



H₂ Energy

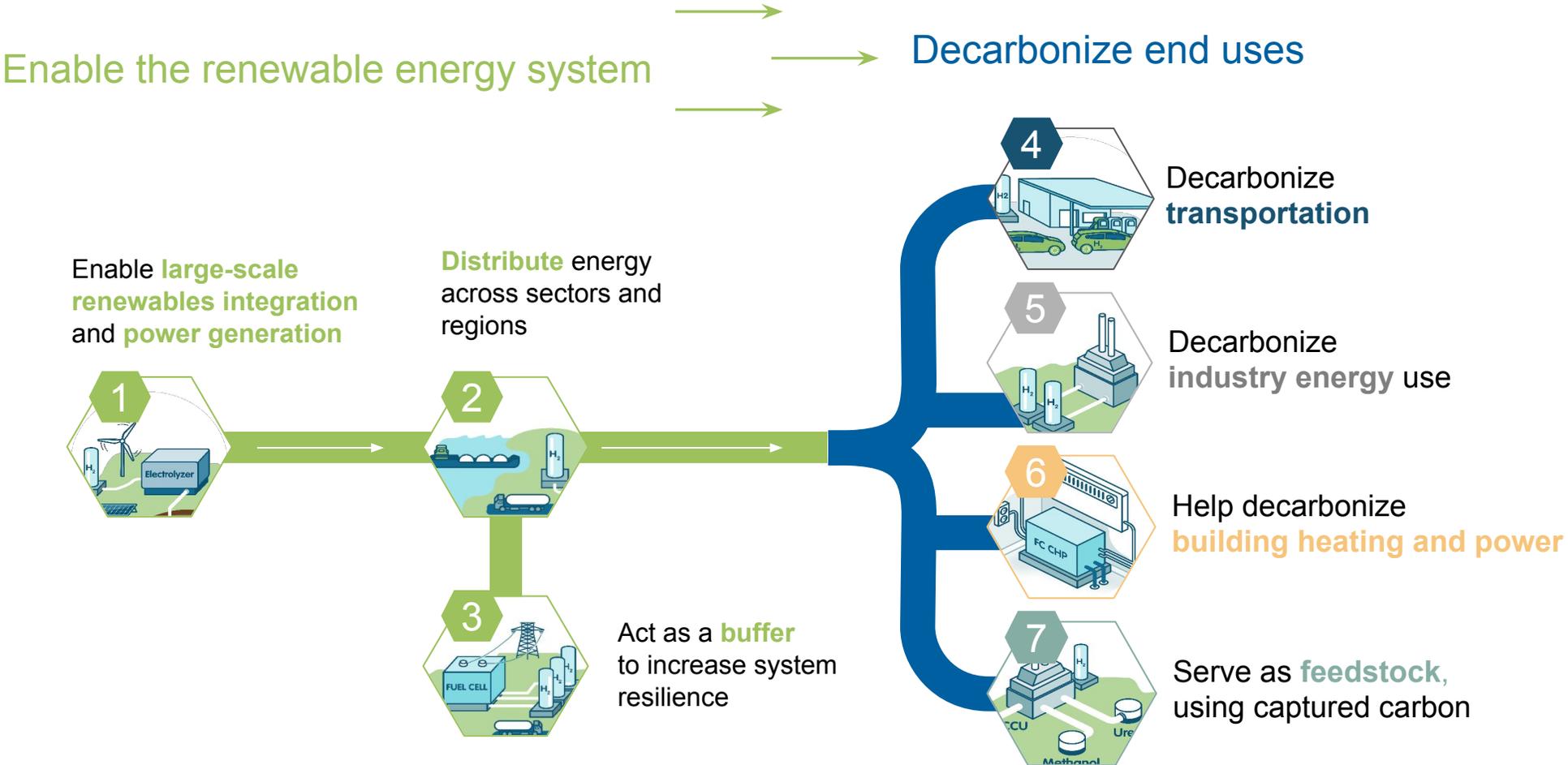
an enabler of the
Grand Energy Transition

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Deep Dive on Gas Workshop, UNECE, Geneva, Sep 24th 2019

There are seven roles for hydrogen in the energy transition



Source: McKinsey & Hydrogen Council 2017.

Zoom: Power-to-Gas



Source: Alena Fargere, James G Carton, Bart Kolodziejczyk, Andres Picatellez, Cansu Karaca, Laura Martintez, and Yena Chae, Future Energy Leaders Hydrogen Taskforce, WEC, "Hydrogen an enabler of the Grand Transition", 2018

200+ P2G projects

Power Demand Size: 250kW to 6,300kW;
Years Operational: 2012-2018 (inclusive)

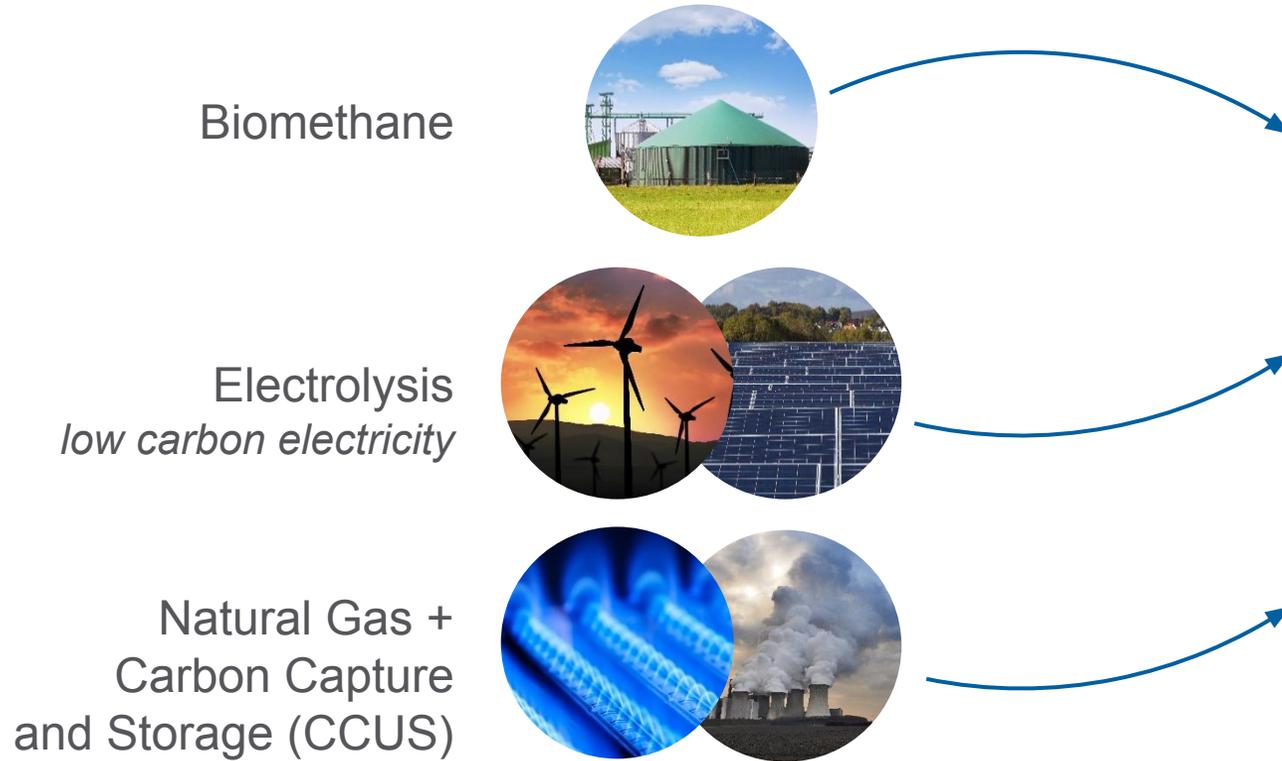
- > mainly in the OECD countries with developed electricity and gas grids and funds available;
- > average size is growing since 2005;
- > developed mainly by industrial actors across hydrogen value chain (most of them are currently Hydrogen Council members)



Ex: HyBalance, Denmark

- > 1.25MW electrolyser
- > connected to a wind farm
- > hydrogen used for: mobility, industry, & grid services
- > european & Industrial funding
- > mature, flexible

Low carbon hydrogen pathways



Zoom: Gas grid conversion



Ex: Leeds, UK

- > conversion of the existing gas grid to hydrogen
- > accounts for size, location, grid complexity, high demand
- > £150 billion cheaper than electrification



Use Cases

Sector	Use Case	Description	Source of hydrogen	Stage of development
Mobility	1st Fuel Cell Electric Vehicle Taxi Fleet	Provide on demand transportation operators an FCEV package by 2021 at the same rate as hybrid and diesel vehicles	Grey – transition to green planned	Commercial, small scale
	Class 8 Semi Trucks Powered by Hydrogen	Toyota is testing the scalability of their fuel cell technology by developing class 8 fuel cell semi-trucks for use in the port	Green	Feasibility Study
	Hydrogen Fuelled Train	Provide a cost effective and sustainable alternative to electrification to decarbonise rail transport	Grey – transition to green planned	Commercial, small scale
Heat	Decarbonising Heat	Detailed engineering solution for converting UK homes and businesses from natural gas to 100% hydrogen, starting in 2028	Blue and green	Feasibility Study

Source: World Energy Council, "New Hydrogen Economy, Hope or Hype?", Innovation Insights Brief, 2019

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Power	A European Flagship Powerto-X Project	Aims at demonstrating that an industrially integrated electrolyser is able to produce green hydrogen and supply grid services at the same time	Green	Demonstration Project
	A Replicable Hydrogen Territory	Uses curtailed renewable energy generated locally to produce hydrogen to be stored and used for local applications	Green	Demonstration Project
Industrial Applications	Decarbonising Ammonia	Clean hydrogen is the major enabler for making CO ₂ -free or “green” ammonia, which is the key ingredient for “green” fertiliser	Green	Feasibility Study
	Decarbonising Steel Production	The SALCOS project aims at gradually moving away from carbon-intensive steel production based on blast furnaces, to a direct reduction and electric arc furnace route, with an increasing use of hydrogen	Green	Demonstration Project

Source: World Energy Council, “New Hydrogen Economy, Hope or Hype?”, Innovation Insights Brief, 2019

Key Insights



Hydrogen today:

- > Early movers proves sustainability
- > Systemic impact on the Energy System
- > Start of global deployment
- > Mature technology

Need to further increase the pace:

- > Implement incentive policies
- > Secure deployments
- > Coordinate the players
- > Set up the first large-scale projects