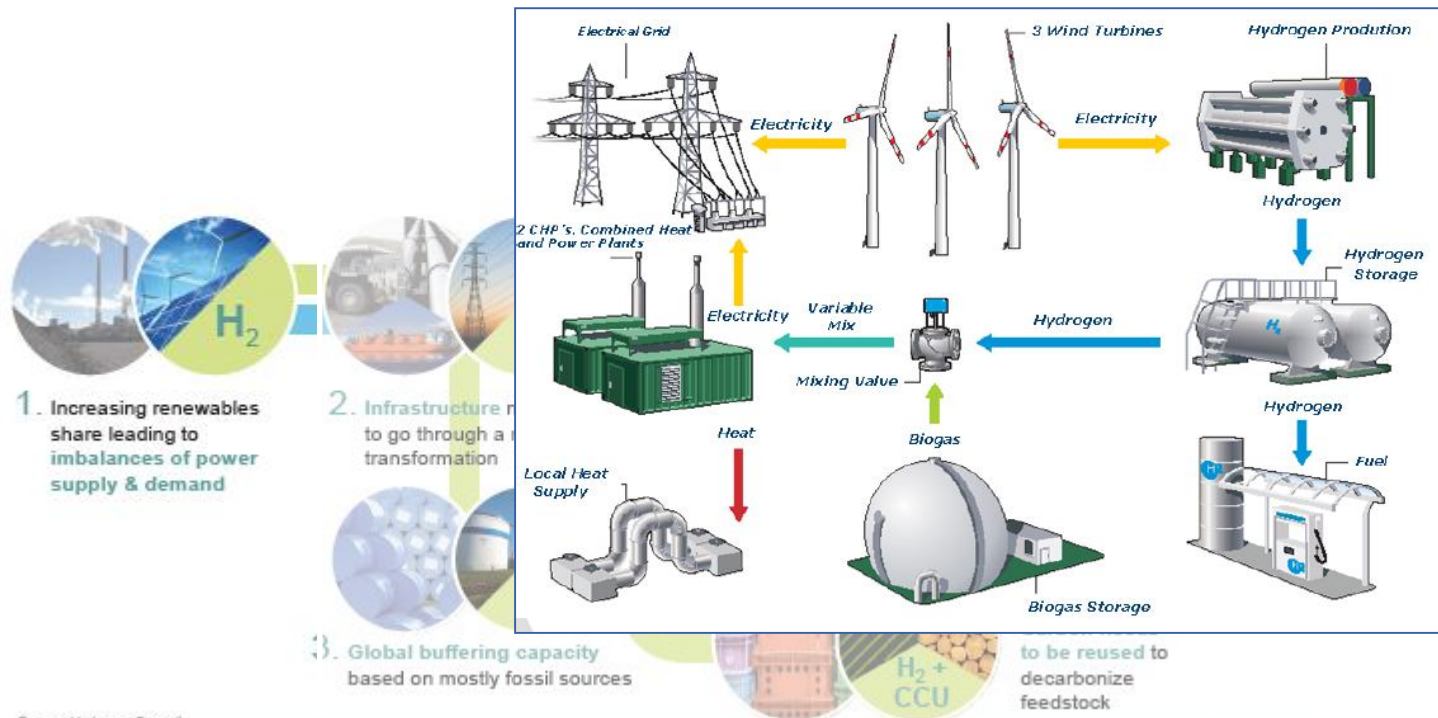
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Germany: PRENZLAU – hybrid of H2 with BIOgas

Partners: Enertrag, Total, Vattenfall



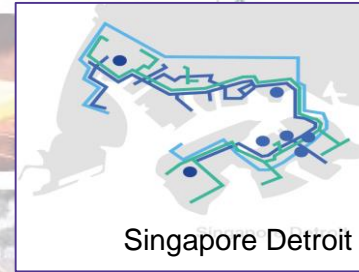
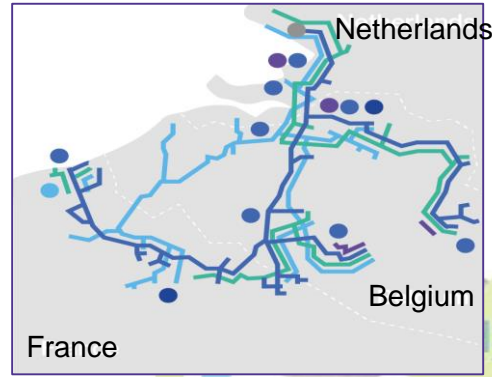
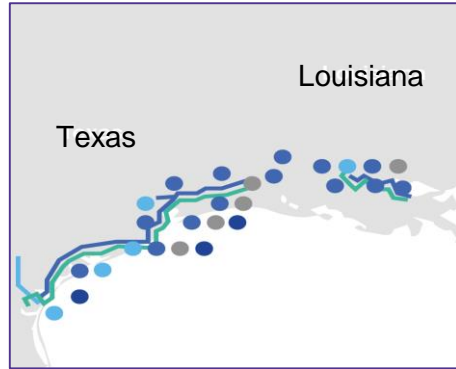
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Source: Hydrogen Council

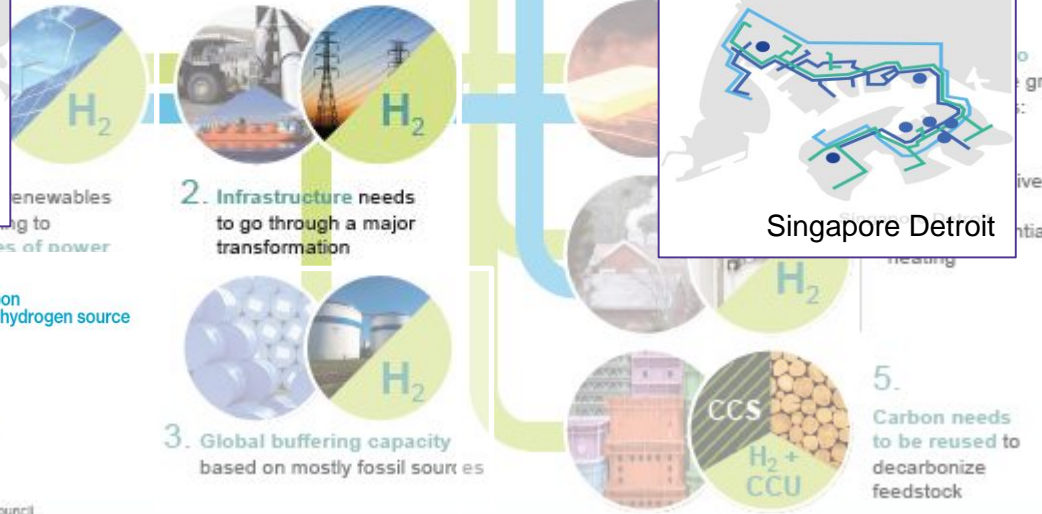
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40 years of global investment in Hydrogen



- Hydrogen
- Oxygen
- Nitrogen
- Synthetic gas
- Hydrogen and or/carbon monoxide facility and hydrogen source
- Oxygen and nitrogen facility
- Cogeneration facility
- Synthetic gas facility



Distribution



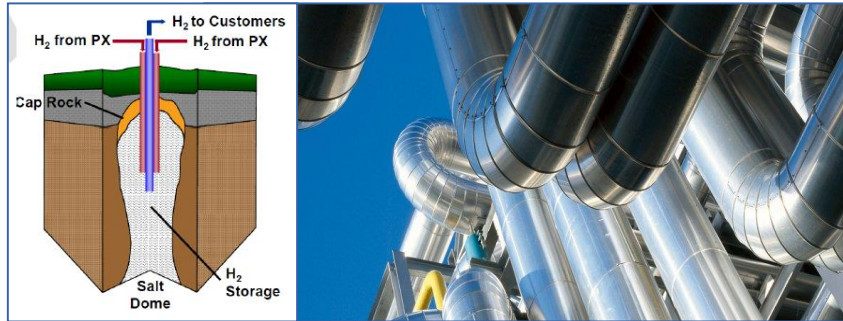
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Source: Hydrogen Council

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USA: Air Liquide operates the world's largest underground hydrogen storage facility

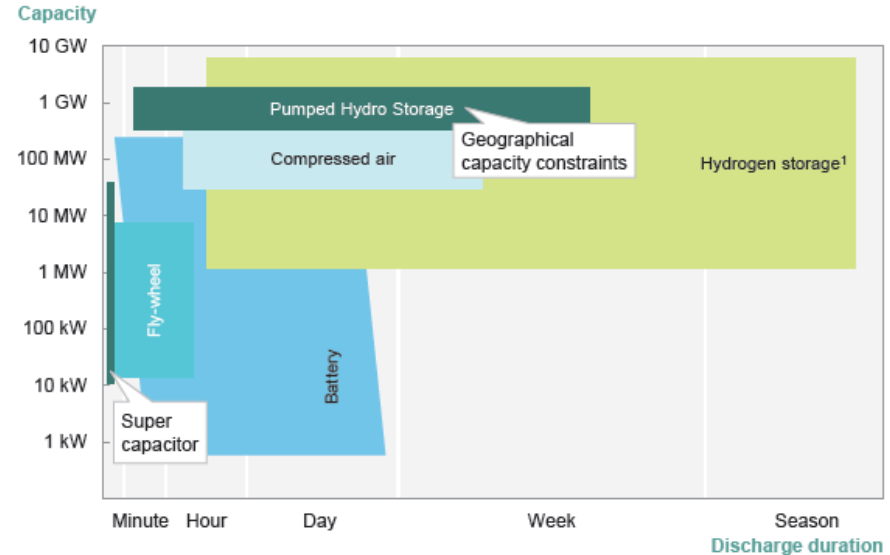


1,500 meters deep and nearly 70 meters in diameter
The facility is capable of holding enough hydrogen to

back up a large-scale **steam methane reformer (SMR) unit for 30 days**

2. Infrastructure needs to go through a major transformation

3. Global buffering capacity based on mostly fossil sources



5. Carbon needs to be reused to decarbonize feedstock

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Source: Hydrogen Council

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Germany H2Mobility: deploying at full speed



Air Liquide, Daimler, Linde, OMV, Shell and Total have agreed an action plan for the construction of a Hydrogen station network in Germany



- **400 Hydrogen Stations by 2023** (100 by 2017)
- **350m € investment**
- **Max. 90 km distance between each station on motorways**
- **10 Hydrogen Stations in each metropolitan area**

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Air Liquide

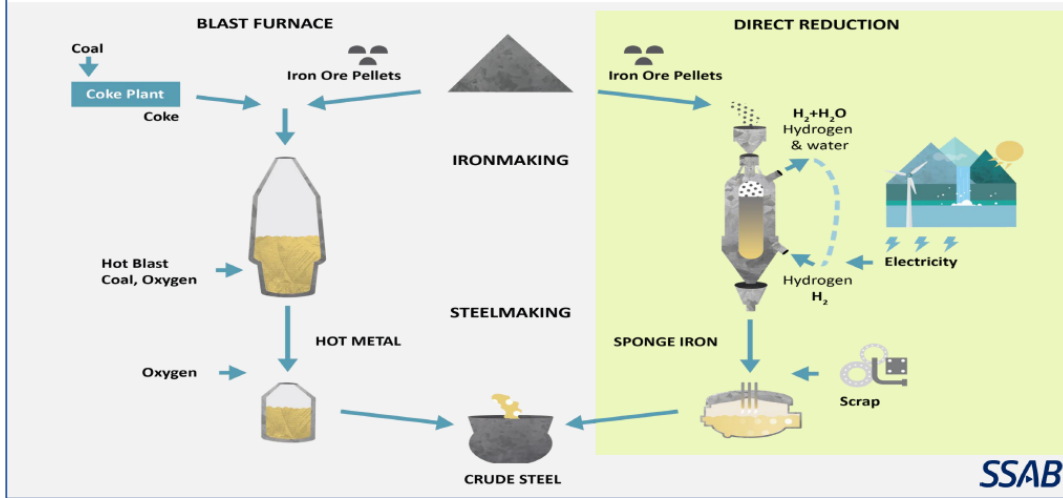
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Hydrogen at industrial processes

CO₂-emission free ironmaking



1. Increasing renewables share leading to imbalances of power supply & demand

2. Infrastructure need: to go through a major transformation

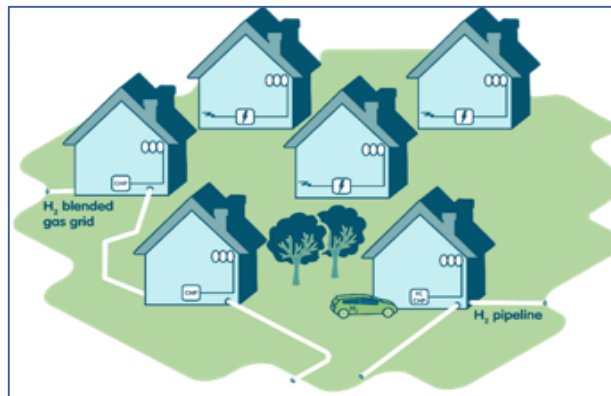
3. Global buffering cap: city based on mostly fossil sources

4. Some energy uses are hard to electrify via the grid or with batteries:

- Long-range transport
- Energy-intensive industry
- Part of residential heating

5. Carbon needs to be reused to decarbonize feedstock

Hydrogen to be used in regions



Already 190,000 buildings are heated with hydrogen-based fuel cell micro CHPs

- Hydrogen is part of a portfolio of solutions for decarbonizing building heating (choice depending on local conditions)
- Hydrogen through the gas grid¹ can fuel heating technology



Leeds planning to convert natural gas grid in hydrogen grid by 2026



Plan to ban oil and natural gas for heating purposes in Germany by 2030

- Hydrogen technologies can serve as energy converter



Japan is expanding to 5.3 million micro CHP-based households by 2030.



1. Increasing renewables share leading to imbalances of power supply & demand

2. Infrastructure needs to go through a major transformation



3. Global buffering capacity based on mostly fossil sources

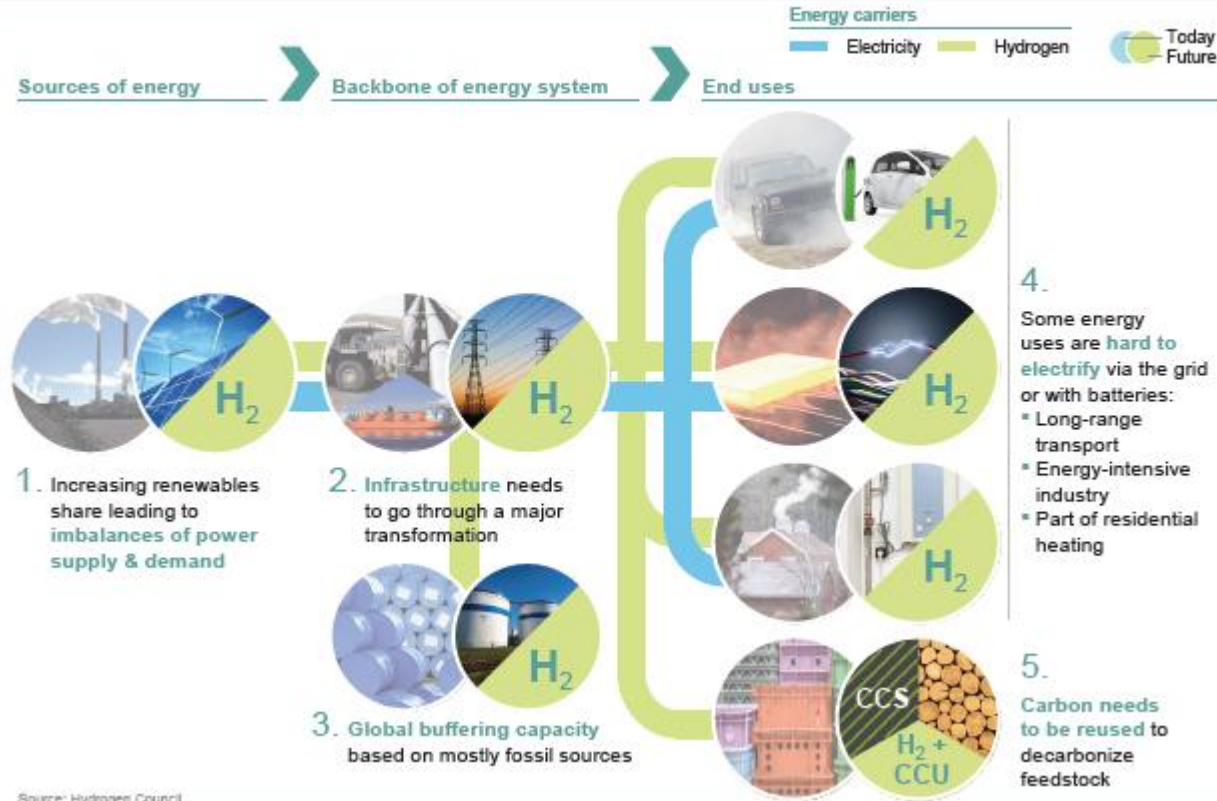


- Energy-intensive industry
- Part of residential heating



5. Carbon needs to be reused to decarbonize feedstock

Figure 1: Hydrogen as a zero-emission energy carrier needed to overcome the challenges around the energy transition



Source: Hydrogen Council

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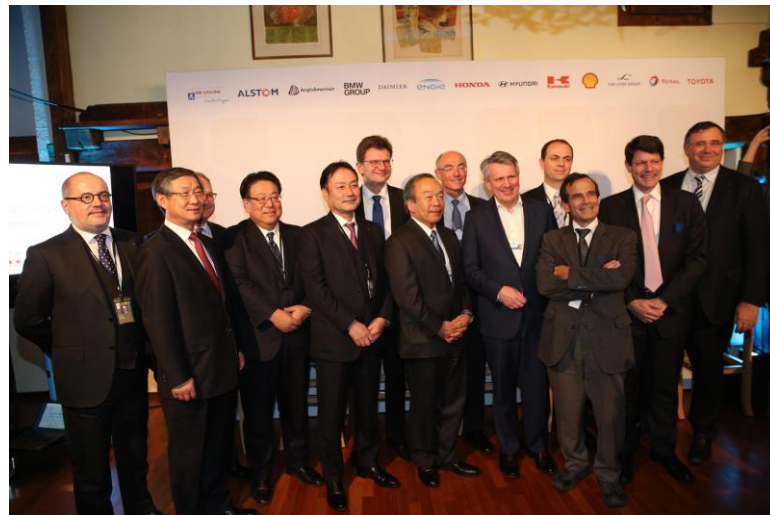


January 17, 2017 – Davos – Launching of the **Hydrogen Council**

13 Companies and their CEO's joining forces to voice the vision and the ambitions of the Hydrogen industry

Hydrogen acknowledged as a key solution to empower the energy transition

A further lever to accelerate
H2 infrastructure & FCEV deployments!



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